

GOVERNMENT OF THE CENTRAL
PROVINCES AND BERAR
R E P O R T
OF THE
INDUSTRIAL SURVEY COMMITTEE.
PART I---VOL. 2.

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INDUSTRIAL SURVEY COMMITTEE

PART I—VOL. 2

NAGPUR

GOVERNMENT PRINTING, C. P. & BERAR

1933

[Price—Rupee One]



IMPORTANT INFORMATION

REPORT OF THE INDUSTRIAL SURVEY COMMITTEE

PART I—VOLUME 1

This volume discusses the considerations that underlie this survey and report on regard to the functions of the State, taxes and expenditure, capital and labour wealth, money and barter economics, etc. It reviews the work done by the Department of Industries since its establishment and makes certain recommendations for the reorganization of the department. It contains the results of a survey of 606 villages and the suggestions made to the Government to encourage about 30 village and cottage industries.

[Pages 1 to 50—Price Re. 0-8-0]

PART I—VOLUME 2

This volume contains two sections. Section I contains Survey Reports of Wardha and Balaghat Districts, and Section II contains Notes on Village and Cottage Industries.

Section I (Pages 1 to 82)—Price Re. 0-8-0

Section II (Pages 83 to 186)—Price Re. 0-8-0

Sections I and II combined (Pages 1 to 186)—Price Re. 1-0-0

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This volume discusses the possibilities of exploiting Forest, Mineral and Power resources of the Province and recommends the reorganisation of the departments.

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PART II—VOLUME 2

(Under preparation)

This volume contains selected portions of the findings of the sub-committees and others on Forest, Mineral and Power resources, and Transport, Taxation and Marketing.

All these Reports
are printed on hand-made paper

PREFACE

This book forms an annex to the First Volume of Part I of the Report.

The first section contains two of the good district reports submitted by the group leaders who were in charge of the village survey parties. The space at our disposal does not permit of publishing the remaining twenty-one reports.

In the second section, selected notes and memoranda on various industries submitted by individuals and institutions are set out according to the order in which the respective industries have been dealt with in the First Volume.

The views and opinions expressed in this volume are those of the writers and are not necessarily endorsed by the Industrial Survey Committee which assumes no responsibility whatsoever on behalf of the writers for their statements.

NAGPUR :
The 5th September 1939.

J. C. KUMARAPPA,
Chairman,
Industrial Survey Committee,
Govt. of the C. P. & Berar.

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REPORT

OF THE

INDUSTRIAL SURVEY COMMITTEE

PART I—VOL. 2

SECTION I-A.—WARDHA DISTRICT

CHAPTER I.—INTRODUCTION

I was co-opted as a member of the Industrial Survey Committee of the Government of the Central Provinces and Berar, on the 20th January 1939. On the 21st, a meeting of the members of the committee and the student volunteers was held when the Chairman, Sjt. J. C. Kumarappa, gave instructions regarding the manner in which the survey was to be conducted and distributed copies of the questionnaire in English, Hindi and Marathi as well as answer books to the members.

Districts were allotted to the members for carrying out the survey and every member was made a group leader with a few volunteers to assist him. I was made group leader for the Wardha district with 10 students to help me in the conduct of the survey. A list of villages to be surveyed in the Wardha district, as recommended by the Deputy Commissioner, Wardha, was also given to me.

On the 22nd evening I started for Wardha with the batch of 10 students. On the 23rd morning I, with a few students, met Sjt. M. P. Dwivedi, the Sub-Divisional Officer, as the Deputy Commissioner was out on tour. The Tahsildar of Wardha was also present. He received us very well, gave us an idea of the district, issued instructions to the Tahsildars for rendering us necessary help and approved the programme of the survey work, chalked out by me. We visited Maganwadi and Nalwadi to acquaint ourselves with village industries and improvements that had been made in them by the All-India Village Industries Association. The student surveyors were divided into five groups—each group consisting of two students—and villages were allotted to them for making the survey. In all 25 villages were surveyed. I visited 12 villages and guided all the groups of surveyors. Tahsil peons were deputed with all the groups except the group which went to the Hinganghat tahsil. The village officers were helpful to the surveyors except at Alipore and Sukli. All the surveyors returned to Wardha on the 4th February and submitted their reports on the 5th. We came back to Nagpur the same evening and the party dispersed.

The report is based on the information supplied by the villagers and village officials on personal inquiry. As far as possible the information regarding agriculture was obtained from the agriculturists and that regarding different industries from persons who are or were actually engaged in the industry. A great deal of information was obtained

from the old persons living in the villages. Although it is not possible to certify the accuracy of the statements and statistics contained in this report, there is no reason to doubt the accuracy of the information supplied by the villagers.

Since almost identical conditions were observed in many of the villages surveyed, it was felt that the survey of more villages would serve no fruitful purpose. The information gathered in the villages surveyed is considered typical of the entire district.

CHAPTER II.—GENERAL INFORMATION

[An analysis of the general information regarding the villages surveyed in the district is given in Appendix A. A statement showing the different castes generally found in the villages and their present occupations is given in Appendix B. The list is, however, not exhaustive. A summary of information gathered from the Wardha District Gazetteer is given in Appendix C.]

1. Population.—The population of the villages surveyed varied from 600 to 4,000 and that of the towns from 6,000 to 22,000. Small as well as big villages and towns were included in the survey.

2. Occupations.—Many people have left their caste occupations and are following other occupations either exclusively or as subsidiary occupations. Many of them have taken to agriculture and field labour when their own occupations are not found remunerative for reasons which are beyond their control. If reckoned according to caste, in the district, there would be 27.4 per cent. agriculturists, 44.1 per cent. industrialists and 28.5 per cent. others in this district (*vide* Appendix C, Table 4). Taking the whole of the Central Provinces and Berar, we would find 20.1 per cent. agriculturists, 42.7 per cent. industrialists and 37.2 per cent. others (*vide* Appendix D). The percentages shown above include the dependents on the occupations concerned. This shows that the province was never mainly an agricultural province. The entire economic structure of the country has undergone a change spreading the demon of unemployment. People have become more dependent on agriculture as agricultural produce is the only commodity which goes out of the villages and brings an income to the villagers. With this they purchase imported manufactured products to meet their necessities. When village industries were in vogue, most of the villagers were fully engaged in industries. At that time they did not feel the pinch of agricultural depression as they do now. The pressure on land was therefore less.

In order to remove the present widespread unemployment, it is essential to have a

planned economy. The plan may be so designed as to restore the balance between the various occupations. The new up-to-date plan may be so devised as to keep roughly 25 per cent. of the population dependent on agriculture, 50 per cent. on industries and 25 per cent. on other occupations.

3. Literacy.—Exact statistics of the literate persons in the villages were not available. It was, however, observed that most of the elderly people were illiterate but were hard-working and interested in their own work. The people of the younger generation have become more literate but they do not like hard work and do not take interest in their work. They have a tendency of going out of the village and getting into clerical or other such light occupation. The percentage of the literate to the total population of the district was 5.75 in 1921 and 6.7 in 1931 (*vide* Appendix C, Table 25). No professional or technical school was found. Primary schools exist almost everywhere.

Professional education useful to the villagers in their practical life may be given in the primary schools. For higher education useful to the villagers, arrangements may be made at one central place in all the tahsils.

4. Area under cultivation.—In the villages surveyed the area under cultivation varies from 355 to 6100, acres. Almost all the available land has been brought under cultivation. This happened particularly when the price of cotton went high, but circumstances have changed and the return from land is not satisfactory. The villagers were in distress on account of the successive failure of crops during the last 10 years. Land is deteriorating from year to year. One great and most important defect is the complete absence of pasture land in all the villages. A perusal of Appendix A indicates that almost the last inch of available land has been brought under cultivation. That which is not under cultivation consists mainly of hills, rivers, nalas, roads, etc. Pasture land is negligible. At Alipore, the pasture land is 663 acres for 3,176 cattle, *i.e.*, .209 acres per head of cattle, at Wathoda, it is 14 acres for 816 cattle, *i.e.*, .018 acres per head of cattle, and at Arvi, it is 8 acres for 3,576 cattle, *i.e.*, .0022 acres per head of cattle. At Kharangana, there are 900 cattle and there is practically no pasture land for them in the village. They are taken to another mauja for grazing. The total unoccupied area under tree, forest, scrub-jungle and grass is 84,956 acres and the total number of plough cattle is 98,976 in the whole district (Appendix C, Table 7). The proportion of unoccupied area to the number of plough cattle is 86 to 100, and 10 per cent of this unoccupied area may be taken as grass lands. So, on an average, roughly .086 acres of land per plough cattle is kept for grazing. Milch cattle, sheep, horses, etc., are not taken into account here. The income of the district councils and the municipalities in the district from cattle-pounds was more than Rs. 28,000 in 1935-36. The cattle go astray for want of grazing land and this is indirect taxation on agriculturists. The villagers state that about two acres of land are re-

Cattle is the backbone of agriculture and the latter cannot thrive without the former being kept healthy and strong. No amount of improved breeding can help the improvement of cattle wealth without providing adequate food for them. Provision of nutritious food for the cattle is of primary importance and improvement in the breed comes next to it. Besides being utilized for direct cultivation the cattle provide manure. Proper manure cannot be obtained without the ability to keep cattle in good condition. The villagers have lost this ability for want of grazing land. They cannot keep milking cattle at all. The consequence is that the outturn of the farm goes down and this has been observed during the last 10 years.

It is, therefore, essential that immediate steps be taken to provide adequate grazing land in all the villages. Not only should the conversion of waste land into agricultural land be stopped but some of the land at present under cultivation be converted to pasture land. Although this may be a drastic step, it is immediately necessary as it will directly help the villagers and the intensive cultivation of the smaller area will more than compensate the loss in the area curtailed. In the alternative, every cultivator may be compelled to reserve a portion of his land for raising fodder for cattle. This may be in the proportion of two acres in every 20 acres of land (*i.e.*, per bakhar owned by the cultivator).

5. Post Office.—Out of the 25 villages surveyed, 17 have got post offices and others have got it within 14 miles.

6. Medical aid.—(1) Out of 946 towns and villages only eight have dispensaries. In 1937, average daily indoor and outdoor patients were 40.8 and 14,000 respectively (Table 27, Appendix C). The percentages of average daily patients treated to entire population of the district (516,266) were .008 indoor and 2.7 outdoor. The villages, having more than 80 per cent. of the population, do not get any relief from them. The places where they exist obtain partial relief. For ordinary diseases the poor people can go to the dispensary but in serious cases they cannot do so. The number of beds is limited. The doctors charge Rs. 2 to Rs. 8 per call. The average income of a poor man is less than one anna a day and that of a middle class man is less than four annas a day. With this meagre income, such people cannot afford to pay for doctors. They do not get any benefit from the dispensaries in serious cases. Only the rich people, who may be less than 5 per cent. of the population, can obtain relief. The income of the dispensaries was Rs. 42,001 in 1937 (Table 27, Appendix C). Private doctors are available in the towns. In addition to their fee for advice they charge about eight annas per day for medicine. If injections are prescribed, the charge rises to about Rs. 3 a day. The poor masses cannot afford to call them. They are meant for rich persons only. It is, therefore, evident that for ordinary diseases less than 20 per cent. and for serious diseases less than 5 per cent. of the population of the district obtain relief from the allopathic system of treatment. The dispensaries provide for allopathic system

The villagers depend mainly on ayurvedic medicines. These physicians are not properly educated and the medicines administered are defective. The treatment is, therefore, not always effective. As the vitality of the people has gone down for want of nutritive food, they stand in great need of medical aid.

(2) The system current in dispensaries is defective. Supply of free medicines leads to the tendency of running to the dispensary for most ordinary diseases, keeping low grade medicines and wasting them. Advice on payment leads the doctors to provide temporary relief after long treatment for making money, and neglect the poor. They delight in the spread of diseases. They have to depend on foreign supply of medicines and for examination of blood, urine, etc., they have no provision. They should aim at preventing diseases and providing permanent cure. Cheap but effective medicines should be distributed on payment and advice should be given free. The medicine should be available in the locality and diagnosis of diseases should be on the spot. They can reach a much greater number of people by adopting ayurvedic system.

The allopathic system is unsuitable for this country. It is of no use to the masses. The cost of medicines is high and the supply is dependent on foreign countries. It gives only temporary relief and is objectionable on religious grounds. Learning takes a long time. The ayurvedic system is most suitable here as the above shortcomings are not found in this system. The effectiveness of the two systems can be judged if equal opportunities are extended to both of them. The one has facilities for education and training and large sums are being spent for its encouragement. The charitable dispensaries provide for this system only. All these are wanting for the other. In spite of this, less than 20 per cent. of the people are benefited by the first and more than 80 per cent. of the people are benefited by the second (ayurvedic) system.

(3) The masses should be given effective medical relief by implementing the following suggestions :—

- (1) One qualified ayurvedic physician should be kept in every village or at least, in a group of villages. His remuneration may be fixed at about Rs. 200 per annum. He should go from house to house for free treatment. The efficiency of his work should be judged by less immature deaths, longer span of life of villagers, less sickness in the village, etc.
- (2) Effective medicines should be kept by the landlords. Labourers bringing available roots and herbs should be given free medicines and others on payment of cost. In the towns, vendors should be licensed or Government should open depôts for sale.
- (3) More than 80 per cent. of money spent on charitable dispensaries should be spent on ayurvedic system and training should be given to the village physicians at these dispensaries before appointment.
- (4) Existing ayurvedic schools, if any, should be recognised by Government

and grants should be given to them for encouragement to obtain qualified physicians.

- (5) A museum of ayurvedic medicines should be kept at the district dispensary or Central museum to enable the people to recognise them.
- (6) Medicines should be manufactured at one place for supply to the villages.

In addition to medical relief it will provide employment to a large number of people.

7. Veterinary aid.—Veterinary aid is available in four towns only. The villagers obtain little relief from this source.

It is essential for every village as agriculture mainly depends on the cattle wealth of the country. But the veterinary aid which requires imported medicines cannot render much help to the villagers as the medicines are costly and they can never be expected to pay for the same. Some sort of indigenous medicines may be supplied and education imparted on this line in the village schools.

8. Roads.—The villages visited were either on the pucca road or within 14 miles of the same and connected by kacha roads. The journey by these kacha roads is very difficult and slow. It becomes impracticable in the rainy season. Even in other seasons carts ply through the fields rather than on the kacha roads as the former is more convenient.

9. Railway stations and Market towns.—Railway stations and market towns are within 20 miles of the villages visited.

10. Night-soil.—The villagers do not know how to utilize night-soil. In the rainy season they pass night-soil by the road sides as the fields are under cultivation. Even after the crops are harvested they follow the same practice. Only about 25 per cent. of the people pass night-soil in the fields but they never cover it with earth. The night-soil is thus wasted and is a nuisance in the villages.

Moving latrines suitable for use in the village were observed at Maganvadi. They may very well be introduced in the villages to do away with both the evils.

11. Farmyard manure.—Farmyard manure is mainly utilized from manurial purposes and to a very small extent cakes are made for burning.

12. Water-supply.—In most of the villages the supply of drinking water is sufficient. In a few, scarcity is felt in the summer season. This can be removed by providing deep wells and tanks.

13. Revenue and Taxes.—In addition to land revenue, cesses are levied in the villages for the upkeep of schools, roads, etc. Wherever there is a sanitation committee, sanitation tax is also levied. There are no octroi duties in the villages. Terminal taxes are levied at the tahsil towns on imports and exports. At the market places stall taxes are levied. The main markets are Nagpur, Wardha, Hinganghat, Arvi and a few big villages. The charges which the villager has to pay at the markets are given in a subsequent chapter. The schedules of municipal taxes at Nagpur, Wardha, Hinganghat and Arvi are given in Appendix F.

At Sailu the bazar area is auctioned and the contractor levies stall tax at the following rates :—

A cart of goods	..	Two annas.
A bojha	...	Six pies.
Cattle	..	Three pies per rupee on sale.

Sanitation tax on imports levied at Kharangana at the following rates :—

A cart of goods	..	Two annas.
A beast load	..	One anna.
A head load	..	Six pies.
Cattle	..	Three pies per rupee on sale.
Butchers	..	Two annas per stall.

Once a duty is levied at the village or the market town, it is not refunded whether the article is sold or not. So in the case of an agriculturist he has to sell the goods at the price obtainable in the market as holding back would require more expenditure for himself and the cattle and taking back to the house would mean losing the taxes paid and expenditure incurred. In the case of a cottage industrialist the sale of the entire output is not possible. He has to pay taxes twice, thrice or four times on the same article in the same market in addition to those in different markets so long as the goods are not sold. This is a great drawback which retards the progress of cottage industries and affects the income of the agriculturists.

The products of cottage industries may be exempted from the taxes of municipalities and local bodies. This may not affect their income very much. The fall in income may be more than compensated by the increase of duty on imported machine made goods. Duties on industrial products or raw materials for cottage industries may be levied in consultation with the Director of Industries.

14. Financial Resources.—A few years (five to seven) back the sahukar was the chief source of finance and the villager looked to him as his benefactor and helper at the time of need. Even during great hardships and famine times, it was the sahukar who came to his rescue. But this source of finance has been brought to a standstill due mainly to two causes :—

- (i) The paying capacity of the villagers has been considerably reduced on account of successive crop failures during the last five or seven years. The sahukar does not lend for fear of not getting back the money at all. This has been his experience during recent years.
- (ii) As new legislations, e.g., Debt Conciliation Act, etc., have been enacted, people are taking undue advantage of this and some of those who are able to pay are purposely not paying. Then again, they can borrow today and apply to the board for conciliation tomorrow.

The sahukar charged interest from 1 to 2 per cent. per month. He also recovered $1\frac{1}{2}$ times the money lent at the end

of 4 to 12 months. This interest rate included the premium for insurance against risk and the more was the premium the greater the risk involved. The sahukar could lend money without any security and could defer the time of payment. He was in close touch with the condition of the villagers and was not required to waste time on investigations. The villagers could get money at the time of their need.

Co-operative Credit Banks exist in the big towns but the villagers do not like to go to this institution for taking loans. The main reasons are that :—

- (1) Villagers have to spend something on investigations by bank officials before they can obtain money. They cannot do so when they are in need of the same.
- (2) It takes a long time to obtain the loan. The time when money could be best utilized passes away by the time they receive it.
- (3) The terms of payment are very rigid and it is difficult to obtain extension of the period of payment.
- (4) The paid bank officials do not take as much interest in the agriculturists as a sahukar does to run his business smoothly.
- (5) Those who take loans from banks have to lose their lands ultimately if the loan is not repaid in time as the banks can adopt summary procedure for its recovery.

For these reasons the villagers are afraid of taking loans from the banks.

Taccavi loans are advanced by Government to agriculturists. But the amount to be distributed is very small and cannot satisfy even 5 per cent. of the requirements of the villagers. The rate of interest charged is 10 annas per cent per month. It is given on the paying capacity of the agriculturists. The money advanced has the first charge on the land and moveables. Besides, it is very troublesome to obtain this loan and the villagers do not get the whole amount advanced. They complain that they have to pay gratuities to the petty officials and waste much time and money in coming from and going to the villages for obtaining loans.

The above picture shows that the credit system of the villages has completely collapsed. The agriculturist cannot get money when he needs it most and, therefore, he cannot carry on the cultivation in an efficient manner. This is also one of the main causes of the successive diminution of the output of crops and crop failures. If a man feeling hungry today has remote chances of obtaining food after some months, death is sure to overtake him. The agriculturist is in the same position today. The co-operative credit system has not proved to be a success. Government taccavi does not satisfy the complete requirements of the villagers. The sahukar may be encouraged, with certain restrictions, to render efficient service. He may charge reasonable interest if he is given the same

facilities as the co-operative banks for the recovery of the outstandings. The Debt Conciliation Act may not be made applicable to loans that may be advanced hereafter. Only genuine agriculturists who took money for agricultural operations and applied it to the same purpose may get relief under this Act. Unless and until a suitable credit system is established in the villages, it is not possible for the villagers to carry on their occupations smoothly. At present the sahu-
kar is being discouraged and the co-operative institutions are being encouraged. In spite of this the former is getting on and the latter are badly hit. The merits of two institutions can be judged only if equal opportunities are given to both. The defects, if any, in a system can be removed by careful observation. The sahu-
kari system might be amended but not ended. The sahu-
kar has rendered efficient service from time immemorial and the best advantage may be taken of his services in future as well.

15. **Indebtedness.**—On account of successive crop failures the villagers are unable to pay the debt incurred by them. The outturn of agriculture does not satisfy even their own requirements. The necessities were first met by selling their ornaments. The next item was moveables. When even this was not available they had to give their lands on *batai*, i.e., taking a part of the output and giving the land for cultivation to those who have got money. Such cultivators have very little interest in the land and the outturn consequently goes down.

Cultivators having 5 to 15 acres land require about Rs. 100 annually.

Cultivators having 25 acres land require about Rs. 200 annually.

Cultivators having more than 25 acres land require about Rs. 300 or more according to the area of land.

They take loans at the time of sowing and pay them back at the time of harvest.

Crop failures have continued for the last five to seven years. But something has been paid somehow or other and three to four year's outstanding still remains to be paid. Exact statistics of indebtedness are not available but it may be stated that many of the villagers are in debt on account of crop failures combined with low price of cotton. They are not in a position to repay the same at present.

The villagers will continue to remain in debt so long as their earning capacity is not increased. Deferring payment of loans and blocking sources of credit are but poor remedies. The evil can be mitigated by planning of agriculture and industries, reducing the burden on agriculture, intensive cultivation, restoration of credit and revival of village industries.

16. **Harijans.**—They live in the outskirts of the villages. The court-yards of their houses are kept clean. The lanes and surroundings in their locality are in no way inferior to those in other parts of the villages. But the houses in which they reside are very small. They have to cook and sleep in the same room having no windows. Very often two or three families live in one small house, in different small rooms separated by earthen walls. They are not given proper facilities for education and obtaining

water. Wells may be dug in the locality in which they reside to remove their difficulty about water.

17. **Drink and drug addicts.**—Wardha district has been declared to be a dry area since the beginning of this year. A few people either obtain drink from outside the district or use spirit for drinking. Opium and ganja habits still exist and those who cannot get wine are gradually turning towards them. But in the long run, people have benefited by temperance and only a few are diverting towards the formation of other vicious habits.

18. **Sanitation.**—The sanitation of the villages is bad. Even where there are sanitation committees the state of affairs is not good. At Alipore, where there is a sanitation committee since a long time, the sanitation was found to be the worst among all the villages visited by the surveyors. There are no roads and drainage system in the villages. The night-soil is passed on the road-sides and *nalas*. The houses are congested. No attention has been paid to ventilation.

CHAPTER III.—AGRICULTURE

1. **Crops raised.**—The following crops are raised in the district:—

- (i) *Food crops.*—Mainly *juar*, *tur*, wheat and linseed. To a small extent *til*, *gram*, *mung*, *bajra* and *moth*.
- (ii) *Money crops.*—Mainly *cotton*. To a small extent *linseed*, *tur*, *til*, and *groundnut*.
- (iii) *Irrigated crops.*—*Sugarcane*, *pan*, *chillies*, *fruits* and *vegetables*.

There has been no change in the crops cultivated during the last 10 to 15 years except in the adoption of *groundnuts*.

2. **Outturn per acre.**—

[100 tolas=1 paili; 8 pailis=1 kudov; 20 kudov=1 khandi.]

- (i) *Juar.*—Half to one *khandi* per acre.
- (ii) *Tur.*—2½ to 5 *kudos* per acre, cultivated with *cotton*.
- (iii) *Wheat.*—Half to three-fourth *khandi*.
- (iv) *Mung.*—4 *pailis* per acre, cultivated with *juar*.
- (v) *Bajra.*—2 *pailis* per acre, cultivated with *juar*.
- (vi) *Kapas (cotton).*—One-fourth *khandi* per acre, cultivated with *tur*.

A few years back the outturn of *cotton* and *juar* per acre was much more than that at present.

3. **Markets.**—The food crops are mainly grown for home consumption. They are not meant for sale. But when necessity arises even food crops are sold away.

The money crops are grown mainly for sale. *Cotton* is sold with seeds at the big markets, e.g., *Arvi*, *Wardha*, *Hinganghat*, *Nagpur*, etc. It is sold in the raw state. It is ginned in the power gins and then consumed in the textile mills within and outside the province. It is also exported out of India, mainly to Japan. The hand gins cannot compete with power gins and similarly hand spinning and hand weaving cannot compete with the mills. Moreover, the cultivators being always in need of money cannot hold back the stock of produce. For

these reasons cotton is sold with seeds and not processed into consumable articles. The present market value of kapas is Rs. 51 per khandi.

Linseed, til and groundnut are sold at the market towns and consumed in the local mills. The bullocks-driven oil ghani cannot compete with them.

Tur is sold in its original state in the market towns where it is converted into dal by manual labour. Villagers cannot do this as they cannot hold back the stock. This can be developed without much effort. But power mills have come into existence elsewhere in the province and this is a menace to the hand mills.

Plantains of Sailu are exported to long distances. Pan, chillies, sugarcane, etc., are marketed in the villages and tahsil markets.

4. Irrigation.—Fruit trees, e.g., oranges, plantains, papai, guava, etc., vegetables, chillies, pan, sugarcane, etc., are grown by irrigation. The main source of irrigation is well. The wells are not very deep but they supply sufficient water for the irrigation of the gardens. If deep wells are dug, gardening can be expanded.

5. Fruit trees.—Oranges, plantains, papai and guava are grown by irrigation. Mango trees are found on the road-sides and in the fields.

6. Payments in kind.—In the tahsil towns and big villages payment is generally made in money but in many of the villages payment is made in kind. It varies from village to village and is as follows:—

- (a) Carpenter—2½ to 5 kudos jawari per bakhar annually.
- (b) Blacksmith—2½ to 4 kudos jawari per bakhar annually.
- (c) Chamar—2 to 2½ kudos jawari per bakhar annually.
- (d) Barber—1½ to 2½ kudos jawari per bakhar annually.

The artisans get the above payment known as dan from the agriculturist for making annual repairs. For purchasing new articles fresh payments have to be made.

7. Palm trees.—No palm trees were found in the villages surveyed. Plenty of sindhi trees are, however, available in the district. They are utilized for mat, broom and basket making. As the district has been declared to be dry they are now an item of liability to the malguzars as they have to pay more tax on account of the existence of sindhi trees on their land. It is likely that the malguzars may like to clear them off and utilize the land for cultivation. The sindhi trees can be utilized for making gur and for bee keeping.

8. Average holding.—The area owned by cultivators can be divided into three divisions:—

- (a) Persons holding land below 15 acres.
- (b) Persons holding land from 15 to 30 acres.
- (c) Persons holding land above 30 acres.

The largest number belongs to class (a). The average holding is not above 10 acres and may be taken as five to seven acres of land.

9. Unemployment period.—Agriculturists who have got a farm of 20 acres and more and who cultivate the land themselves have no leisure. They are engaged throughout the year in agricultural operations. Similarly those who are engaged in annual service of the big landlords and cultivate their land are never idle. But those who have got uneconomic holdings say five to seven acres of land and the agricultural labourers, having no land of their own, are idle for three to four months in a year—after the harvest and before the rains, i.e., in the months of *Chaitra*, *Vaishak*, *Jaishtha* and *Asad* corresponding with March, April, May and June. During these months they get employment for about two days in a week and have to remain without adequate food often times. Even during the period of cultivation they do not get regular employment.

Agricultural labour can be utilized during this period for repairing village roads, planting fruit and other trees on road-sides to meet the requirements of villagers and for carrying on village industries pertaining to food, shelter and clothing which should be reserved for the villagers.

10. Economic holding.—In order that a piece of land may be called an economic holding it should satisfy the following conditions:—

- (1) It should provide full employment to one pair of bullocks.
- (2) It should provide full employment throughout the year to one family consisting of one man, his wife and two children.
- (3) The outturn must be sufficient to maintain a family and a pair of bullocks for more than a year, after providing for the seeds.

A holding of 20 acres, also known as a bakhar, requires a pair of bullocks to be fully engaged in its cultivation. It provides full employment to one family of cultivators throughout the year. The outturn at Sailu may be estimated as under—

(i) If cotton and tur are cultivated in 20 acres:—

	Rs.	Rs.
Cotton 5 khandis at Rs. 50 per khandi	250	..
Tur 4 khandis at Rs. 12 ..	48	..
		Rs.
Total ..	298	say 300
Expenses ..	..	100
		—
Nett annual income ..		200

(ii) If cotton, tur, juar and wheat are cultivated:—

	Rs.	Rs.
Cotton in 10 acres—2½ khandis at Rs. 50 per khandi	= 125	
Tur in 10 acres ..—2 khandis at Rs. 12 ..	= 24	
Juar in 7 acres ..—5 khandis at Rs. 10 ..	= 50	
Wheat in 3 acres—2 khandis at Rs. 15 ..	= 30	
Kadba of juar 700 pulis ..	15	
Kutar of wheat ..	5	
		Rs.
Total ..	249	say 250
Expenses ..	..	50
		—
Nett annual income ..		200

About Rs. 40 may be deducted on account of land revenue. The nett annual income can be about Rs. 160. The income can be increased by proper manuring and intensive cultivation. Two acres out of this land may also be reserved for grazing cattle. The annual earning would thus be sufficient to maintain one family and one pair of bullocks for more than a year, after providing for the seeds.

It may, therefore, be taken that 20 acres of land is an economic holding.

11. Agriculture as an occupation.—Having ascertained what an economic holding is, it is possible to find out the number of persons including their dependants who can be engaged solely in agriculture as a profitable occupation—

Total area under crop in the district=1,027,604 acres.

An economic holding=20 acres.

Number of economic holdings that can be made in the district= $1,027,604 \div 20 = 51,380$.

Number of persons including their dependants who can be engaged profitably in agriculture at one family of 4 persons per holding= $51,380 \times 4 = 205,520$.

Total population of the district=516,266.

Percentage of population that can be engaged in agriculture=39.8.

Percentage of population that require occupation other than agriculture=60.2.

Taking 20 acres as an economic holding for the whole province, the percentage of population that can remain dependent on agriculture alone can be worked out as follows:—

Total area sown in the Central Provinces and Berar in 1935-36 was 24,301,398 acres.

Total population of Central Provinces and Berar in 1931 was 15,507,723.

Percentage of population that can be made dependent entirely on agriculture is, therefore, 31.3.

This shows that 68.7 per cent. of the population is in need of occupations other than agriculture. This is so when the last inch of land available has been brought under cultivation.

Labourers are also required, for carrying on agricultural operations, for about eight months in a year. They require other work for some days when cultivation is being carried on and for about four months after cultivation. As they are not dependent entirely on agriculture, they have been included under the head "persons who require employment other than agriculture".

CHAPTER IV.—INDUSTRIES

1. Introduction.—In this district, as in other parts of India, occupations including village industries are the traditional professions of different castes and this has already been dealt with in a previous chapter. A list of village industries of this district is given in the Table of Contents. Detailed information regarding individual industries is given in a subsequent chapter. Hand-ginning, hand-spinning, flour-grinding and colour-making have practically disappeared. Only the All-India Village Industries Association, Wardha, is doing something. Sheep-breeding, wool-spinning, kambal-weaving,

oil-pressing, rope-making toy-making, and gur-making are on the verge of extinction. Carpentry, blacksmithy and tanning have lost their character as key industries and are confined to repair work and the supply of consumption goods of a crude nature. Weaving, dyeing and printing have been hit hard and many industrialists have left them. Pottery, brick and tile making, shoe-making, mat and basket making and sunn-hemp extraction are being carried on as they provide cheap articles to the poor villagers. Soap-making, paper-making and bangle-making have been newly taken up by a few persons only. Dal milling is done on an organized scale by merchants. Dairy products manufacture is a subsidiary industry of the agriculturists but this source of additional income is fast disappearing for want of grazing land in the villages. Gold-smithy flourishes when people have enough and to spare.

The industries lingering on are essential for carrying on agriculture, require technical skill, are not attractive to others, and supply cheaply the needs of poor villagers. For these reasons many of them are still confined to the classes following them from ancient times. They do not provide the industrialists with sufficient food and clothing. They are followed as there are no better occupations.

2. Causes of decline.—The main causes of the disappearance and downfall of the cottage industries in this district appear to be the following:—

- (i) High price of cotton attracted all classes of people to agriculture and every body neglected other industries as they were comparatively less remunerative.
- (ii) Advent of power-driven machinery and consequent cheap cost of production have driven the cottage worker out of his trade.
- (iii) Transport facilities for foreign goods are greater than those for the cottage products. It is easy to import goods from Europe, America, Japan, Calcutta and Bombay by ship and by rail than to import goods from the remote villages to the district towns by bullock carts. The roads are unsuitable for rapid and efficient transport.
- (iv) Marketing of imported and machine-made goods is in the hands of expert merchants but the cottage products are sold by the producers themselves who have little knowledge of the different markets and changing fashions. The producers are poor and cannot finance the industry properly.
- (v) Fashions have changed considerably and the cottage workers have not adapted themselves to the changed circumstances.
- (vi) The restriction that each man should follow his own caste profession has either vanished or is vanishing. The division of labour among the people as a whole is upset.
- (vii) The cottage worker has to pay taxes like octroi, stall, etc., in almost every market where he takes his goods for sale.

If they are not sold he has to bring them back and pay taxes again when they are taken to the market. Thus the same article is taxed over and over again.

3. Effect of decline.—The people who have been deprived of their trade have taken to agriculture and labour. As indicated above, agriculture can support only a small percentage of the population. The factories have not been able to absorb all the artisans rendered idle through no fault of their own. In the whole of the Central Provinces and Berar only 61,974 persons were employed in the factories during the year 1938. This is less than .4 per cent. of the entire population of the province. The result is that the pinch of unemployment is keenly felt everywhere. Let alone the other necessities, even adequate food—the prime necessity of man to keep body and soul together—is not available to the villagers at all times during the year.

4. Revival and development.—Development of industries is dependent on the manipulation of credit and currency, transport and tariff policy of the country. To make an effort to develop industries without these powers is similar to the effort of a man to run with his feet tied. The best the latter can do is to utilize his hands but little progress can be made unless he can freely move his feet. The above powers rest with the Central Government and the Central Government is the authority which can really undertake industrial development. If the Provincial Government is to undertake this work, it must have the above powers or a voice in their manipulation or it must find out some suitable substitutes for these powers. Sales tax and taxation on imports by municipalities and gram panchayats under the guidance of the Provincial Government, may serve the purposes of tariff duties to some extent and may have protective effect on village industries. Transport may be controlled by encouraging road transport, by cart for small distances, by providing suitable roads and grazing facilities and by charcoal gas driven motor lorries for long distances. Having obtained protective effect on village industries, barter can be re-introduced in the villages to a great extent to counteract the effect of credit and currency. As regards many of the other hindrances the Provincial Government can immediately take steps to put an end to them.

5. Suggestions.—If the following suggestions are adopted the dead and dying industries may be revived and existing ones developed to provide employment to the rural classes:—

- (i) Sales tax may be levied on goods competing with village products, e.g., factory-ginned cotton consumed in mills, mill-made vegetable oils, kerosene oil, factory tanned leather, etc.
- (ii) Transport facilities may be enlarged, existing kacha roads may be repaired and new ones constructed.
- (iii) Facilities may be given to every caste to follow its own traditional occupation.

It effects a great saving in technical education, e.g., tanning, weaving, carpentry

etc. Although these industries are highly technical, the son learns his father's trade without any effort or expense. Division of labour among the population as a whole is maintained.

- (iv) Octroi duty and stall tax on cottage products may be abolished. Machine-made goods may be heavily taxed. Taxes on industrial products and raw materials for industries may be levied with the consultation of the Director of Industries and only on his recommendation.
- (v) Marketing may be placed in the hands of expert merchants who can study the demand and introduce changes from time to time. The cottage worker may confine himself to the manufacture of goods and need not waste his time in marketing. The time thus saved will enable him to manufacture double the quantity that he can do at present and out of this surplus production the remuneration of the expert merchants can be met. The great obstacle of the lack of finance may also be removed through the intervention of expert merchants.
- (vi) Gram panchayats may be established and given the authority to tax imports into villages in consultation with the Director of Industries.
- (vii) Demand may be created for cottage products. The price of cottage products will have to be maintained at a lower level than the machine-made goods by increasing the price of the latter by taxation. They should be cheap in rupees, annas and pias. Simple moral force and arguments for national self sufficiency would not be useful as every individual looks to his personal gain rather than to the nation as a whole. If a demand is created, supply will automatically follow.
- (viii) Wages of factory labour may be kept on a par with that of the village artisan so that the latter may not drift to the factory. It will enable the industry to compete with imported products, in times of need, by bringing down the cost of production.
- (ix) Research laboratories and workshops may be established to make researches in improving the methods of production of village industries and in finding out new industries which can be suitably carried on by the villagers in their own cottages.
- (x) Village Industries Institutes may be established in all the tahsil places to teach the villagers improved methods of manufacture but they are required only after a demand has been created for their products.
- (xi) There may be at least one representative of the Department of Industries in all the tahsil places to supply the diverse requirements of different cottage industries.

CHAPTER V.—TRANSPORT

1. **Introduction.**—No attention appears to have been paid to the construction of roads to connect the villages *inter se* and the villages with the market towns, although vast amounts have been spent on the construction and upkeep of the trunk roads to connect the distant cities. The village roads are unsuitable for transport even during the winter and summer. Transport is impracticable during the greater part of the rainy season. The roads are merely portions of land left between the fields. The villagers prefer to take carts through the fields when there is no crop in them. The roads are, therefore, worse than the cultivated fields. It is easy to roam about the whole world in trains, ships and aeroplanes but it is difficult to travel even a few miles in the villages.

2. **Usual means.**—The usual method of transport from the village to the market town and back and the villages *inter se* is by bullock carts, because it is cheap and buses cannot ply on kacha roads.

The articles taken to the market are mainly non-perishable. The only perishable articles are plantains and vegetables but even they are exported by cart without any damage to the goods. For distant traffic, however, railway is used. Passengers use buses on pucca roads.

People within the locality are benefited by carts, Indians by buses and Europeans by railways, so far as earnings are concerned.

3. **Taxes.**—There are no tolls or taxes for the use of kacha and pucca roads by the carts. Buses have to pay licence fee and petrol tax to the Provincial Government. There is no tax on transport by railway.

If any kacha bridge is made over a river, taxes have to be paid for transport. At Hinganghat, a kacha bridge is constructed over the Wana river. The transport charges are as follows:—

Cart 3 annas for going and coming back.

Man 3 pies for going and coming back.

Cattle 9 pies for going and coming back.

Even if carts, men or cattle do not go over the bridge but pass through the river, a tax is realised. It is given on contract by the Public Works Department and both the contractor and the Department make some profit in the business.

Such taxation may be stopped and the construction of the bridge taken up as an ordinary department work. In no case should the tax be realised from those who do not use the bridge.

4. **Earnings of a cart owner.**—If a cart owner carries cotton bales from Arvi to Nagpur his earnings are as follows:—

One cart carries four bales of cotton and completes the journey to and fro within five days. On the return journey it rarely gets anything for carriage. One cart costs Rs. 25 and lasts for three years. The bullock pair costs

Rs. 50 and renders service for about six years.

	Rs. a. p.
Income—Hire of four bales at Rs. 1-8-0 per bale.	6 0 0
Expense—Two bullocks at Re. 0-8-0 a day for five days	2 8 9
Depreciation for cart Re. 0-2-0 and Depreciation for bullock Re. 0-2-0.	0 4 0
Repairs, oil, etc.	0 2 0
Total	2 14 0
Earning in five days	3 2 9

The monthly income is Rs. 18-12-0. The cart owner carries on this traffic from November to January, i.e., about three months in a year. With the help of agricultural labour, the cultivator near the towns plies carts when he has no work and earns about Re. 0-8-0 a day.

5. **Suggestions.**—Control of transport is essential for the development of industries. The Provincial Government can control transport by cart and bus within the province but it has no power over the railways. For regulating the imports and exports of a country, transport rates act in the same way as customs tariff. This is one of the reasons why there is a great influx of foreign goods and no outlet for indigenous products. This state of affairs can be mitigated to some extent by encouraging road transport.

The articles (cotton, tur, etc.) that are exported to long distances are not perishable. Quick transport is not essential for them. Pucca metalled roads are already in existence for long distance traffic, but they are more suitable for motor transport. Carts follow the side tracks where there are no stones, as stone spoils the hoofs of the bullocks. These side tracks are full of sand and so the transport by cart becomes more costly and is much delayed. They should be constantly repaired to suit cart transport. The largest item of expense for the cart owner is cattle fodder. If this can be reduced the cart owner will be able to carry goods to much longer distances. This can be done by reserving adequate land for grazing and raising cattle fodder by the side of the roads or at suitable distances. Research may be made in improving cart wheels which can be made by the village carpenters so as to cause less exertion to the bullocks and enable the cart to carry heavier loads. The bullock cart transport can provide employment to a number of cart owners, carpenters, blacksmiths, labourers, wood-cutters, etc.

The efficiency of different methods of transport can be judged properly only when equal opportunities are extended to all of them. Railway trains and motor buses run on ways on which a vast amount of money is spent annually. They are daily being improved upon by research. The fuel is readily available for them. The bullock carts run through hills and valleys on self-made ways on which no money is ever spent. No researches are ever carried on for their improvements. No grazing land is provided for the bullocks which are the motive power of the cart. If the bullock cart is put on an equal footing, by removing the above obstacles, with the railway train and the motor bus, it may compete with them to a much greater extent.

After providing all these facilities, wherever the cart cannot withstand competition from the railway, motor buses run by crude oil or charcoal gas may be encouraged. This will enable the Provincial Government to control long distance traffic to some extent.

The greatest obstacle in the transport from village to village and the village to the market is the poor condition of village roads. If the construction of kacha village roads is now taken in hand it will provide immediate relief to village labour, which is urgently in need of the same and confer permanent benefit on the villagers. Agriculturists will also be able to supplement their income and out of this income they may be able to pay up their rent. The collection of land revenue may be made easy. By the side of these kacha roads trees can be grown for the use of the villagers. Fruit bearing trees would provide the poor people with a source of free food supply at the time of need. Tanners, carpenters, telis, weavers and other village artisans also require various sorts of wood, bark, etc. Their requirements can also be met from this source. To some extent they can supply ayurvedic medicines also. The trees to be planted would have to be carefully selected so that they can supply the requirements of the villagers as best as it would be possible to do so.

The expenditure on roads need not be very great. Pucca metalled roads are unnecessary for the villagers. Rather they would be detrimental to their interest as the motor bus may then start competition with the bullock cart. Creation of hard surface on the roads for the two wheels of the cart and the bullocks to walk without any trouble would be sufficient. Two parallel lines, each about one cubit wide, with sufficient space in between, may serve the purpose. Kacha drains to allow the rain water flow away without damaging the road would be essential.

In these circumstances if the entire activities of the Public Works Department, carried on at present, be stopped for about a year or two and all the available money and energy spent on the construction of suitable kacha village roads, there may not be any appreciable loss elsewhere while the gain to the villagers would be considerable and lasting.

CHAPTER VI.—CONSUMPTION

1. Articles consumed and sources of supply.—Articles of food like jwar, tur, chillies, vegetables, etc., agricultural implements, earthenware and leather articles are available within the villages. Other articles of daily use such as clothing, food articles like oil, salt, tea, sugar, gur, kirana, miscellaneous articles, like cutlery, locks, hinges, lanterns, cooking utensils, matches, kerosene oil, umbrellas, stationery, washing soda, soaps, leather, etc., are imported from outside. They are articles of everyday use and are not made in the villages. Many of them are made by power driven machinery and are either imported from foreign countries or obtained from Indian factories. They enter the villages through the towns in a consumable state.

2. New habits.—Fashionable clothes and living combined with tea drinking and bidi smoking habits and use of aluminium ware have been newly adopted by the villagers. The annual expenses of a well-to-do villager

living in the old and new style are as follows:—

New style of living—annual requirements and expenses—

	Annually.
	Ra. s. p.
1 coat at Ra. 3	3 0 0
2 shirts at Re. 1	2 0 0
2 caps at two annas	0 4 0
2 pairs of shoes at Ra. 2-8-0	5 0 0
1½ pairs of dhoti at Ra. 2-8-0	1 12 0
1 dupatta at 10 annas	0 10 0
1 umbrella at Re. 1-4-0	1 4 0
Total	15 14 0
say	16 0 0

	Weekly.	Ra. s. p.
Tea	0 5 3	
Bidi	0 5 3	
Supari	0 0 8	
Total	0 11 0	35 12 0
or 11 annas x 52 = say		36 0 0

Grand Total .. 52-0-0

Old style of living—annual requirements and expenses—

	Annually.
	Ra. s. p.
One pair of dhoti	2 8 0
One feta	1 0 0
Two bandis	1 0 0
One dupatta	0 8 0
One ghongada	1 8 0
Total	6 8 0
say	7 0 0

	Weekly	Ra. s. p.
Tobacco and match box Re. 0-1-6 or		
Re. 0-1-6 x 52 =	4 14 0	
say	5 0 0	

Grand Total .. 12 0 0

Expense on new style of living	52 0 0
Expense on old style of living	12 0 0
Difference	40 0 0

One man spends Rs. 40 more annually by living in a new style. As the new style of living is gradually replacing the old the villagers are getting poorer and poorer day by day. Most of the money spent on the former goes out of the village whereas money spent on the latter remains in the village. The old style of living is more suitable for the villagers in the discharge of their duties. This should, therefore, be encouraged and the new style of living discouraged.

Aluminium wares take away the money of the villagers and when the utensils wear out, nothing is realized for them. The habit of going to the cinema houses and riding on motor buses is gaining ground. At Kapsi Jatra villagers come to see cinema shows from long distances.

3. Possibilities of indigenous substitutes.—(i) Gur can be made from sindhi trees economically and imports may be reduced. Since the district has been declared dry the juice of the sindhi trees is going waste. Propaganda and teaching the method of manufacturing gur to the villagers are necessary for this purpose.

(ii) Iron articles such as cutlery, locks, etc., can be made by the village blacksmith.

(iii) Cloth can be made within the village with hand-spun yarn. It will give employment to a large number of villagers and utilize the services of mahars, the original weavers of khadi.

and congested. A number of families are often found living in a small hut separated into small rooms meant for each family where they cook and sleep. The vitality of the villagers has gone down and they fall easy prey to diseases. They, without having any medical aid, die like cats and rats. Their cattle have no grazing field and no veterinary aid. Sanitation of the villages is not good. There are no drains. People pass nightsoil by the road-sides and in the *nalas*. The elderly people are illiterate but hard-working and the new generation is more literate but easy-going. They constantly remain indebted and have lost their credit. They have no financial resources. The cultivators raise the same crops year after year. They have no plan. Village industries are either extinct or are on the vanishing point. Villagers consume imported machine-made articles and sell the agricultural produce outside the village. Thus they have become dependent on others for the supply of their requirements and the disposal of their output. The pinch of unemployment is keenly felt. Roads are worse than the fields and transport often becomes impracticable in the rainy season. Quick transport is impossible. They cannot afford to take nutritive diet. They do not get sufficient food throughout the year. When food is wanting other necessities and amenities of life have no place. An economic condition worse than this cannot be imagined.

2. Causes of misery.—The powers that be have so far focussed their attention on the improvement of towns and cities in preference to that of the villages. They have aimed at the development of large scale industries in the hope that it will bring prosperity to this country as it has done in foreign countries. They have encouraged quick transport and free trade with the same end in view. But the results have been just the reverse. Just as food acts as nectar to a healthy man and poison to a man with high temperature, the machine has brought prosperity in the exporting countries like the United Kingdom and Japan having scarcity of labour and adversity in the consuming countries like India having abundance of labour. The entire village economy has been upset by machine-made goods. The village craftsmen have been driven out of their trade. They have taken to agriculture and labour. They could maintain themselves when the price of agricultural produce was abnormally high. In normal times the position becomes worse. The burden on agriculture has exceeded the limit of endurance. No other source of employment is left in the villages. Having no means of livelihood the villagers are in a miserable state.

3. Solution—revival of village industries.—Human being is a selfish creature. Every individual endeavours to obtain the greatest good for himself. Similarly, the society and the State endeavour to attain the greatest good to the greatest number. The methods of attaining this end differ according to different circumstances.

Taking the province as a whole, agriculture as an occupation can provide for 31.3 per

cent. and large scale industry has yet provided for less than .4 per cent. of the entire population. The problem is to find out means of livelihood for more than 68 per cent. of the population. If they are to be provided for in large scale industries they will have to be developed more than 80 times their present level. On the face of it, it is impracticable. Even if such a state can be reached we would not be able to consume all the output. Even the existing large scale industries cannot sell their entire output within the province. The next step is that they can be exported. But if every country exports its manufacture who will import them? Exports will have to be balanced against imports. Consumption cannot be increased indefinitely. There is already a hue and cry against over-production. Large scale production may be advocated on the ground of producing the maximum benefit with the minimum effort. It may be argued that it can produce sufficient wealth to maintain the whole population. But it cannot provide employment to all. The alternative is to distribute wealth without any exertion on the part of the recipient. This is again impracticable and undesirable. It will increase idleness and the attendant evils. The resulting evils are manifest in the *Rajas* and the descendants of wealthy persons. A man must work for at least six hours a day to earn his livelihood. The principle of maximum benefit with minimum effort by the aid of machinery is not applicable to this country. Large scale industry cannot, therefore, provide a means of livelihood to all the people of the province. On the other hand, it renders idle a greater number of men than it can employ. More than 50,000 *telis* and 80,000 *mahars* have been rendered idle in the *Wardha* district alone by a few oil and cotton mills. Large scale industry is rather a curse than a blessing to this country.

Village industries may be the other alternative for providing employment. Before the advent of machinery this provided occupation to the villagers and they were happy. If the villagers are encouraged to take to village industries by giving protection against machine products even now all of them can get employment. Their earning capacity will thereby increase and they will become happy again.

The objections against the protection of village industries are the high cost of production and crude finished product. So far as the consumption within the country is concerned, a high cost of production cannot come in the way. The State has to consider the country as a whole. If consumable articles are made in the province, the wealth remains within the province but if they are imported the country is impoverished by its value whatever its price may be. National wealth having increased, the purchasing power of the people increases and they can afford to pay higher price. When large scale industries like textile mills, can obtain protection on the ground of saving the industry to keep labour employed, village industries can claim the same against mills with redoubled force. In the mills labour gets only a portion of the taxpayer's money in the form of protection but in the village industries the entire sum goes to the poor villagers.

The finish of the articles can also be improved gradually. Fashion comes after food and the villagers are in need of the latter. The objection that we shall be going back to middle ages and remain behind the world also holds no water. The methods of attaining the greatest good to the greatest number differ according to circumstances. Village industries afford the greatest good to the greatest number in this country and, therefore, it is the duty of the State to protect them against any odds. Latest methods of production combined with labour saving appliances, being unsuitable to attain the above end, must be discarded. Industrial development of a country is not an end in itself. It is a means to an end, the end being the removal of unemployment, increase of national wealth, etc., to make the people happy. Large scale industries cannot and village industries can stand this test in this country. It may, therefore, be concluded that village industries and village industries alone can provide occupation to the entire population and make the people happy. Self-help is the best help. The villagers can help themselves if village industries are revived.

Large scale industries can find a place only after the entire population has been provided for and the demand still remains unsatisfied or when there is a demand from foreign markets in the case of articles which are capable of being made in the cottages. The articles which are incapable of being made in the cottages and those which supply raw materials to the village artisans may be produced in large scale industries.

4. **Suggestions.**—The State should direct more attention to the improvement of the villages and the villagers. It should see that everybody in the State is provided with an occupation and a reasonable standard of living. This is possible only with the revival of village industries and dividing agricultural land into economic units. There should be a general planning including agriculture, forest and industries, with the above end in view. There should be proper planning of crops and sufficient grazing land for cattle. Cottage industries should be protected from large scale industries and developed by granting full facility and aid for flourishing. Researches should be made for improving village industries. Large scale industries should be confined to the manufacture of those articles which cannot be made in the cottages and those required for export purposes. Education should make the villagers fit for practical life. Ayurvedic medicines should be provided for the people and the cattle. Manuring with night-soil, cowdung, bones and flesh of dead animals should be taught. Deep wells may be provided for irrigation. Wells may also be dug for supplying water to Harijans. Octroi duty on village products should be abolished. The financial system should be revived by encouraging the sahkars to supply the needs of the villagers on a reasonable return. Proper facilities should be given to them for the recovery of loans. Indebtedness should be wiped off by improving the earning capacity of the villagers. Village roads should be constructed without delay and repaired every year. Transport should be controlled

by the Provincial Government by encouraging road transport with cart and motor lorries. Action should be taken to check the growing vicious habits of bidi, tea, etc., in the villages. All wastes of the villages should be utilized to the best advantage.

The aim of village reconstruction should be to make it a self-supporting unit. As far as practicable the requirements of the villagers should be met by village products. A few model villages should be reconstructed in the beginning and the experience gained should be applied in the remodelling of other villages.

CHAPTER IX.—INDUSTRIES

1. **Flour grinding.**—In olden days it was carried on in almost all the villages and the women of the village were employed in this industry. They used to grind flour for their own consumption as well as for that of the well-to-do persons. With the advent of the flour grinding mills run by oil engines and electric power, many villagers have left grinding flour even for their own consumption. The women who were employed in this industry have to remain idle at present. Suitable improved chakkis have been devised by the All-India Village Industries Association at Maganwadi, Wardha, and it is possible to grind more flour in these chakkis with less exertion but the main difficulty at Maganwadi appears to be the availability of suitable stones for the chakkis. The price of stone imported from Agra is so high that it is not possible for the villagers to pay for the chakki made from this stone. It is necessary that for this purpose investigation should be made to find out suitable pucca stones within the province. Efficient and pucca stone chakkis are available for Rs. 2 at Tiwa, two miles from Jubbulpore. The Lodhi class people can grind 20 to 25 seers of flour per day of nine hours in this chakki. They are as efficient as the Maganwadi chakkis. These chakkis can be introduced in all the villages. The flour-grinding mills should be eliminated as it does not serve any useful purpose but on the other hand deprives a large number of people of employment. It will not affect the poor consumers as they can do flour grinding in their own houses. Many women will be employed in grinding flour for well-to-do people and they can be expected to bear a little higher cost which would be negligible. Import of mill made flour into the province will have to be checked by suitable measures.

2. **Dal milling.**—(1) *Introduction.*—This is carried on as a cottage industry at Wardha. Merchants are engaged in this industry. Cultivators sell tur to the merchants after keeping as much as they require for consumption. This is converted into dal by the merchant manufacturers.

(2) *Process of manufacture.*—Tur is first screened to remove dirt and other waste materials from it. Then it is put in water for four hours and then dried. Mustard oil is applied to it. It is then ground in two different chakkis, the price of which is Rs. 8 to Rs. 10 each. Then it is ground in three different chakkis the cost of which is Rs. 7 each. The dal thus made is put into the

chalani (screen). By this, dal is separated from tur which has not been converted into dal. This dal is put under a fan where the outer covering (husk) which is light, is separated from dal proper. Then dal is put in the *ukhli* and cleaned. It is again put under the fan. The product is pure dal which is sold locally. All the above operations are simple and can be carried on by the villagers. Recently, dal mills have been started at various places in the province. Machine-made dal is also imported from other provinces such as the Punjab and the United Provinces.

(3) *Difficulties and suggestions.*—If the machine-made dal is taxed the industry can supply labour to a large number of villagers. The cost of production will not be very high as compared with the mill product and the consumers will not be required to pay more. A sales tax may be levied on mill-made dal to encourage this village industry. Arrangement should be made for the supply of suitable chakkis to the villagers and they should be trained in the art of manufacture. The agriculturists have no holding capacity. Suitable credit system should, therefore, be established in the villages. Heavy octroi and stall taxes may be levied on tur and no tax be levied on tur dal, in order to encourage the manufacture of dal in the villages.

3. Oil Extracting—(i) Oil ghani—(1) *Introduction.*—About 50 years back oil pressing industry was carried on in almost all the villages by the telis. Telis were the only suppliers of oil. In the villages where there were no telis the *malguzar* provided them with land, house and full capital, e.g., ghani, bullock, raw materials, etc., and took one seer of oil per day in return. Oil ghani in a village was a necessity.

Now this industry is almost dead mainly due to mill competition. Hardly 25 ghanis are working in the whole district, although the population of telis is 55,823 according to the census of 1931. These people have diverted themselves to other occupations such as agriculture, trade, labour, etc.

Ghani oil was used for edible purposes and also for lighting. Now kerosene oil has been substituted for lighting purposes and mill oil for edible purposes.

(2) *Manufacture and sale—Raw materials and finished product.*—Oil seeds (linseed and til) were available in the villages. No taxes were levied on them. The oil produced was consumed within the village and oil cakes were utilized as cattle fodder. The villagers supplied the oil seeds, took the oil and gave the oil cake to the teli as his wages. Oil and oil cakes of the few ghanis that are surviving are sold within the villages. Oil is used for edible purposes and oil cakes as cattle fodder.

Now oil seeds have to be sold outside the village in the market towns. Cartage, stall tax and octroi duty have to be paid on the same. Oil is imported from the towns. The same expenses have to be incurred again for oil. Oil cakes are exported out of India by the mills. Moreover, oil is not available in the pure form. Oil cakes have very little percentage of oil. The mill-made oil cakes have less nutritive value than the ghani made ones, according to the villagers.

Appliances.—The wooden ghani was made of tamarind, sirish or neem tree trunks and could be made by local carpenters. It is a complicated appliance although it appears to be simple. There were special carpenters who knew the technique of making and repairing the ghani. The pestle of the Baradi ghani was small. Although it gave more strain to the bullocks it was found to be advantageous as the wife of the teli could raise that up for taking out oil and putting in more seed. A child could also be kept asleep as if in a cradle by the side of this ghani while it was working. This gave the teli's wife more time to work. Oil was generally taken out from the top of the ghani. Arrangements existed for taking out oil from the lower portion of it in a different type of ghani. The Rajasthani ghani is worked at Arvi. It resembles the All India Village Industries Association ghanis at Maganwadi and is very efficient. The pestle is very long and the output is good. The percentage of oil obtained in this ghani as compared to the power-driven mills is as under—

Seeds	(i) ghani		(ii) Oil in mill
	Seeds	Seers	Seers
Til ..	80	34	34
Linseed ..	80	30-32	34-36
Groundnut ..	80	35	44-46

Rajasthani ghanis are suitable for til oil but require improvement for producing linseed oil to withstand mill competition. Some improvements have, however, been effected by the All-India Village Industries Association at Maganwadi and the Maganwadi ghanis can take a full charge and give a better percentage of oil although not equal to that taken out in the mills. They should be introduced in the villages. The cost of one ghani is approximately Rs. 40.

Labour.—For one Rajasthani ghani two skilled men and one unskilled woman are necessary. The skilled men work alternately from 3 a.m. to 11 a.m. and 2-30 p.m. to 7 p.m. One family consisting of one man, one grown up boy and one woman can also do this work. No paid labourers are engaged. The woman does the household work and cleans the seeds. She works for about half a day.

Capital and finance.—About eight bags of oil seeds are required for carrying on the trade efficiently. Oil seeds are available at Rs. 20 to Rs. 22 per khandi. But with Rs. 100 to Rs. 125 as working capital a teli can carry on his trade.

Fixed capital—		Rs. a. p.
One ghani	..	40 0 0
One bullock	..	30 0 0
	Total	70 0 0
Working capital	..	125 0 0
	Total	195 0 0

Say, Rs. 200 are required for one working unit.

Fixed capital has to be provided for by the teli himself. At least a part of the working capital must always be owned by him. When he has enough money he buys more seeds from growers direct. If he falls short of money he purchases from merchants either

in cash or on credit by paying a little higher price. This is a great drawback in the ability of the teli to compete with the mills.

Market.—Oil is sold locally. It is not exported to distant markets like mill oil. The telis sell the mill oil also as ghani oil and charge a higher price for the same. Oil cakes are sold locally at a price higher than that of the mill-made ones. No taxes are levied on the sales. They are sold by the teli himself to the ultimate consumer.

Stocking.—Oil and oil cakes are readily sold away. Seeds, however, have to be stocked. They are stocked by the teli in small quantities. They are also obtained from the merchants but at a disadvantageous rate.

(3) **Process of manufacture.**—The seeds are first cleaned by the wife of the teli. They are then charged in the ghani. The quantity charged at a time is eight pailis tilli (8½ seers) or five pailis (five seers) linseed. The bullock goes round and round the ghani pressing the seeds with the pestle and the teli pours hot water in the ghani for obtaining more oil. It takes about 2 to 2½ hours for a charge of tilli and 3 to 3½ hours for that of linseed. The viscous substance that remains after decantation of the oil is again put in the ghani and oil is obtained. The Maganwadi ghanis take more charge and less time for extracting oil.

It requires about six months to learn this art.

(4) Income—

Til oil— (At Arvi)

Oil seeds per charge = 8 pailis = 8½ seers.
Labour 2 to 2½ hours per charge.
Working hours 3 a.m. to 11 a.m. and 2-30 p.m. to 7 p.m. = 12½ hours, i.e., 5 charges a day.
Oil obtained per charge = 3 to 3½ seers.
Oil cake obtained per charge = 4½ to 5 seers.

Linseed oil—

Seeds per charge = 5 pailis = 5 seers (approximately).
Labour 3 to 3½ hours per charge.
Working hours 12½ hours, i.e., 4 charges a day.
Oil obtained = 1½ to 2 seers per charge.
Oil cake obtained = 3 to 3½ seers per charge.

Working unit—One day.

Til oil—

Cost price—

Raw material 8 pailis × 5 charges =	5 8 0
40 pailis at Rs. 22 per khandi of 160 pailis.	
Expenses of feeding one bullock at six annas a day.	0 6 0
Total ..	5 14 0

Selling price—

Oil 3 seers × 5 charges = 15 seers at six annas per seer.	5 10 0
Cake 5 seers × 5 charges = 25 seers at 14 seers per rupee.	1 12 0
Total ..	7 6 0

Sale price ..	7 6 0
Cost price ..	5 14 0
Nett saving per day ..	1 8 0

Two skilled men and one woman can earn Rs. 1-8-0 per day if they work 12½ hours by crushing til seeds. But as cheap oil is available nobody is willing to pay a high price. People go in for cheap oil of linseed and groundnut.

Linseed oil—

Cost price—

Raw materials 5 pailis × 4 charges = 20 pailis at Rs. 20 per khandi of 160 pailis.	2 8 0
Expenses of feeding one bullock at six annas a day.	0 6 0
Total ..	2 14 0

Selling price—

Oil 1½ seers × 4 charges = 7 seers at five annas per seer.	2 3 0
Cake 3½ seers × 4 charges = 13 seers at 14 seers per rupee.	0 14 6
Total ..	3 1 6

Sale price ..	3 1 6
Cost price ..	2 14 0
Nett saving per day ..	0 3 6

There is, therefore, very little profit in extracting linseed oil.

(5) **Difficulties and suggestions.**—Mills can supply cheap linseed and groundnut oil. The ghani cannot take out as much percentage of linseed and groundnut oil as the mills do. The required degree of heat is not generated in the ghani. Although in til oil a teli can very well compete with the mills the demand for the same is little as it is dear. Linseed oil is in vogue. The consumption of cheap groundnut oil is increasing. The teli has to pay a high price for oil seeds.

This is one of the most important industries which needs revival. There is a great demand for oil at present which is satisfied by imports from other provinces. The province as a whole imports oil and exports oil seeds. This may be stopped by imposing a sales tax on mill-made oil and a terminal tax on the export of oil seeds. If the village teli is enabled to supply vegetable oil the oil cake will remain in the villages and enrich the cattle wealth of the country. The carpenters who make ghanis will obtain employment. Kerosene oil is harmful to the eyes and when lighted in the bed-room in the night it is harmful to health, as it emits a large quantity of carbon. Vegetable oil is beneficial to the eyes and does no harm to the health even when lighted in the bed-room. A sum of Rs. 1½ crores approximately goes out of the province annually by consuming kerosene oil. The purchase of spectacles, lamps, etc., also decreases the national wealth. Besides losing sight and health, the people of the province are made poorer by the vast amount of money going out. This can be saved by levying heavy sales duty on kerosene oil and encouraging the use of cheap vegetable oil for lighting purposes. A sales duty will have a protective effect on vegetable oil. Sjt. Joglekar of Poona has made some researches in evolving a vegetable oil lamp. According to him this oil can give as much light as kerosene oil at 25 per cent. less cost. A suitable lamp for this purpose should be devised and researches carried on in this line. No time, money or energy should be spared to undertake this work in order to prevent the drain of money flowing out of the province. The appliances

should be improved by making researches and improved *ghanis* like those at Maganwadi should be introduced in the villages.

The mills purchase oil seeds in large quantities and can stock the same. The village teli has no financial resources. He has to purchase from the merchants in small quantities by paying a higher price. This curtails his ability to compete with the mills. Arrangements should be made to supply oil seeds to the village teli at a cheap rate. This may be solved to some extent by increasing the marketing charges on oil seeds in the grain market.

(ii) Extraction of castor oil by boiling—
(1) *Introduction*.—There is only one family at Jalgaon which extracts castor oil by the boiling method. It is carried on by a teli family consisting of two brothers and one woman. This oil is used for lighting and lubricating purposes. It is displaced by kerosene oil for lighting, and by crude lubricating oil for lubrication.

(2) *Manufacture and sale—Raw materials*.—Are castor seeds which are available locally. No taxes are paid on this nor can they be used for any other purpose. Fire wood is collected from the banjar land. Nothing is paid for this.

Appliances.—They consist of one flat hard stone, fixed on the ground somewhat below the ground level, one wooden musal, and one iron pan. All these are available locally and cost about Rs. 3. They are simple appliances.

Labour.—One man and one woman can do this work.

Finished product is made available in a consumable form.

Capital and finance.—Fixed capital required is Rs. 3 for appliances. Working capital required for seeds and oil is about Rs. 25. The total sum necessary for running this industry is about Rs. 30. Telis have no financial resources.

Markets.—The teli moves from village to village for the sale of oil. He does not attend any markets. He is not required to pay any taxes.

Stocks.—He does not stock any material either raw or finished. He purchases his requirements and sells the output. He finds a ready market.

(3) *Process of manufacture*.—The castor seeds are first baked. Then they are crushed on the flat stone with the help of the wooden musal. Then the crushed seeds are boiled with water. The oil comes on the top of the water which is then removed and sold.

(4) *Income*.—In one week oil is taken out twice. At one time one kudo castor seed is treated. In one day oil can be extracted from three kudos of seeds. Oil extracted is 2½ dhadas per three kudos seeds. (4½ seers = one dhada and 1 maund = 4 dhadas = 18 seers). This operation is carried on generally for three months, between *Fagan* and *Asar*, i.e., March to June. At other times the teli sells imported castor oil which he purchases from Arvi at Rs. 4-8-0 per maund of 18 seers.

Unit.—Three months working.

Cost price.—

Raw material—Castor seed three kudos in a day—3 × 2 kudos in a week = 6 × 12 kudos in 3 months = 72 kudos = 3 khandis 12 kudos at Rs. 15 per khandi.	Rs. 54
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Fire-wood obtained free from banjar land
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Sale price.—

Finished product—Oil 2½ dhadas in a day or 5 dhadas in one week = 5 × 12 dhadas in 3 months = 6 dhadas at Re. 1-8-0 per dhada.	90
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Net earning in 3 months for one man and one woman.	36
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Besides this oil cake is also obtained. The income on this account is in addition to the above figure.

4. *Gur-making—(1) Introduction*.—About 20 years back, a large quantity of gur was produced near Karanja and Talegaon, but the gur-making industry is now almost dead due to the competition of imported gur. On account of the improvements in communication and transport, gur from Betul within the province and from Ankapali, Gaya, etc., outside the province, is imported by the merchants and sold here. The manufacturers at this place cannot compete in price with the imported article. No foreign product has been substituted for this, nor is there any change in the demand of the people for the product. There have been some improvements in the processes of production in recent years but in spite of these it is not a paying industry. The finished product is used for edible purposes. This was a side business of many of the cultivators in the past. At present, it is being carried on to a small extent at Rajni, Bonethana, Sawli, Pipri, Yengaon, Behadi, Kanada, Umri, etc., about four to six miles from Karanja, by the malguzars and the big landlords. The small cultivators sell raw cane as they obtain a higher price for it as compared to that for gur. The big landlords prefer to make gur instead of selling cane because they themselves do not go for selling and they do not rely upon their servants for getting reasonable return from the sale of cane. The cultivation of cane is carried on as a side business. Only small plots of land are devoted for cane growing at different places. It is, therefore, not possible to manufacture gur on a large scale by machinery as large quantities of cane are not available at any one place. Malguzars manufacture gur for sale.

(2) *Manufacture and sale—Raw material*.—Cane is grown by the landlord in his own fields. He is not required to purchase cane from anybody else. No tax or duty is paid on this raw material except land revenue to Government. Cane is also used for direct consumption.

Appliances.—Very big pans were used in the old days for boiling cane juice. The empty pan required four men to lift it. Wood was purchased for burning in the furnace. Wooden *ghanas* were used for extracting cane juice. They were prepared locally. Some juice was left in the cane and the cane had to be boiled again for taking out the remaining juice. Twenty persons were required for a unit of manufacture. Some improvements have been made in the appliances during the

recent years. The cane, left after the juice is taken out, is used as fuel for the furnace. The cost of fuel is entirely saved. Small pans are now used and they, fully loaded with juice, can be lifted by two men only. Iron ghanas are used for extracting cane juice. They are obtained from Kirlosker in the Bombay Presidency or from the Punjab. They extract the juice of the cane completely. Only eight persons are now required for a unit of manufacture. The following appliances are necessary for running the industry:—

	Rs.
Furnace	20
Iron pans	28
Iron ghana	175
Miscellaneous	5
Total	228

Separate expenses for bullocks are not necessary. The bullocks kept for cultivation are utilized for this work.

Labour.—For the cultivation of cane two extra labourers are required. For the manufacture of gur eight persons are required. The manufacturing operations take about one month and the labourers engaged by the landlord for cultivation are utilized for this purpose also. No extra expenses on this account are incurred by him. Labourers required for a unit of manufacture are as follows:—

Bringing sugarcane from the field	1 man
Cutting the cane	1 man
Feeding the ghanas	2 men
Driving two pairs of bullocks in two ghanas.	2 men
Feeding the furnace	1 man
Expert for boiling the juice	1 man
Total	8 men

For a unit of work two ghanas must be simultaneously run in order to supply sufficient juice for keeping the other persons engaged.

Capital.—The landlord does not require separate working capital for this business. The fixed capital required is about Rs. 230.

Finished product and market.—The finished product, i.e., gur, is as good as the imported one. It is preferred by the consumers to the imported article. It is sold by the manufacturer to the ultimate consumer but when he cannot do so he sells it to the merchant. No tax is paid when the landlord sells it in his own village. When it is taken to Arvi, Chandur, etc., octroi duty has to be paid.

Stocking and finances.—The manufacturer himself stocks the gur for about three or four months but if it is not sold within that period he sells it to the merchant. The merchant stocks it afterwards until it is sold. The manufacturer uses his own finances.

(3) **Process of manufacture—Cane cultivation.**—Cane is cultivated where irrigation facilities are available. One well can irrigate

$1\frac{1}{2}$ acres of land. So $1\frac{1}{2}$ acres can be taken as a unit for the cultivation of cane and manufacture of gur therefrom. One acre requires about 36,000 chips of sugarcane and four canes can grow in one chip. But all of them do not grow. In one *bafa* measuring 5×5 cubits about 70 canes are obtained. One acre, equal to 800 *bafas*, produces about 60,000 canes. So in $1\frac{1}{2}$ acres 90,000 canes are obtained. Cane is grown from March to October. The product is available from November to April. The wells in this part (near about Arvi) are approximately 32 feet deep and in the summer season, the depth of water in the wells is about four to five feet. The ploughing of the fields takes about eight days and then seeds are sown. The field is irrigated twice a week in summer. Generally no irrigation is necessary in the rainy season, but when it is dry continuously for about 15 or 20 days, irrigation becomes necessary.

Extraction of juice and manufacture of gur.—The cane is cut in the field and brought by one man to the ghana (juice extracting machine). There it is cut by another man into short lengths and a third man takes the pieces and feeds the ghana. One ghana can extract 50 gallons of juice in six hours. The juice thus extracted is put in the iron pans and heated in the furnace. The juice is concentrated to a certain limit. The expert gur-maker knows the time when the juice is to be taken out of the furnace. As soon as that point is reached, the juice is removed from the pan and put in wooden boxes. Then it is put on pieces of cloth for some time. After that it becomes ready for sale. About a month is required to learn the art of making gur.

(4) **Income.**—Working 16 hours a day it takes a month to manufacture gur from the total output of cane from $1\frac{1}{2}$ acres of land and the total gur obtained is about 10 khandis (one khandi = 20 maunds and one maund = 10 seers). Gur is sold at Rs. 50 per khandi. Last year it was sold at Rs. 25 per khandi.

A unit = one well irrigating $1\frac{1}{2}$ acres of land.

Cost price—

	Annually
	Rs.
Seed at Rs. 72 per acre	108
Labour, two extra men for cultivation	120
Extra expenses	25
Total	253

Production = 10 khandis gur.

Sale price—

Gur 10 khandis at Rs. 50 per khandi. 500

Nett profit— 247

This is earned when sugarcane cultivation and manufacture of gur are carried on as subsidiary works and when persons doing these works are already engaged for other agricultural operations. If, however, an

attempt is made to do this work separately the following extra expenses will be necessary :—

	Rs. s. p.
Two bullocks for 12 months at Rs. 15 per month ...	180 0 0
Five labourers at four annas a day for one month ...	37 8 0
One skilled man at eight annas a day for one month ...	15 0 0
Two pairs of bullocks for one month, hire, fodder, etc.	25 0 0
Total ...	257 8 0

The extra expense is more than the nett profit gained. It is, therefore, not a paying proposition to make an attempt to manufacture gur except as subsidiary to agriculture.

(5) *Suggestions and difficulties.*—The main difficulty in this business appears to be the want of irrigation wells. They are not deep and therefore cultivators cannot carry on extensive cultivation of sugarcane. The process of manufacture has already been improved. If the manufacture of gur from sugarcane is to be encouraged, a study of the process of manufacture and cane cultivation in areas such as Ankapalli, Benares, Gaya, etc., will have to be made. But it is not necessary to encourage gur manufacture from cane in this district. Sindhi trees are available in plenty throughout the district and their juice is at present not being utilized for any purpose. In Bengal gur is manufactured from the juice of Sindhi trees on an extensive scale. In this province a beginning has been made by the All-India Village Industries Association at Shegaon. The villagers here may also be taught to manufacture gur from sindhi juice.

Gur from sindhi juice.—The economics of making gur from sindhi juice may be worked out as under :—

One man can tap 25 to 30 trees a day. The same trees are tapped for three days and given rest for the other three days. So for a unit of manufacture 50 trees are required. One tree yields 5 lb. of juice a day. One pan is required for boiling 125 lb. of juice. About half a pound of wood is required for boiling one pound of juice. The total quantity of wood required daily would be 62½ lb. The wife of the tapper can go to the forest for collecting firewood. The furnace can be made with brick and mortar by the tapper himself. The juice is boiled for about three hours in a pan. One lb. of gur can be made from 10 lb. of juice. The tapper can obtain 12½ lb. of gur daily. Juice can be extracted from the sindhi trees after the rains and before the summer sets in. So the juice-yielding time is from the end of October to the middle of March, i.e., about four months in a year. A family consisting of one man, his wife and two children can carry on this industry.

The earnings of a family will be as follows :—

Unit—50 sindhi trees, tapper and his wife.

Daily—Juice from 25 trees at 5 lb. per tree=125 lb.

Gur from 125 lb. juice=12½ lb.

One lb. gur can be sold for 1 anna therefore, 12½ lb. gur can be sold for 12½ annas.

Daily income of a family is Re. 0-12-6, therefore monthly income of a family is Re. 23-7-0 say, Re. 24.

In four months the family can earn Re. 96.

During the remaining eight months the tapper and his wife can do some other work. The income from this industry is attractive as it is much higher than that from other village industries. This industry can, therefore, be profitably introduced in this district. The villagers will have to be taught the method of manufacturing gur. This can be done at the All-India Village Industries Association at Shegaon, Wardha. There is a prejudice in the minds of the people against using sindhi gur. The taste also differs to some extent from cane gur. Propaganda should be made to remove this prejudice and create a taste for sindhi gur.

5. *Bee-keeping and Honey collecting*—

(1) *Introduction.*—Nobody in the district carries on the industry of bee-keeping. At Maganwadi it is carried on for training students in this art. In a few villages the work of collecting honey is carried on. Honey-collectors were found at Alipore and Jalgaon.

No particular caste follows the profession. Honey is mainly used for medicines but it is difficult to get pure honey in the cities or villages where extraction is not done as it is adulterated with gur. Wax is used to a small extent by the village chamars within the district. At Saugor it is used for candle manufacture. It is consumed by the Military Department and exported out of India.

No substitute has been introduced for honey in the villages for medicinal purposes. Paraffin wax has been substituted for pure wax in various industries where wax was originally used.

(2) *Extraction and sale—Method of extraction.*—The bee-hives are taken away from the trees by driving away the bees. It is difficult to drive them away and carelessness in this is fraught with dangerous consequences as the bees sting. Honey is squeezed by hand, filtered with cloth and then sold. Honey and wax are not freed from suspended impurities. The villagers do not know the method of cleaning them.

Bees and trees.—Satpuda bees are occasionally found. Agya bees are seen in abundance. Other varieties of bees found in this part are Tamh, Kote, etc. Bee-hives are found on the sindhi, tamarind, babul and many other trees. No tax is levied on this industry.

Labour and Capital.—Only one man can do this work. No capital is required for carrying on this business.

Market.—Honey and wax are sold in the villages. No tax is levied on them. The honey-collectors themselves sell the products to the consumers and the merchants.

Stocking.—No stock is required to be kept by the persons extracting the same, as

the output is readily sold. But the merchants stock them for sale to consumers and exporters.

Waste.—There is no waste in the business.

(3) *Income.*—From the ordinary honey comb quarter to half seer honey is obtained. Honey and wax are sold at Re. 0-12-0 per seer. In one week two men get about Rs. 4 in this work. But honey is not obtained regularly.

(4) *Difficulties and suggestions.*—People do not know the art of bee-keeping. Nor do they know the method of purifying honey and wax. Whatever is available in the forests is obtained and sold.

The demand for pure honey and wax is fairly good. Bee-keeping can be introduced in the district and thus provide an additional source of income to the villagers. Methods of purifying honey and wax should be taught to the villagers. The villagers should be first trained in bee-keeping and then they should be advanced loans for carrying on the business.

The All-India Village Industries Association at Maganwadi, Wardha, has an apiary where apiculture is carried on, on modern lines. Students are also trained in bee-keeping.

6. *Pottery*—(1) *Introduction.*—This industry is carried on in almost all the villages. Kumbhars are engaged in this industry. Most of the Kumbhars are following their traditional occupation. Demand for the potteries made by the Kumbhar exists but he has not been able to make both ends meet and is passing through very hard times. The articles made by him are used for keeping water, cooking, burning lights, children's toys, etc. Aluminium utensils are displacing earthenwares. Well-to-do persons use brass and copper wares. Due to the use of kerosene oil, *diwas* have no sale. Attractive foreign toys are fast displacing the earthen ones. Cement tanks have been substituted for earthenware nands. Substitution and competition have hit the potter hard but he is carrying on as he can supply cheap pottery to the poor villagers. No improvements have been made in the process of manufacture.

(2) *Manufacture and sale—Raw material.*—Ordinary earth is utilized for the manufacture of potteries. The earth available in this district is not of a good quality for making pottery. Very good pottery clay is available at Kondhali in the Nagpur district and pottery made at Kondhali are sold at various places in the Wardha district. Similarly potteries of Lohar village, 18 miles off Hinganghat, is sold in the Hinganghat market. Suitable raw material is essential for the running of this industry. The mizguzar obtains all his annual requirements from the potter in exchange for the earth utilized by him. The potter does not get the best clay available in the villages.

Firewood is collected from the banjar land in small villages and purchased in big ones. Vis is used for giving a shining appearance to the pots. It is purchased from itinerant merchants. It is found in Betul.

Appliances.—The main appliance is the wheel. It is partly made by the village carpenter and partly by the Kumbhar. A few

beaters of pots are also required. The wheel costs Rs. 1-8-0 and other articles eight annas. The total value of the appliances required is Rs. 2.

Labour.—One man and his wife can carry on this business.

Finished products and markets.—The finished products are available in a consumable state. They can also be manufactured on a mass scale by machinery. At Nagpur and Jubbulpore pottery wares are being manufactured on a mass scale. The Kumbhars manufacture pottery for sale. They themselves visit markets for the sale of their wares to the consumers.

Bazar dues are paid by the potters at the tahsil and village markets. Although the duty appears to be very small, it is very high as compared with the sales proceeds of the potters. The potters have to pay duties over and over again on the same goods before they are actually sold. At the Arvi market the Kumbhar has to pay a tax of two annas per cart-load of about 300 pots costing about Rs. 7 or Rs. 8. The amount of sale at the market is about Rs. 2 or Rs. 3. The tax is 6 per cent. of the sale price. At Wardha, the bazar tax is four annas per cart-load. The value of pots sold per bazar is about Re. 1 or Rs. 1-8-0. The tax is 16 to 25 per cent. of sale price.

Stock.—A stock of the finished product is held by the Kumbhar. He takes about two to four weeks to dispose of one week's production.

Capital and Finance.—The Kumbhars used to obtain money from the saukars. Now they have no financial resources. The fixed capital of Rs. 2 is found by the potter. They do not require any working capital.

Waste material.—The broken pots cannot be utilized again. They have to be simply thrown away. Sometimes they are used to fill up the plinth of houses.

(3) *Process of manufacture.*—This is the family business of Kumbhars and the whole family is engaged in the making of pots. The Kumbhar and his wife do the work jointly. The Kumbhar digs the earth. His wife brings it to the house. The earth is then screened. Horse-dung is picked from the banjar land. Then a mixing of earth, horse-dung and ash is made in the proportion of 4, 2 and 1½, respectively. The mixing is pounded with water. After it is well pounded it is put on the wheel and pots are made and then beaten. At this time the potter and his wife work for 14 hours a day. When the pots are dry, they are fired. The next day they are ready for sale. On the weekly bazar day the potter goes for selling the pots.

(4) *Income.*—Unit of production—one week and one family.

Labour required.—

(1) Digging earth—2 hours, and... bringing home.	1 day for 1 person.
(2) Screening earth	1 day "
(3) Picking horse-dung	1 day "
(4) Mixing and pounding	1 day "

Total ... 4 days for 1 person.

Work from (1) to (4)	2 days for 2 persons.
(5) Making and beating 100 pots	3 days for 2 persons.
(6) Firing	1 day for 2 persons.

Total production 100 pots in ... 6 days by 2 persons

As one day is spent in the bazar, this is the weekly production of a potter.

Raw material.—

(1) Earth	Free.
(2) Firewood	8 annas.
(3) Vis 4 seers annually at 4 annas a seer.	Negligible.
Total	8 annas.

Therefore, cost of production for 100 pots is eight annas.

Sale Price.—

Nands are sold at 3 annas to 6 annas each.

Ordinary pots at 3 pies to 6 pies each.

On an average the total sale price is about Rs. 3-8-0 for 100 pots.

Nett gain—

	Rs.	a.	p.	
Sale price	3	8	0	
Cost price	0	8	0	
Difference	3	0	0	in a week's production.

One week's production takes about two weeks to be sold and so Rs. 3 is the income of 15 days.

Therefore, the monthly income of a family is Rs. 6.

They have to pay 8 annas to Re. 1 per month as market dues. This will have to be deducted from the income, shown above.

(5) *Difficulties and suggestions.*—The potter does not get suitable clay. He has to pay exorbitant market dues. The cost of firewood is heavy. He cannot withstand competition from organized industries. He has no expert merchant's advice. He has no financial resources.

The best clay available in the village should be reserved for the potter and he should not be asked to supply anything free of charge to the malguzar as his income is meagre. He should be given the facility to collect firewood from the forests free of charge. No tax should be charged on potters' ware. A sales tax should be levied on the aluminium wares. Not only do these metal wares take away the villagers' money but they also make the villagers sick and render them less efficient in their work. By taxing kerosene oil and encouraging vegetable oil for lighting, the demand for earthen *diwas* can be improved. The potters should be taught the art of making decent toys which may be introduced in place of imported Japanese toys. Treadle driven potter's wheel can be made with cement concrete for about Rs. 6. A sample of such a wheel can be had from Messrs. Sulemanji Ganibhoi, Agent of the Associated Cement Company, at Jubbulpore. Potters can be taught to make this improved wheel which can improve the producing capacity of the potter. But greater demand must be created for his products before improving his efficiency.

Only this year has a small pottery research unit been started by the All-India Village Industries Association at Wardha. More work needs to be done on these lines.

7. *Bangle-making.*—Only lac bangles are prepared at Arvi and Wardha by a few Mohammedans known as manihars. The bangles are consumed within the district. Only one man can carry on the industry. The bangle makers are able to support their family with the earnings from this industry.

Glass bangles are imported to a very large extent. They are not made here. Glass bangle-making can be carried on as a cottage industry. There is good scope for this industry here. Arrangements should be made for training the villagers in the manufacture of glass bangles.

8. *Soap-making—(1) Introduction.*—This is a new industry in this district. There was a soap-factory at Arvi but it has been closed down. There is one factory at Hinganghat which manufactures washing soap. At Maganwadi experiments are being carried on by the All-India Village Industries Association for the manufacture of soap with saji matti. At present saji matti is brought from Sonara—a village 16 miles from Wardha. It contains 16 per cent. of soda ash. The places near the Pavna River have got some deposits of sodium carbonate. It was used for washing clothes and soap manufacture in the olden days.

(2) *Manufacture and sale.*—Oil and caustic soda are the main raw materials required for the industry. Oil is available here. Caustic soda is imported from Bombay. This is a foreign product.

The appliances are made in Bombay and imported by the soap manufacturer. The imported machines are cutting machine, embossing machine, etc.

Soap is sold in Hinganghat and the surrounding villages in the tahsil. It is sold to the consumers direct and through merchants. The manufacturer stated that for 35 seers soap the cost of production was about Rs. 7-12-0 and the sale price was Rs. 8-4-0.

He keeps the stock of raw materials and finished product. He has sufficient capital for the industry.

(3) *Difficulties and suggestions.*—Caustic soda has to be purchased from foreign countries. Suitable substitutes should be found out for this product. Saji matti may, to some extent, be utilized but it requires experimenting. The All-India Village Industries Association, Wardha, has succeeded in its attempts to some extent. There is good scope for the manufacture of toilet soaps.

9. *Tile and brick making—(1) Introduction.*—Kumbhars are engaged in the manufacture of tiles and bitkari in that of bricks. Machine-made tiles of Bagra and Jubbulpore and corrugated iron sheets of Tatanagar are being used by well-to-do persons in place of country tiles. No improvements have been made in the process of manufacture. Tiles are used for roofing and bricks for building the walls of houses. Both bricks and tiles are manufactured on a large scale by power-driven machinery. The factories, being organized industries, can obtain suitable raw materials. Suitable raw material is the main cause of the durability of the machine-made goods. Such materials are not available to the village artisan.

(2) *Manufacture and sale—Raw materials.*—Ordinary earth available in the villages is the only raw material. The brick manufacturers pay Rs. 5 to Rs. 20 and the tile manufacturers pay five thousand tiles to the malguzar, in exchange for the earth used by them. Wood required for the firing is purchased.

Appliances.—The United Provinces Kumbhars who visit the villages seasonally prepare their own wheel for the manufacture of tiles. Small pieces of wood are required for the manufacture of Baradi country tiles. All the appliances can be made in about Rs. 5. The tools are simple and all the members of the potter's family work in this industry.

Markets.—The purchasers go to the house of the manufacturer for purchasing their requirements. No tax is levied on the finished products. Stocks are held by the manufacturers themselves.

Capital and Finance.—Money is required for purchasing wood for firing. The manufacturers depend upon their own capital. They have no financial resources.

(3) *Process of manufacture.*—The people coming from United Provinces manufacture tiles with the help of the potter's wheel whereas local manufacturers do so by hand. United Provinces Kumbhars manufacture tiles by the following method :—

They dig the earth and remove the small stones by screening. It is then converted into soft mud. It requires about two days to be ready for use. The soft mud is put on the wheel and long cylinders are made. When they are half dry they are cut into two parts and left to be dried completely. Then they are fired. Now the tiles are ready for sale.

The local Kumbhars adopt the following method :—

The earth is brought, cleaned and softened by putting some water in it. It is then placed on a round piece of log and given the required shape after which it is dried. This work is carried on for six months, at the end of which all the dried tiles are fired. They are now ready for sale.

(4) *Income—United Provinces people.*—They work for three months. Every day they manufacture 1,000 tiles. Three persons are engaged in this work, one for digging, screening and preparing the earth and two for making tiles. In three months they prepare 90,000 tiles. 5,000 tiles are given to the malguzar and about 1,000 are damaged. The remaining 84,000 are sold at about Re. 1-4-0 per thousand. The total income for three months is Rs. 105. They have to spend Rs. 25 on fuel, etc. The nett income is Rs. 80 in three months for three men.

Local manufacturers.—A family of three persons prepares 600 tiles in one day. It works for six months and prepares 108,000 tiles. 5,000 tiles are given to the malguzar. Some are damaged and the remaining tiles are sold at Re. 1 per thousand. The total

selling price is about Rs. 100. The expenses are as follows :—

	Rs.
For fuel	... 25
For labour for bringing the earth if it is at a long distance	... 15
Total	... 40
Nett income for six months	... 60

If earth is obtained by the manufacturers themselves the nett income would be Rs. 75.

(5) *Difficulties and suggestions.*—The process of manufacture is very crude. It requires improvements. Suitable raw materials are not available to the Kumbhar. At Karanja they are prevented from using the good clay suitable for this purpose. There is a tank in the village the clay of which is suitable for making tiles. The tiles manufactured out of this are reported to be durable but the malguzar does not allow them to use the clay for this purpose. So they have to bring it from a long distance. Supply of suitable clay is very essential for carrying on this work efficiently. It is, therefore, necessary to reserve for this industry such plots of land in every village where the finest clay for the manufacture of bricks and tiles is available.

10. *Cotton-ginning—(1) Introduction.*—About 20 years back hand ginning was carried on in almost all the villages producing cotton. At first it was confined to the cultivators themselves but afterwards it was taken up by traders. Due to the high price of cotton after the Great War, people became idle. Power ginning factories were established. The cost of ginning went down. In the beginning, due to dirt, etc., in it, the hand ginned cotton fetched Re. 1 to Rs. 2 per khandi less than the factory ginned cotton. Gradually the difference rose to Rs. 5 to Rs. 10 per khandi, due to fraud by traders. Consequently hand ginning completely disappeared.

It provided employment to women. No particular caste or community was engaged in it. The hand-ginned cotton was consumed in the textile mills. Cotton seeds were used as seeds for cultivation and as cattle fodder. These seeds fetched more price than factory ginned seeds as the latter break and are less suitable for sowing. As the hand-ginning industry is extinct the cultivators are now using factory ginned seeds for sowing with the result that the yield of cotton has gone down. The villagers have forgotten the art of ginning and the carpenters the art of making hand gins.

(2) *Manufacture and sale—Raw materials.*—Kapas, being the chief money crop, was available in all the villages.

Appliances.—Hand gins were made by the village carpenter. One carpenter could make one hand gin in a day. The total cost of one gin varied from Re. 1 to Rs. 1-8-0. Some of its parts wore out and had to be replaced in two to three years.

Labour.—One woman could do this work independently.

Markets.—Ginned cotton was taken to the nearest market place by the cultivators and manufacturers for sale to the merchants and the millowners. Cotton seeds were sold within the village.

Stock and Finance.—Neither the manufacturer nor the cultivator kept any stock of ginned cotton. It was readily sold in the market. The big merchants and mills stocked ginned cotton and as such indirectly served as financiers to this cottage industry.

Capital.—The cultivator required only a few hand gins and invested about Rs. 5 in them. No working capital was required as kapas was obtained from his own field.

Small organized hand-ginning establishments worked with 25 to 50 gins. On an average 30 gins may be taken as a unit for a small factory.

About seven khandis of kapas were consumed in an establishment in one week. One week's supply of kapas was always required. Capital required for an establishment was as follows:—

Fixed capital.

	Rs. a. p.	Rs. a. p.
30 gins at Rs. 1-4-0 ..	37-8-0	37-8-0
	37-8-0	

Working capital

Kapas seven khandis at Rs. 125.	875-0-0	
Labour 30 women at 3 annas per maund (14 seers) for seven khandis.	36-12-0	
	911-12-0	911-12-0
Total—		946-4-0
		say, Rs. 1,000

A capital of Rs. 1,000 was required for running the industry.

(3) **Process of manufacture.**—One woman takes some kapas by her side. With one hand she rotates the gin and with the other supplies kapas. The ginned cotton falls on the opposite side and the seeds fall on her own side.

(4) **Income.**—One woman could gin 14 seers (equal to one maund) of kapas and earn three annas per day. The ginning charges in a hand ginning establishment came to Rs. 5-4-0 per khandi (28 maunds) of kapas.

As the ginning charges in power ginning factories were high the hand ginner could get more than Rs. 5-4-0 per khandi as ginning charges, earn his livelihood and support a large number of labourers.

If a similar establishment is started now the estimate of profit and loss can be worked out as under—

Three khandis of kapas ordinarily contain one khandi of cotton and two khandis of seeds. Women's labour is available at one

anna and six pies per day. One labourer can gin one maund (14 seers) of kapas in a day

Cost price—

	Rs. a. p.
Kapas three khandis at Rs. 51 per khandi	153 0 0
Labour charges at one anna and six pies per maund for three khandis = 3 x 28 x 0-1-6.	7 14 0
Total ..	160 14 0
say,	161 0 0

Sale price—

Cotton ginned one khandi at Rs. 125 ..	125 0 0
Cotton seeds two khandis at Rs. 18 ..	36 0 0
Total ..	161 0 0

There is no loss in the business, only the trader has no margin of profit.

The ginning rate in the factories is Rs. 2-8-0 per khandi of kapas and that by hand gins at one anna and six pies per maund per labourer comes to Rs. 2-10-0 per khandi. The hand-ginned cotton is sold at a discount as compared to factory ginned cotton. The demand for cotton seed for sowing is very little and the bulk of it is exported. So, ordinarily, a higher price for cotton seed cannot be obtained. The loss, if any, can, however, be recovered by the sale of cotton seed at a higher price for sowing although the demand is not high.

(5) **Difficulties and Suggestions.**—No improvements were made in the process of manufacture by the villagers. At Nalwadi in Wardha, hand-gins are working and they have been improved to a certain extent. Laxmidas Gin at the All-India Village Industries Association, Wardha is a highly improved hand-gin. Agriculturists have no holding powers. They try to dispose of the kapas as soon as it is picked, to obtain money. The merchants have no inducement to organize this industry. The hand-gins stopped on account of admixtures in and consequent low price obtained for its products.

A tax should be levied on the factory ginned cotton consumed in the local textile mills so that they may not use it at all. The mills will not lose anything as the cost of ginning cotton by hand-gins is the same as that by power gins. Even if the mills have to pay something more for hand-ginned cotton they will reap indirect benefit from the agriculturists in the form of more sales when their paying capacity will increase. The mills are at present earning profits at the cost of the cultivators who have no control over the present situation. Japan is not taking Indian cotton in sufficient quantities. So the price of cotton has gone down without a proportional decrease in the price of the cloth and yarn produced in the mills. It is, therefore, just and desirable that cultivators should get something out of the mill-owners' profits. The mill-owners cannot claim the whole profit as it is not due to any extraordinary ability shown or risks undertaken by them. Mill labour also should not be allowed to take advantage of this situation. Their wages need not be increased at all as the present profits are not due to increased efficiency of labour. The profits, due to changed circumstances are being earned at the cost of the cultivator. The State should see that no individual or class of individuals is allowed to gain or suffer on account of circumstances beyond his or its control. The cultivators,

therefore, are in need of relief from this source. Suitable steps should be taken to prevent admixture of cotton ginned on hand-gins with dust, water, etc., in order that hand-ginned cotton may not be sold at a discount in the market as compared to the factory ginned cotton.

11. The sari weaving (from mill yarn)—
(1) *Introduction.*—Kostis are engaged in this business. They were found in most of the villages visited by the party. But in none of them were they solely engaged in this industry. Many of them were engaged in textile mills, agriculture or field labour either exclusively or in addition to weaving. They have a tendency to give up the industry as they are unable to earn a living. As the art of weaving is very technical, in none of the villages except one, were people of other castes following this profession. A few years back they were in a flourishing condition. Printed saris which are very beautiful to look at, but not very durable are displacing handloom saris. Saris, woven in mills also compete with handloom products. It is not possible for the handloom weaver to sell his products as cheap as the mills do but the products of the handloom are more durable and women prefer them. Moreover, a number of designs made on handlooms cannot be made in mills. That is why this industry is still surviving although the kostis are in the worst possible condition. About 14 years back the weavers used to manufacture saris on ordinary throw shuttle looms but now fly-shuttle looms have been adopted.

(2) *Manufacture and sale—Raw materials.*—Coloured yarn is purchased from the merchants in the local market. At Sailu there are some dye works which supply dyed yarn to the local weavers, as well as to the weavers at Arvi, Hinganghat, etc., through merchants but the colour of this yarn is not fast. Fast coloured yarn is imported from Nagpur by the merchants and purchased by the weavers locally. Generally 20's and 32's yarn is used for weft and warp respectively and 64×2's for borders. The 20's and 32's yarn are manufactured by the mills within the province while the 64×2's yarn is imported from Japan.

Appliances.—The following appliances are required by a sari weaver :—

	Rs.	a.	p.	
Hand loom	4	0	0	made locally.
Sari	2	0	0	made locally.
Kama	2	0	0	made locally.
Phani or Reed	1	0	0	made locally.
Charat	1	8	0	made locally.
Kunchi (Brush)	5	0	0	made locally.
Thul	2	0	0	made locally.
Rahat	1	8	0	made locally.
Shuttle	0	8	0	imported from foreign countries.
Pinjra (Dobby)	4	0	0	imported from Nagpur.
Miscellaneous	1	8	0	
Total	25	0	0	

Labour.—One skilled weaver for weaving, one skilled woman for opening the yarn, making the weft pirn and one boy as helper are required for a unit of work. In all one man, one woman and one boy can carry on this industry as a family business. But at the time of sizing the warp outside labour is engaged as one man cannot do this work.

Capital.—Fixed capital required for appliances is Rs. 25.

Ordinarily a weaver weaves 20 saris in a month. For this he requires raw materials worth about Rs. 25. He should always have in stock raw materials that can be consumed in one month. So a sum of Rs. 25 is required as working capital. The total capital required is Rs. 50 only.

Market.—Weavers sell saris to the consumers and the merchants. The major part (about 90 per cent) is purchased by the merchants from the weavers at Sailu and then sold either to the consumers or to the merchants, in other villages and towns. The merchants of other villages used to visit Sailu some time back but now they do not come here. They place orders with the merchants at Sailu for their requirements. In other villages, petty merchants purchase saris from the weavers and go round the village markets for selling them. Stall taxes at the bazars vary from one anna to six pies. At tahsil places, for big lots octroi duty is to be paid in addition to the stall tax and no refund is made if the goods are not sold. The merchants charge a commission of six pies per sari from the weavers at Sailu. Stocks are held by merchants. Weavers are too poor to stock saris. They have to sell either at cost price or even below that when there is no demand for their products, in order to meet the daily needs of life.

Finance.—At present the weavers have no financial resources. The merchants used to give them yarn on credit but owing to the want of paying capacity of the weavers they have withheld the practice.

(3) *Process of manufacture.*—The yarn purchased from merchants is given for warping to the warper. After that it is sized by the weaver, then the warped ends are put through the healds and the reed on to the loom. Now the warp becomes ready for weaving. Then the weaver weaves saris. He weaves about 20 saris in a month after sizing and warping the yarn required for the same. His wife and children help him in unreeling the yarn and winding the weft pirns.

The saris thus woven are taken by the weaver to the merchants and the consumers for sale. They are generally sold as soon as they are made.

(4) *Income.*—

		At Sailu.	
Unit—20 saris woven in one month (8½ yards × 45" each)			
<i>Raw material—per bundle of dyed yarn—</i>		Rs.	a. p.
32's warp—36 muttas at Rs. 6		6	12 0
64/2's border—7 muttas at Rs. 12-8-0		2	12 0
20's weft—45 muttas at Rs. 4-10-0		10	6 6
20's heading—5 muttas at Rs. 4-10-0		1	2 6
(Dyeing charges eight annas per bundle)			
Total		21	1 0
<i>Warping of 20 saris—</i>			
1 warp—12 akats=12×28 cubits at Re. 0-1-6 per akat.		1	2 0
Sizing (an other man's help is necessary for eight days).		1	2 0
Thread reel 2, at three annas	Re. 0-6-0		
Purani	Re. 0-4-0		
For 40 seers	Re. 0-10-0		
For 18 seers (approximately)		0	5 0
Total expenses		23	10 0

Sale price.—20 saris at Re. 1-8-0 each—Rs. 30. Net income is Rs. 6-6-0 in one month for one man, one woman and at least one child.

The prices of yarn and cloth always fluctuate. Sometimes the weaver obtains high price and at others he has to sell below cost prices. So his income always varies. But on an average he is unable to earn a living wage.

(5) **Difficulties and Suggestions.**—The chief difficulty in the way of the Kostis is the competition from mill-made saris and printed saris. They cannot compete with the mills. The margin of profit being very low their position is going from bad to worse. They get insufficient food to eat. They have no financial resources.

If the supply of saris is reserved for the Kostis only, the industry will get much relief. Mill-made saris should be taxed heavily to attain this end. In the alternative, a sales tax may be imposed on mill-made cloth to enable the handloom weaver to compete with the mills. The difference between the cost price of the mills and that of the handloom weaver should be the basis of taxation. Arrangements should be made for stamping the length and the breadth of saris and certifying the fastness of their colour. Similarly, arrangements should be made for supplying pucca coloured yarn to the weavers. An organization for creating overseas markets for the products of the weavers should also be established. Creation of demand for the products of the handloom weaver is the chief problem and this should be immediately solved.

12. **Weaving gonas (with hand-spun and mill yarn)**—(1) **Introduction.**—The dhangar caste, the weavers of ghonghada, are engaged in this industry. They weave gona from *Bhadrapat* to *Falgun*.

Gona is used by the agriculturists for carrying cotton and grain in carts to the markets. They are also used as *jajams*. As there is a failure of crop during this year, the demand for gonas has gone down considerably. Owing to poverty, the farmers have begun to use hessain cloth instead of gona. The production of gona has increased due to the introduction of mill yarn for weaving. As no other work is available some of the dhangar women spin yarn from mill waste for the manufacture of gonas. Mills also manufacture gonas which are used as *jajams*. They compete with handloom gonas.

(2) **Manufacture and sale.**—Mill yarn is purchased from the merchants. Generally 2's., 4's. and 6½'s. yarn is utilised. For spinning yarn mill waste is purchased from the merchants. No tax is paid on the raw material.

Appliances.—The appliances are simple and can be made locally. The spinning wheel costs 8 annas; one handloom costs Rs. 9 and other equipments cost about Rs. 20. In all Rs. 30 are required for appliances.

Labour.—One man and his wife can carry on the industry.

Working capital.—Two weeks supply of raw material is always necessary. In one week raw material costing about Rs. 6 are required. So the working capital required is Rs. 12.

Finished product and market.—The finished product is sold by the manufacturer to the consumer at the village markets. The article is supplied in a consumable form. If the load exceeds 15 seers, terminal tax is charged at eight annas per maund at Arvi and three annas per maund at Wardha. Stall tax is charged at the markets.

Stock and Finance.—At Virul when the output is not readily sold it is kept with a merchant. He charges interest at 3 per cent. per mensem if goods worth Rs. 50 or Rs. 100 are kept. For one or two gonas he charges at nine pies per rupee per month. The money is advanced by him and recovered when gonas are sold away. The goods are kept with him from *Pola* to *Diwali*, i.e., August to October, i.e., for three months. As soon as the crop is harvested, demand revives and the stock is sold. In other villages the dhangars make gona when they can be sold.

(3) **Process of manufacture.**—The weaver obtains yarn, opens it, prepares the warp, sizes and then starts weaving. The woman prepares the weft yarn and size. After it is ready it is taken to the market for sale by the weaver. When hand spun yarn is used the woman spins the yarn in addition to the other work detailed above.

Mill yarn gonas are less durable and can be woven quickly but the hand spun yarn gonas are more durable and take more time in weaving.

(4) **Income**—

Mill yarn gona (At Virul).

Unit of work—8 days, 1 man and 1 woman

Cost price—Raw material.

	Rs. a. p.
4's warp—bundle 1 at Rs. 2-4-0 per bundle ..	2 4 0
2's weft—1 bundle and 14 muthas at Re. 1-12-0 per bundle—(1 bundle=20 muthas).	3 0 0
Colour 2½ tolas at nine pies per tola ..	0 2 0
Sizing—jawari 4 paulis ..	0 4 0
Total ..	5 10 0
Interest for three months at six pies per rupee per month, approximately.	0 7 0
Total ..	6 1 0

Outturn—2 gonas.

Selling price—

Selling price at Rs. 4 per gona—Rs. 8-0-0.

Net earning in eight days—Re. 1-15-0.

In one month one man and his wife earn Rs. 7-12-0 approximately.

This amount can be earned if the entire output is sold and if they are always engaged. But they have to remain idle for some time for want of demand.

Khaddar gona (1½ × 28 cubits)**Raw material—**

	Rs.	a.	p.
Cotton waste 10 seers ..	2	0	0
Spinning Re. 0-2-6 per seer ..	1	9	0
Colour ..	0	2	0
Sizing ..	0	4	0
Total ..	3	15	0
Interest for three months at six pies per rupee per month ..	0	6	0
Total ..	4	5	0
Output—1 gona in eight days ..	5	8	0
Sale price ..	1	3	0

One woman can spin half a seer of No. 1 yarn a day and earns one anna and three pies.

	Rs.	a.	p.
In eight days she earns ..	0	10	0
Nett earning in eight days ..	1	13	0
In one month the family earns ..	7	4	0

approximately.

(5) *Difficulties and suggestions.*—Mills compete with the dhangars. The demand for gona has gone down. People are ready to produce but they say there is no demand. Demand must be created in order that this industry may revive.

13. *Dyeing and Printing*—(1) *Introduction.*—The Rangaries are engaged in this industry at Sukli. In the past it was being carried on in many villages. Rangaries reside at Deoli, Rohna, Selu, etc., but they are not carrying on this profession. Even at Sukli very few of them are following the old methods of dyeing and dye manufacture. Imported chemical dyes have taken the place of indigenous vegetable dyes. The imported German dyes are attractive and cheap and do not require much skill and time for doing the work. At Sailu yarn is dyed with imported colour and sold within the village and at many other weaving centers of the district. At Sukli, razai, farads are dyed and printed, to a small extent with indigenous dyes. The razais printed with imported chemical dyes are more attractive and therefore people prefer them.

(2) *Manufacture and sale—Yarn dyeing.*—This is done only at Sailu with imported German colours. Yarn is obtained from the local textile mills through the local merchants. The appliances used are simple and are made in the villages. The manufacturers themselves stock the dyed yarn and sell it to weavers and merchants.

Dyeing and printing of razai farads (at Sukli)—Raw materials.—The Rangaries obtain chaddars from the Indore mills through merchants. In old times they were purchasing khadi chaddars made of hand-spun yarn from the Mahars. The dyers take out the roots of Al trees and obtain flowers of Ghati from the jungles of Malegaon and Borkhedi. They are boiled in a pan until they give out a colour. This coloured material is mixed with turti, hirda, hirakas, iron powder, gum and (ochre) geru. The colour thus obtained is fast. At Rohna, dyes used to be made from Kardi flowers. The

fruits of this tree were utilized for the manufacture of oil. The Sukli manufacturers purchase imported colours also from Sailu. No tax is paid on the raw materials.

Appliances.—The appliances used by the manufacturers are very simple and can be had for about Rs. 10. One pan costing Rs. 6, some pots for Rs. 2 for keeping colour and printing blocks costing Rs. 2 are required.

Market and finished products.—The manufacturers themselves take the razais to village markets for sale to the consumers. They go so far as Darwaha and Digras in the Yeotmal district and various important village markets in the Wardha district. At tahsil places terminal-tax is charged for heavy loads and at other markets, stall taxes have to be paid. The dyers keep the stock of the unsold articles. They have got no financial resources.

One chaddar is purchased for about Rs. 1-4-0, dyeing charges being four annas. They sell it from Rs. 1-10-0 to Rs. 2. These chaddars are not very attractive and people hesitate to purchase them when beautiful articles are available at about the same or a little higher price.

(3) *Difficulties and suggestions.*—The indigenous dyes are not attractive although they are fast in colour. So they cannot withstand competition from the imported stuff. Research and investigation are necessary in this line of work. Improved methods of dyeing and printing should be taught to the Rangaries. We are importing razai farads in large quantities. The local manufacturers can very well make the same.

14. *Wool spinning and Kambal weaving*—(1) *Introduction.*—Before 20 years this industry was carried on very briskly. But now it is in a dying condition. It is carried on by the Dhangar caste as a part-time occupation. They weave ghonghadas (woollen blankets) from *Falgun* to *Asar*, i.e., February to June, and sell them from May to August. From *Bhadrapad* to *Falgun* they weave gona.

Ghonghada is purchased by the agriculturists in the rainy season for protection against rain while working in the fields. During the winter they are used for protection against cold. It is advantageous to the agriculturists to use this ghonghada. In spite of this the demand is decreasing. Umbrellas and imported kambals are being used as substitutes. Cheap ghonghadas imported from South India also compete with the local products.

There are about 60 families at Virul but only 10 to 12 are doing this business. The Dhangars reside in many villages but most of them have left this occupation. They have taken up agriculture and labour.

(2) *Manufacture and sale—Raw materials.*—Wool is purchased locally from merchants or shepherds. Some Dhangars utilize the wool of their own sheep. Wool is purchased for Rs. 12 to Rs. 15 per 20 seers. Tamarind seeds required for sizing are locally available. No duty is paid on them.

Appliances.—They are simple and are locally made of wood. They cost about Rs. 10. No improvements have been made in the appliances.

Labour.—One man and one woman can carry on this industry. The man weaves and the woman spins.

Working capital.—One warp for six ghonghadas is prepared at a time. Fourteen ghonghadas are made in 20 seers of wool. Raw materials of at least two warps are always required. The value of 20 seers of wool, i.e., Rs. 12 to Rs. 15 is the required working capital.

Markets.—Ghonghadas are taken to the markets for sale by the Dhangars themselves, Merchants also purchase them and take them to different villages for sale. The finished product is not attractive and is very rough. But it is most suitable for the farmers as it can serve two purposes—

- (i) protection from rain, and
- (ii) protection from cold.

Stocks and Finances.—The stock of raw materials as well as of the finished product is kept by merchants. The Dhangars purchase wool from the merchants and obtain two months' credit. They have to pay about rupee one per maund more for this facility.

(3) **Process of manufacture.**—Wool is first carded and the carder takes Rs. 1-8-0 for carding 20 seers of wool. Then about 10 seers of wool is spun into yarn by his wife. The other half is spun on payment of two annas and six pies per seer. One woman spins 40 tolas in a day. The yarn is stretched into warp and sized. It takes one day. For 14 ghonghadas, 14 pails of tamarind seed costing four annas are required for sizing. The woman winds the west pirns for weaving. Weaving of one ghonghada takes about a day. It is then taken to the market for sale. In one month one man and one woman make 14 ghonghadas and sell them at Rs. 1-8-0 each.

(4) **Income (At Virul)**—

Unit—14 ghonghadas, time one month.

Cost price—Raw material.—

	Rs.	a.	p.
Wool 20 seers	..	12	0-0
Tamarind seed	..	0	4-0
Carding	..	1	8-0
Spinning 10 seers wool at two annas and six pies per seer.	..	1	9-0
Total	..	15	5-0

Outturn—14 ghonghadas.

Selling price—

	Rs.	a.	p.
14 ghonghadas at Rs. 1-8-0 each	21	0	0
Therefore, the monthly income of one family is.	5	11	0

(5) **Difficulties and suggestions.**—The appliances are crude and old. Improved spinning wheel and fly shuttle sley should be introduced to improve their producing capacity. Substitutes like umbrellas and imported kambals should be discouraged by propaganda and better education among the farmers. Wool grading should be taught and different varieties of kambals should be made from different grades of wool.

Arrangements would be necessary for their disposal. Sheep-breeding may be encouraged to supply them with an additional source of income.

✓ **15. Sheep-breeding—(1) Introduction.**—About 15 to 20 years back the industry was in a flourishing state. In Karanja alone there were about 500 khandis of sheep (1 khandi=20 sheep). But now there are only about 25 khandis. Sheep-breeding on a small scale is also found at Robna, Sirpur, Nandgaon, Talegaon and Alipore. But everywhere they are in a declining state.

The shepherds are Dhangar by caste. Dhangars also weave ghonghada and gona.

(2) **Business method.**—One shepherd can tend four khandis of sheep. The shepherds move from place to place for sheep grazing. In the rainy season sheep used to graze in the forest but now, as it is not available for grazing, they graze in the outskirts of the villages. At this time the shepherds collect the manure and sell it at the rate of rupee one per dalli. In the night they keep the sheep in their houses.

From February to May the sheep are kept at night in the fields of the farmers for manuring. The shepherd receives one pail of jawari per khandi of sheep for one night's manure. He obtains this for about four months. This year he has received only one pail jawari, for one night's manure of four khandis of sheep.

Shearing of wool is done twice a year. The output per sheep varies from 5 to 15 tolas per shearing. All the wool is mixed up. There is no grading system. Even if it is graded there is, at present, no demand for graded wool. Wool from the legs and chest is harder in feel than that from the back. The former, about five tolas per sheep, is thrown away. Shearing of the sheep is necessary otherwise the animal falls sick. Wool is sold at the rate of Rs. 12, to Rs. 15 per 20 seers and is purchased by the ghonghada weavers. The price of sheep is Rs. 100 to Rs. 125 per khandi.

(3) **Income**—

Unit—80 sheep reared by one shepherd.

Wool.—Ten tolas per shearing per sheep on an average.

Annual output—

Tolas	Shearing	Sheep	=
10 ×	2 ×	80	
1,600 tolas=20 seers at Rs. 15 per 20 seers—Rs. 15 annually.			

Manure—

Jawari (in pailies) × khandi of sheep × days.	
1 × 4 × 120 = 480 pailies of jawari.	
= 3 khandis of jawari.	
at Rs. 10 per khandi.	Rs. 30 annually.
In the rainy season five dalas at Re 1 per dala	Rs. 5 annually.
Total income	Rs. 50

The income on account of breeding and milk of she-goat is in addition to the above.

Waste—

Five tolas of wool from leg and chest of each sheep are wasted.

Therefore, total waste = 5 tolas × 2 shearings × 80 sheep = 10 seers of wool at Rs. 15 per 20 seers = Rs. 7-8-0.

(A) *Difficulties and suggestions.*—The chief source of income appears to be from manure. The manure during the rainy season fetches very little price. If it is kept in a proper way so as not to lose its manurial property higher price may be obtained for it.

Wool that is wasted can be utilized and can fetch about Rs. 7-8-0. The Dhangars do not know how to spin this short and hard wool. The improved wool spinning wheel of the Punjab and the United Provinces may be introduced among these castes. The greatest difficulty is about grazing. About 15 years back the sheep were allowed to graze in the reserved forests. But now they are not allowed to do so. If sufficient grazing land is provided this industry can be developed.

16. **Carpentry—(1) Introduction.**—Carpenters are found in all the villages as they are indispensable. The castes engaged in the work are Sutar and Genda. Other castes, such as Telis, have also taken up this profession. Village carpenters make ploughs, carts, cart-wheels, doors, windows and other requirements of the villagers. In the tahsil towns carpenters make tables, chairs, and other requirements of the towns people.

The fate of the village carpenter is bound up with that of the farmer and the village artisan. He prospers and suffers with them. He gets 2½ to 5 kudis of jawari per bakhar (= 20 acres of land) annually from the agriculturists for repairing the agricultural implements. New articles are made by him on extra payment. Instead of carts, railways and motor buses are now used for long distance traffic. Hand-gins have disappeared. A few oil ghanis are in existence. New handlooms are rarely made. The carpenter has lost all these sources of income. Owing to successive crop failures his income from the farmer has also gone down. For these reasons his economic condition has become very bad and he is living from hand to mouth. But the farmers require ploughs for cultivation and carts for the cartage of farm produce from the fields to their residences, and from the village to the market place. For this reason, the carpenter still exists in all the villages. Foreign ploughs have not been adopted by the villagers as yet.

(2) *Manufacture and sale—Raw material.*—Wood, mainly of babul and sal trees, is utilized by the village carpenter. Babul is available in the villages. It is required for agricultural implements and is supplied by the farmer. Sal is purchased from the neighbouring markets. It is imported from the forests and is used for making building materials. No tax is levied on babul. Municipal tax is charged on sal when it is brought for sale to the markets. Babul is used for no other purpose.

Appliances.—Some of the appliances are made by the village blacksmith. Hathodi, wasula and some other appliances are imported from the towns. The method of manufacture has not been improved.

Labour.—One man and one helper can carry on this profession.

Capital and Finance.—Besides appliances, the carpenter requires about Rs. 10 of wood for building purposes. Wood for agricultural implements is supplied by the farmer. He has no financial resources.

Stock and Market.—The carpenters do not stock finished articles. Ordinarily they do not go out marketing their products. The consumers either purchase their requirements or supply the wood and get them made on payment, from the carpenter. Rich carpenters prepare carts and cart-wheels and furniture for sale in the village markets. They carry them from market to market for sale. Bazar taxes have to be paid for these articles. In the Arvi market, carts from Amraoti district are brought for sale. Samundrapur and Waigaon carpenters take rengis and cart-wheels for sale to the Kapsi jatra. The quality of the finished product is rough. A plough lasts approximately for three years.

Waste materials.—Bark and chips are utilized for burning purposes. Cheap wooden toys can be made from some of the waste materials.

(3) Income—Manufacture of cart-wheels.**At Alipore—**

<i>Wheels of ordinary cart</i>		Rs. a.
Value of wood required	..	3-8
Labour—7 days for 2 men	..	..
Outturn—One pair of wheels	..	..
Sale price	..	5-8
Income per week	..	2-0
Therefore the income per month for 2 men is	..	8-0

At Nandpur—

Value of wood required	..	3-8
Sawing charges	..	1-0
Carting from Arvi	..	0-8
Wages of an additional man for one day	..	0-4
Cost price—Total	..	5-4
Labour one man for 10 days	..	..
Outturn—One pair of wheel.	..	8-0
Sale price	..	..
Income in 10 days	..	2-12

Therefore, the monthly income of one man Rs. 8-4 is.

At Karanja—

Making of three pairs of wheels for 1 bundi, 1 rengi and 1 chhakada.	..	..
Value of wood required	..	5-0
Sawing charges	..	3-0
Labour charges	..	0-8

Cost price—Total .. 8-8

Labour—1 carpenter makes them in one month.

Sale prices—

Large-sized wheels pair	..	6	8
Medium-sized wheels pair	..	4	0
Small-sized wheels pair	..	3	0
Total	..	13	8

Therefore the income per month for 1 man is Rs. 5.

The carpenters have been reduced to a miserable condition. They have to maintain their families of at least four to five members with a paltry sum of about Rs. 5 to Rs. 10 per month. They are hardly able to meet the necessities of life.

(4) *Difficulties and suggestions.*—With the decay of the village industries the demand for the appliances required for them has gone down. No improvements have been made in the methods of manufacture. They have no facilities for obtaining technical education. The existing handicrafts schools of the province, although they help in increasing the earning capacity of the carpenters, cannot train all the carpenters. They pay more attention to furniture-making. Seasoned wood is not available to the village carpenter.

Carpentry and blacksmithy are key industries in so far as they supply the tools and implements for running other cottage industries such as handloom weaving, hand ginning, spinning, oil-crushing, pottery, gurmaking, rope-making, paper-making, toy-making, etc., and supply vehicles (carts) for the transport of village products. This function of the carpenter and the blacksmith has been vanishing along with the disappearance of the cottage industries. Their function as suppliers of consumable articles such as furniture, building materials, household materials is quite different and as such they require only such attention as other cottage industries do. But the function of supplying tools and appliances as it is a key industry, deserves special attention. Like other key industries it is in need of immediate revival and the best brains, specially of engineers, should combine to do so. If the cottage workers are provided with improved appliances, they will be enabled to produce more in quantity and better in quality than they are doing at present and, therefore, their capacity to compete with imported articles and earn their livelihood will increase.

The village carpenters and blacksmiths should be trained to make the tools and appliances for the cottage workers without the aid of power-driven machinery. For this purpose, technical schools should be established in the district towns and admission to the carpenters and blacksmiths should be free of charge. Two skilled artisans, two assistants, a few tools and a hut at each centre may serve the purpose. If this elaborate arrangement cannot be made now, education on the above lines can be introduced in the existing handicraft schools, immediately. The teaching of the art of making furniture and other consumable articles may be limited to a small extent and the main course should be the manufacture of tools and appliances for cottage industries. Researches in making improved appliances can also be carried on in these schools.

Demand for tools and appliances should be increased by reviving village industries. Transport by cart should be encouraged. Arrangements should be made for supplying seasoned wood to the village carpenters. A tendency should be created in the trained students to remain in the villages.

17. *Blacksmithy.*—(1) *Introduction.*—A blacksmith is as necessary in a village as a carpenter for making and repairing agricultural implements. Almost in all the villages a blacksmith is found. In very small villages the blacksmith pays a visit occasionally and does the work of the agriculturists. In ancient times, he was in a flourishing condition but now he is no better than his fellow artisans. The Lohar caste is engaged in this business. They make kudali, axe, sickle, etc. They are now mainly confined to repairing work as most of the iron-ware are imported from the towns. The articles of every day, use such as locks, nails, axes, saws, bolts, nuts, knives, razors, etc., etc., are all imported. If these are made by the village Lohar he can have a very happy time. But unfortunately, all these articles are machine-made and cheaply available. The village blacksmith cannot compete with the mills. He has not improved his methods of working. He has no facility for obtaining technical training. The handicraft schools have not been able to turn out enough trained men and they were not found in any of the villages visited by this party. The Lohars are idle from *Asar* to *Falgun* and can be suitably employed in other work.

(2) *Manufacture and sale—Raw materials.*—Scrap iron imported from Tatanagar is purchased at two annas and six pies per seer from the merchants in the towns and big villages. Old iron is also purchased whenever it is available at a cheaper rate. Charcoal is purchased in the villages.

Appliances.—The appliances cost about Rs. 20. The blacksmiths themselves prepare ghan, hathodi and sandshi. Kanus (file), chakkis for sharpening and fukani (fan) are purchased by them. If improved leather bellows are used they have to invest a much larger sum. This was found in many villages. No improvements have been made in the appliances.

Labour.—One skilled labourer for holding the iron and giving it proper shape, one unskilled man or woman for working the bellows and one man for beating the hot iron with the ghan are required in this industry. In all three persons are required for running this industry.

Working Capital and Finance.—About 20 seers of iron costing Rs. 3-2-0 are to be stocked for making new articles and repairing old ones. Two bags of charcoal costing Rs. 2-10-0 should always be in stock for the furnace.

Working capital of about Rs. 6 to Rs. 10 are required for carrying on this industry. The blacksmith has got no financial resources.

Market.—The villagers purchase their requirements from the shop of the Lohar. Sometimes the Lohar goes to the village

bazaar to sell the articles made by him to meet the petty requirements of villagers. He has to pay a stall tax of 6 pies at Sailu. He sells about four annas worth of articles in the bazar.

Waste.—Small bits of iron are thrown away.

(3) *Process of manufacture.*—Iron is heated in the furnace. When it is red hot it is held with the sandshi by the skilled worker and struck with the ghan by an unskilled worker. The skilled man moves it to give it a shape. The ghan holder strikes the iron only when it is red hot. When it becomes cool it is heated and the same operations are again and again carried out till the final shape is given. For sharpening razors and other instruments the chakki is used.

(4) *Income.*—It is not possible to give any estimate of a Lohar's income as he is mainly engaged in repair work. He receives about 2½ to 4 kudus jawari per bakhar annually for repairing the implements of the farmer. He can make one axe in a day with iron worth eight annas. The other expenses incurred by him are labour charges for 2 men, i.e., eight annas and charcoal worth eight annas.

The total cost is Rs. 1-8-0 and the selling price is Rs. 2. His earning can be eight annas in one day. But there is very little demand for axes. His income has dwindled down to a very small amount and he is unable to make both ends meet. He lives in a small kacha house and gets insufficient food.

(5) *Difficulties and Suggestions.*—Factory made iron articles have flooded the market. The Lohar is not able to compete with them. No improvements have been made in his methods of manufacture. Iron scrapes pass through a number of hands before the Lohar gets them, whereas the power factories get them at the cheapest rate. The Lohar does not know nickle plating and the articles made by him are crude, unattractive and get rusted very soon.

With all the above difficulties the lot of the Lohar can be improved. Iron articles are indispensable as they satisfy the various needs of man. Articles like locks, scissors, cutlery, knives, buttons, and various other things can be made without the aid of mechanical power and they can successfully compete with factory made goods. Such articles should be selected and made in the villages. New and up-to-date manual appliances should be introduced and imported factory made articles should be taxed. Arrangements should be made for supplying iron to the blacksmith at cheap rates. Blacksmiths should be allowed to utilize, free of charge, iron ores if they can find them. This is a key industry as it supplies tools and appliances to other village industries. The suggestions made under carpentry are applicable to this industry as well.

18. *Mat and Basket-making (from bamboo and sindhi)*—(1) *Introduction.*—The people engaged in this industry are known as Burads. The bamboo articles are made at Wardha, Hinganghat, Arvi and Rasulabad. The sindhi baskets are manufactured in the villages. The Burads manufacture

baskets, fans, cart hoods, winnowing fans, mats, etc., from bamboos and baskets, mats and brooms from sindhis. These articles are consumed locally by the villagers for various household purposes. It appears that no substitute has yet been introduced for these articles.

(2) *Manufacture and sale.*—Raw materials are bamboo and sindhi trees. Bamboos are purchased from the merchants. Green bamboos are required for this industry. At Arvi, they have to pay two annas per bamboo whereas at Wardha it is available at one anna. Sindhi trees are available in the banjar land and no price is paid for them.

The only appliance used is kati and can be prepared by the village blacksmith. The Burads do not employ any outside labourers but they work themselves. The articles made by them are sold in the bazars by themselves to the consumers. Sindhi baskets are sold at about Rs. 1-4-0 per 20. Two men can prepare 40 baskets in eight days. The manufacturers themselves keep the stock of bamboo articles. Sindhi baskets are generally purchased by the merchants from the manufacturers and they bring them for sale into the markets. Rohilas, who charge exorbitant rates of interest, are the only financiers. Their monthly earnings vary from Rs. 5 to Rs. 10.

(3) *Difficulties and Suggestions.*—The main difficulty of the Burads appears to be the want of financial assistance. They have to pay high prices for the bamboos. Raw materials should be made available to them at a very cheap rate. Sindhi baskets appear to be very durable and should be introduced in the mines of the province.

19. *Rope-making*—(1) *Introduction.*—Ropes are generally made by the agriculturists themselves for their own use, from the sann hemp cultivated in their own fields. The agriculturists do not cultivate sann hemp or manufacture ropes for sale. Either by themselves or with the help of agricultural labourers, they try to meet their own requirements. At Arvi the Kangars and at Sukli the Bhamtis manufacture rope from sann hemp, for sale. This is the main business of the Kangars. The Bhamtis cultivate sann hemp, extract it from the plants and sell it. Only a few families are engaged in the manufacture of ropes. Although rope-making was their main business, they have left it because it is not paying. Ropes manufactured by the Kangars are consumed by the villagers. Imported coir and manila ropes are being used as substitutes for the indigenous sann hemp ropes. There is no change in the process of manufacture.

(2) *Manufacture and sale*—*Raw material.*—Kangars purchase sann hemp in the Arvi market at Re. 1 or Rs. 1-4-0 per maund (=10 seers). Tax is levied at two annas per cart-load of hemp at Arvi. One cart-load contains five to ten maunds of sann hemp. The Bhamtis at Sukli utilize their own produce. It is not used for any other purpose.

Appliances.—The appliances are very simple. The Kangars use only wooden instruments made of bamboos. They purchase bamboos and wood worth about twelve

annas and make the appliances themselves. The Bhamtis spin the yarn on takli. The takli is, a very big long piece of wood with iron caps at both ends. The lower end of the takli is put on a coconut shell. It is rotated by hand for spinning. It costs about eight annas and is imported from Bhandara.

Labour.—Two women are required for a unit of manufacture in case ropes are made by the method adopted by Kangers. One Bhamti can do all the operations without the aid of anybody else.

Working capital.—Ropes from 20 seers of sann hemp can be made in about two weeks. Two weeks' supply of raw materials is sufficient. So Rs. 2 are required for running this industry.

Markets.—Manufacturers take their ropes to the village markets and sell them to the consumers. No bazar or octroi duty is levied on these ropes. The quality of the ropes is inferior to that of the imported ones.

Stocking.—The ropes are sold in the weekly bazars. Generally no stocks are held but if any remains unsold, it is kept by the manufacturers. They do not sell it to the merchants.

Finance.—They have got no financial resources. They are so poor and their paying capacity is so low that nobody gives them money on credit.

Waste materials.—There is no waste material in this industry.

(3) *Process of manufacture.*—The Kangers adopt the following method of manufacture—

One woman holds the instrument and rotates it to spin the yarn. The other woman sits down at one place and supplies sann hemp. The woman holding the instrument moves further and further as the yarn becomes longer and longer. When the spinning of yarn is finished, generally three yarns are put together and twisted at both ends by the two women and thus the rope is made. The Kangers mix the sann hemp with earth to make the ropes heavy. The ropes are so made that the black and dirty hemp mixed with earth is hidden within the good and better quality material so that purchasers cannot make this out simply by looking at the ropes. The ropes become weak on account of this malpractice. The Kangers know this but they say they have to do it or else they cannot get any profit. The agriculturists also realize this. As far as possible they avoid purchasing this kacha rope as in the long run it is costly.

The Bhamtis do the following:—

A bundle of sann hemp is hung by the side of a Bhamti. He sits down with his takli, takes the sann hemp in one hand and the takli in the other. He puts the lower end of the takli on the coconut shell so that it may be smoothly rotated. With the help of one hand and thigh he rotates the takli and manufactures yarn. With the same takli he doubles the yarn and manufactures ropes. He does not mix earth with the hemp.

No improvements have been made in the process of manufacture followed by the Kangers or by the Bhamtis. About a month is required for learning the technique of this art.

(4) *Income.*—The Kangers purchase about ten seers of hemp for Re. 1 or Rs. 1-4-0 at the Arvi market. Two women work throughout the week and manufacture ropes. The manufactured product is sold in the weekly bazar for about Rs. 1-12-0 or Rs. 2. Thus they earn about 12 annas a week. One woman earns about six annas a week i.e., Rs. 1-8-0 per month.

In the case of Bhamtis only one person can carry on this industry. At a time he takes about two seers of hemp costing four annas. He spins for two days, twists for one day and does some other operations for one day more. Thus in four days he prepares six pairs of ropes and sells them at one anna and six pies to two annas per pair. The total sale price ranges from nine to twelve annas and his nett income is about five to eight annas in four days. So in one month he earns from Rs. 2-3-0 to Rs. 3-8-0. As it is not a paying business very few Bhamtis are manufacturing ropes. They produce sann hemp only and sell it in the market.

(5) *Difficulties and Suggestions.*—The main difficulty is that the raw material is not available at a cheap rate to the Kangers. They cannot compete with the imported mill-made coir and manila ropes. The competition with the mill-made ropes should be reduced by taxing them to revive this industry. It is also in need of improved appliances.

20. *Sann hemp producing*—(1) *Introduction.*—This is carried on in almost all the villages to supply the requirements of the farmers. The farmers cultivate sann hemp along with other crops to make ropes for their home and agricultural uses. The Bhamtis cultivate it for sale. They were found at Ithlapur and Sukli. In the Arvi market, sann hemp is brought for sale from Wardha—Maneri, Mangrul, etc. It is purchased by the Bhamtis and the Kangers for the manufacture of rope. It is purchased by the merchants for export also.

(2) *Manufacture and sale.*—The plants cut from the fields are put under water for seven days to enable the fibre to leave the stalks. This is called the retting process. After that they are taken out of water and dried. Women take out the fibres by hand. This is a very laborious process and one woman can take out about two seers of fibre in one day. As soon as the sann hemp is ready it is taken to the weekly bazar for sale. The waste material, i.e., stalks remaining after taking out the fibre, is utilised for making tattis to be used as doors, walls, etc., of houses.

(3) *Income.*—One man having five acres of land obtains about 2,000 bundles of sann hemp and sells them for Rs. 100. He has to spend about Rs. 50 or Rs. 60 for seeds, labour, revenue, etc. His annual earnings are Rs. 40 to Rs. 50 in this business.

(4) *Difficulties and Suggestions.*—The main difficulty of the sann hemp producer is the extraction of fibre from the plant. The introduction of improved appliances may

bring down the cost of manufacture considerably. It will help the Bhamtis in earning better wages. The people were very anxious to have suitable appliances for taking out fibre from the plant quickly. The linseed fibre extracting plant devised by the Oil Seeds Specialist, Dr. Richaria, of the Agricultural Department, appears to be a suitable appliance for this work. A specimen of this machine has also been kept in the museum at Maganwadi and the Bhamtis of Sukli, about seven miles from Wardha, have been directed to visit this museum and get such machines prepared, by the village carpenter.

21. *Flaying*.—The dead animals are taken by the kotwar of the village. He is Mahar by caste. He gets the dead animals free of charge, flays them outside the village, eats some of the meat and throws away the rest. The skin is salted and then sold to the tanners, known as Chamars. The kotwar does the watch and ward of the village and gets some agricultural produce from the cultivators for his services. Nobody except the Mahar touches dead animals. Even the tanners think it irreligious to touch and flay them. The bones, meat, etc., are not put to their proper use.

All parts of the dead animal can be utilized to the best advantage. Dead cattle institutes have been started at various places within the province for this purpose. One exists at Wardha proper also. This institute utilises skins, bones, flesh, fat, hoof, horn, etc., of the carcass. Skin can be turned into finished leather, bones and flesh into manures, fat into lubricants and horn into combs, sticks and various other articles. Flaying is the occupation of Mahars and they should be trained in all the above branches of manufacture at the dead cattle institutes. Scholarships should be awarded to them during the period of training. After training, they should be given loans under the State Aid to Industries Act to start this business. The State should give all possible facilities for converting this village waste into national wealth. Salt should be supplied to the Mahars free of excise and import duties as is done to other large-scale industrialists. This can be done by opening depôts at various big villages. To avoid competition, this industry should be reserved for the Mahars and nobody else should be allowed to intrude in their trade.

22. *Tanning*—(1) *Introduction*.—About 20 years back this industry was in a flourishing condition. The Chamars are engaged in this industry. They do not touch the dead animal on religious grounds. They purchase raw hides from the Mahars and tan them. They prepare *motes* (leather buckets), ropes and various other leather wares for the agriculturists. Khojas have got two tanning factories in the district. This is considered low grade work. Technical skill is required for undertaking this industry. The Chamar learns this work from his father and incurs no expenses on technical education. This industry is dependent upon the requirements of agriculturists. Due to failure of crops, during recent years, it has received a set back. Leather ropes are being substituted by

manila and coir ropes and motes by rahats. Hides and skins are exported to foreign countries. Finished leather tanned in power factories, is imported for local consumption. The Chamars do not know the process of tanning finished leather nor can they compete with power driven machinery. Imported finished leather and leather wares have been driving the Chamars out of their trade. Many of them have been diverted to agriculture and field labour. No improvements have been made by them in their processes of manufacture. Cottage chrome tanning is carried on in the Goseva Charamlaya at Nalvadi. Money bags, watch straps, portfolios, shoes, chappals, etc., are also made here, with their own factory tanned leather.

(2) *Manufacture and sale—Raw materials*.—Skins and hides are available in the villages. They are purchased from the Mahars. No tax or duty is paid on them. They are purchased at Rs. 60 to Rs. 100 per khandi (20 hides). The weight of a khandi of dry hides varies from 3 maunds to 5 maunds. The average rate is Rs. 20 per maund.

Lime, myrobalan (hirda), berelic myrobalan (baheda), hiwar bark, babul bark, anjan bark, etc., which are used as tanning materials are available in the villages. The terminal tax on myrobalan is five annas per maund (40 seers) at Arvi, whereas the cost of this material is about Re. 1-8-0 per maund. The tax is about 20 per cent. of the value of the material. At Alipore, the tanners cannot afford to obtain myrobalans. They use berelic myrobalan. Consequently the finished leather becomes black and fetches less price. Lakhs of maunds of myrobalans are exported from India to be used by tanners in England, but the local tanners are unable to obtain them and that when more than half of the total Indian export is from this province alone. At Arvi Chamars purchase myrobalans at Rs. 2 per maund, tanning barks at three to four annas per bojha of 10 seers, and lime at ten to eleven annas per tin of 16 seers. Three Mohammedans prepare country lime and sell it at 9 pies for 1½ seers. Water tax for tap water is Rs. 2-10-0 annually. Both well and tap water is used.

Appliances.—The appliances are made in the villages. The tanners require one pit for keeping water and tanning materials, one wooden log for hanging the skin and a few iron tools for taking out flesh and hair from the skin, cutting it for the manufacture of motes, and leather ropes, sewing the motes, etc.

Labour.—This is the family trade of the Chamars and all the members of the family are engaged in the work. The main worker is the Chamar and his wife helps him. But both of them are skilled in the trade. Two persons can carry on the work.

Finished product and Market.—The tanners themselves sell the tanned leather and other articles made by them to the villagers. They take the articles to the village markets for sale where they have to pay a stall tax. The articles are not very attractive. Leather is not properly tanned as the

Chamars cannot get suitable tanning materials and keep the hides in process for a long time. Therefore, the articles are not very durable. Two hides are required for one mote which is sold at Rs. 5 to Rs. 8. One thick rope of 30 cubits is made from one hide and is sold at Rs. 4-8-0 to Rs. 5-8-0.

Finance and Stock.—Stocks are kept by the tanner himself. He has no financial resources.

(3) **Process of manufacture.**—The Chamars purchase raw hides and skins and put them in lime-water for 15 days. After that about five to six skins are taken out of the limewater every day and the Chamar removes the hair and flesh attached to the skin. Then they are kept in water with myrobalan and other tanning bark for three to four days. After that they are taken out, stitched with Sindhi leaves, hung on a wooden bar and filled with the water of the tanning materials. As the water flows down the tanner fills them up again. In this way the hides are kept for about 3 days. Then they are stitched from the opposite side and the same operations are carried on for one day more. Then they are washed with clean water and used for manufacturing leather articles. At Arvi the Chamars keep the hides in tanning water for one day only and hang them with similar water for another day.

For making ropes the hides are not hung but instead of this they are cut into strips and put in the tanning water for one day. Fresh tanning materials have to be taken for each operation of the same hide as well as for new hides. The tanned leather is cut in such a way as to supply one single strip of leather for the whole length of the rope. Three ply-ropes are manufactured with those strips. Each strand contains 2, 3, 7, 9 or 11 strips of leather, according to the thickness of the rope.

(4) **Income.**—One tanner ordinarily tans about six hides, makes motes and ropes, etc., from the tanned leather and sells them in about a fortnight. His earnings are as follows :—

Unit—

Six hides.

Cost price—

Hides—Six at Rs. 60 per khandi	Rs. a. p.
Myrobalans at $\frac{1}{4}$ seers for 2 hides=25 seers	18 0 0
approximately at 2 per maund.	1 4 0
Tanning barks at 12 seers for 2 hides=36 seers	0 10 0
Lime	0 3 0
Total	20 1 0

Say, of Rs. 20

Outturn and sale—

1 mote requires 2 tanned leathers, and
1 rope for mote requires 1 tanned leather.
Two motes and 2 ropes are made.

Two motes at Rs. 8 each	Rs. a. p.
Two ropes at Rs. 4-8-0 each	16 0 0
	9 0 0
Total	25 0 0

Nett income in a fortnight—

Sale price—Rs. 25.

Cost price—Rs. 20.

Difference—Rs. 5.

The monthly income of a tanner is Rs. 10 approximately.

(5) **Difficulties and Suggestions.**—No attention has yet been paid to the development of the village tanning industry. The export of raw hides and skins and the import of finished leather have been encouraged. Rahats and machine-made coir and manila ropes have taken the place of leather articles. No facilities are available for the village tanners for developing their trade.

They have not got sufficient space in their houses for carrying on the industry. At Wardha, they have been deprived of their own houses and at present they are living in rented ones. They have no financial resources. They cannot keep the hides in process for a long time. Khoja merchants tan hides and skins for export. They do not manufacture finished leather. All the tanning materials are not available in the villages and even when they are available the tanners do not get facilities for obtaining them. As the tanners are poor they cannot afford to go out long distances and obtain their requirements. No merchant stocks the tanning barks. They are indiscriminately taxed by the municipal committees. The Chamars cannot compete with the factories. All these factors have combined to drive the Chamar out of his trade and have made him a poor man. He lives in a small and unventilated kacha house situated in a congested and unhealthy locality. For obtaining finished leather, the province pays many times over the money received by the supply of raw hides and skins.

It is possible to manufacture finished leather without the use of machinery as it is manifest from experience at the Goseva Charnalaya, Nalwadi, Wardha, and at the tannery of Messrs. J. A. Rizvi and Co., Raipur. It is, therefore, desirable that Chamars should be taught the latest methods of manufacturing finished leather at these tanneries and new tanneries should be opened for training them. There are a few educated men in the Chamar community. At Arvi, one Sit. Baliram Kisan Savarker has studied English up to the VI standard and he is engaged in this business. His brother is also studying English. He is keen to learn this business but is very poor. The whole family depends upon him and he cannot afford to spend money on education. Such persons should be given sufficient scholarships to maintain their family and receive education. After receiving education loans may be given to them under the State Aid to Industries Act for running the business. As soon as a few persons become trained in this line and they establish a few cottage factories, imported factory-made finished leather may be taxed. The Provincial Government has got no power to prohibit or restrict the import of any merchandise. The only step it can take is to levy a sales tax on the finished leather manufactured in power driven factories. No objections can be raised by the Central Government to this procedure. If the import of finished leather can be stopped and supply of indigenous finished leather is made, prices can be kept up at the present level. The whole output of the cottage factories can be consumed within the province. This will save the drain of money out of the province in the form of

the import of finished leather. Separate plots should be reserved for the Chamars for carrying on their trade in each village. All the tanning materials should be made available to the village tanners. No tax or obstruction should be put in their way for collecting or obtaining them in the villages and the forests. No municipal taxes should be charged upon the tanning materials. Sales tax should be levied on factory-made manila and coir ropes. Credit system should be revived in the villages.

23. **Shoe-making—(1) Introduction.**—Chamars are engaged in shoe-making. The Chamars who do tanning and those who are engaged in shoe-making are of the same caste. But those who do tanning do not carry on the business of shoe-making and *vice versa*. Although most of the Chamar families are engaged in shoe-making, their condition is in no way better than that of other village artisans. Many of them are engaged only in repairing work. Machine-made shoes of leather, rubber and canvas are imported and sold cheaply. They are also attractive. So the people prefer to purchase them, although they are not durable. For this reason the demand and price of the products of the local Chamars have gone down. The articles made by the local Chamars are not attractive. The leather used by them is not soft. High class people do not use them. The villagers prefer country shoes to the imported ones. The Goseva Charnalaya at Nalwadi manufacture superior quality of shoes, chappals, etc., with their own factory tanned leather.

(2) **Manufacture and sale—Raw materials.**—Both country leather and imported leather are used for shoe-making. The mochis of towns and big villages generally purchase imported leather. In the villages the Chamars generally use country leather and to a small extent, imported leather.

Appliances.—The appliances are simple and available in the villages. About Rs. 10 are required for all the tools. No improvements have been made in the methods of manufacture or in the tools used by the mochis.

Labour.—One man can do this business.

Market.—The shoes are sold in the village markets by the mochi himself. The consumers purchase them. Sometimes, if the quality of the product is good, some mochis act as middlemen, purchase the shoes from the manufacturer and sell them from bazar to bazar. This was marked specially at the Hinganghat and Wardha weekly bazars where excellent Sambhar shoes were brought for sale from Chanda by the mochis. They were sold at Re. 1-8-0 to Rs. 2 per pair. For similar shoes Flex and Co. would charge much higher price. The upper leather appeared to be of a superior grade.

Stocking and Finance.—Stocks are held by the mochis themselves. They have no financial resources.

(3) **Suggestions and difficulties.**—On account of the import of cheap factory-made shoes the village Chamars have been reduced to poverty. They cannot compete with the factories. Taxes should be levied on the imported shoes and free education should

be given to the village mochis. It is quite possible to meet the whole requirements of the province within the province itself and there is no reason why machine-made shoes should be encouraged or allowed to be sold in the province. They may be discouraged by a heavy sales tax.

24. **Dairy Farming—(1) Introduction.**—This industry has been carried on in this district since a long time by the Gowalis. The villagers who have got milking cattle sell butter and use churned curd for consumption. This work is carried on near about Karanja at Nara, Tarora, Ranwadi, Malegaon, Garipit, Borgaon, Zaurwada, Sawali, Belara, Aznadi, Deholi and many other villages.

(2) **Business method.**—The Gowalis keep herds of cattle and graze them in the forests. The agriculturists follow this as a subsidiary occupation. Merchants move from house to house and gowali to gowali and collect loni made by them every day. They collect this for about one week and then sell the same in the market on the bazar day. The gowalis purchase cattle fodder, e.g., cotton seed, oil cake, etc., from the merchants. They have to borrow money for paying grazing charges to Government. The grazing charges have been raised from three annas per cattle 12 years back to Rs. 2 per cattle at present in Karanja. As the gowalis are indebted to the merchants they sell loni to their sahuks in repayment of loans. About Rs. 500 worth of loni is sold every weekly bazar day at Karanja. It is sold in large quantities at the Wardha and the Anji markets also. At Wardha it is converted into ghee by heating in iron pans. Ghee is sold to the consumers through retail vendors.

(3) **Difficulties and suggestions.**—There is a long chain of middlemen between the gowali and the ultimate consumer. The gowali is poor and cannot afford to stock loni or convert this into ghee and then sell it. He is harassed by the creditor for the repayment of loans or the sale of loni to him. The grazing charges in the Government forests are exorbitant and this business is, therefore, not paying. Vegetable ghee is mixed up with genuine ghee and consumers cannot detect it. No pasture land is available in the villages. No veterinary aid is received by the villagers.

There is a great demand for ghee in India. It is very essential for physical and mental work. Every possible facility should be given for increasing the production of ghee. No charges for grazing in the Government forests should be levied. Arrangements should be made for raising sufficient cattle fodder by the Forest Department. The supply of cattle fodder should not be a source of income but an item of expenditure in the Forest Department. At least two acres of land per milch cattle should be provided in the village as pasture land. Farmers should be compelled to reserve two acres in every 20 acres of agricultural land for raising cattle fodder. Vegetable ghee should not be allowed to be sold without being coloured so that it can be distinguished when it is mixed with ghee. The number of middlemen should be minimized.

Moneylenders should be encouraged to advance loans but they should be prevented from taking back loni in payment. The villagers should be encouraged to sell ghee instead of loni. This is the most suitable subsidiary occupation for agriculturists. They can obtain an additional income from this source. In order to give them the most deserved relief, this work should be immediately taken in hand.

25. **Toy-making.**—Toys from wood are made in this district at Rasulabad and Deoli. Only a few families known as Chitaries are engaged in this industry at present. Articles manufactured by them are not attractive and are much inferior to the imported Japanese and other foreign toys sold in the bazars. Raw materials are obtained locally. No tax is paid on them. Only one person can carry on this work. The tools cost about Rs. 10. They are simple and can be made locally. The articles are sold by the manufacturer himself. He does not go to the village bazars. He attends only the jatras held in different places in the province. The main jatras attended are Chincholi, Mangrul, Sonegaon, Kapsi, Virul, etc. He has to pay stall tax and the taxes at these jatras are very heavy as compared to the total sales. At Kapsi a stall tax of Rs. 3 is charged for the whole period of the jatra and the total sales amount to about Rs. 15 or Rs. 20. The tax comes to about 15 to 20 per cent. of the sales. The stock of articles is kept by the manufacturer who has no financial resources. No improvements have been made in the process of manufacture.

Chitaries should be trained in the manufacture of different varieties of toys for which there is a demand in the market. A large sum of money is going out of the province on account of the sale of imported toys and it is very essential to study this subject closely. If necessary some people should be deputed to the places where toys are manufactured and after they obtain training they might be given help under the State Aid to Industries Act, for carrying on the trade. The persons selected for training should be from the community which are at present doing this business. Foreign toys should be heavily taxed.

26. **Goldsmithy.**—It is carried on in many big villages and the caste engaged in this trade is Sonar. He manufactures gold and silver ornaments for the use of the villagers. His business has gone down because the villagers have become poor. Many of the villagers are selling whatever they have got to meet their daily expenses. This industry flourishes when the people have enough and to spare. Its prosperity depends upon the prosperity of the villagers.

27. **Paper-making—(1) Introduction.**—This industry is carried on at Anji and Wardha. At Maganwadi this has been started by the All-India Village Industries Association mainly for research and for training students in the art.

(2) **Manufacture.**—All the raw materials required for this industry such as rags of cloth, used up bamboo articles, seed stalk

and various other waste materials are available in the villages.

At Anji, on behalf of the All-India Village Industries Association, the manufacturer Sjt. S. Naga Raja Rao, a former student, has employed nine villagers in this industry. During the current year he expects to manufacture Rs. 1,000 worth of paper. Out of this approximately Rs. 600 or more will be distributed as labour charges. The price of paper is Rs. 6-4-0 to Rs. 7-8-0 per ream. The percentage of expenditure in this industry is as follows:—

	Percent
Raw material	.. 12
Chemicals and sizing materials	... 4
Labour	... 60
Rent	... 1
Depreciation	... 7
Management	... 16
Total	... 100

(3) **Process of manufacture.**—The raw materials are boiled for 24 hours. Then they are trampled under foot in the pits, bleached, washed with clean water, and put in soaking pits. The resulting pulp is put in clean water tanka. It is mixed with water and layers of pulp are taken on mats made of grass available in the district. This layer of pulp is removed with the help of a piece of thick cloth. Layer after layer of pulp is put with pieces of cloth between them. Then these sheets are stuck on the walls to dry. When the paper becomes dry it is taken out, sized, glazed and cut into the required sizes. Now they are ready for sale.

(4) **Difficulties and Suggestions.**—At present there are no paper mills within the province and all our requirements have to be imported from outside. The provincial requirements can be supplied by the villages if hand-made paper industry is encouraged. It will be a good source of income to the poor villagers and save the drain of money going out of the province. The consumers may be required to pay a little higher price for the hand-made paper but the province as a whole will be benefitted as money will remain within the province. The village waste will become a source of wealth. The quality of the paper manufactured by hand is good. It has been used by all the surveyors for the purpose of the industrial survey. The villagers should be trained in paper making at the All-India Village Industries Association, Wardha. After training, financial aid should be given to them under the Central Provinces State Aid to Industries Act, for manufacturing paper. Government should purchase only hand-made paper for its requirements. As hand-made paper cannot compete with the mill-product, a sales tax should be levied on the latter. The basis of taxation should be the difference between the cost prices of the hand-made paper and of the mill-made paper so as to put the manufacturer of hand-made paper on the same footing as the mills. This will provide a source of extra income to the Provincial Government and to the villagers. Research stations should be established for improving the quality and method of making hand-made paper.

Old records of the Government are destroyed by burning. They can be utilized in making hand-made paper of a superior quality. Either a central factory or several factories as suitable centres may be established by the Government for this purpose. It will provide employment to a large number of people and produce wealth from waste. This may be done in jails as well.

28. Pan production—(1) *Introduction.*—A few years back this industry was in a flourishing condition. Baries are engaged in this trade. There are 100 houses of Baries at Jalgaon but only about 50 of them are engaged in this trade. Pan is used for eating. The price and demand have gone down. The persons engaged in this trade are, however, not in a happy state now. No improvements have been made in the process of production.

(2) *Production and sale.*—The creeper and the earth required for the creeper are available in the villages. The malguzar takes 50 pans weekly by force, if necessary, otherwise earth required for pan creepers is not allowed to be taken.

The whole family of the producer is engaged in this work. Men carry on the production and women collect the pans from the pan creepers.

Pan is sold in the villages and tahsil markets, by the producer. At Arvi the market charges are Rs. 2 per cart-load and at Talegaon they are one anna for three baskets.

About Rs. 300 are required for carrying on this industry. The appliance required for this industry are available within the villages. The producer has no financial resources.

(3) *Process of production.*—First the field is ploughed. Columns are made for sowing the seeds of Sava. In the rainy season the new creepers are cultivated. Water is supplied throughout the year by means of wells. In this way the process is continued for three years.

(4) *Income*—

Unit—Cultivation of one bigha by a cultivator for three years.

Cost of production—

	Rs. a. p.
A pair of bullocks—	.. 70 0 0
Yoke (300)	.. 2 8 0
Bat	.. 7 0 0
Mote	.. 25 0 0
Sandur	.. 2 0 0
Two servants continuously for three years at Rs. 40 per annum each.	240 0 0
Total	.. 346 8 0

Expenses in three years .. 346 8 0

Expenses on one patti (continued for three years):—

	Rs. a. p.
Earth	.. 9 0 0
Labour for sowing	.. 21 0 0
Labour-cultivation of creeper	.. 4 0 0
Creeper charges	.. 20 0 0
Creeper tying	.. 10 0 0
Reeds	.. 6 0 0

	Rs. a. p.
Bamboos or sag	.. 7 0 0
For protection	.. 2 0 0
Total	.. 79 0 0
Expenses per bigha (bigha=6 patti)— 79×6—Rs. 474.	474 0 0
Rent to malguzars for three years	.. 15 0 0
Total expense for three years	.. 835 8 0

Sale price—

Income of one patti for three years	.. 204 0 0
Income of six patti or one bigha in three years=204×6.	1,224 0 0

Nett income in three years—

Selling price	.. 1,224 0 0
Cost price	minus .. 835 8 0
	Say, Rs. =Rs. 388-8-0 390

The annual income of the cultivator is Rs. 130 approximately.

(5) *Difficulties and suggestions.*—The pan leaves are spoiled by small insects. The insects are red and black. People do not know how to protect the leaves from these insects or kill them without spoiling the green pans. Government should try to remove this difficulty of the people and help them to improve their industry. Bamboos should be made available at cheap rates. They may be allowed to take earth free of charge.

CHAPTER X.—MARKETS

The survey party visited the weekly markets of the tahsil towns in order to have a glimpse at the indigenous articles brought for sale. Generally the cottage products that are manufactured within the locality or in the surrounding villages are brought to the weekly markets for sale. A study of the markets gives one an idea of the articles that are manufactured within the locality, brought for sale from the surrounding districts and imported from outside. Cottage industry products were found in the markets.

1. *Wardha Weekly Market (Sunday).*—*Sugarcane.*—It is brought for sale from Surgaon, Pipri, Kalgaon, Rehki, Satodi, etc. The area under cultivation varies from half to 10 acres. Gur is not made in these villages.

Rice.—It is brought from Manegaon near Bhandara. For one cart-load of rice Rs. 1-10-0 are paid as taxes as follows:—

Re. 1 Nagpur terminal tax, four annas
Wardha terminal tax, four annas
Wardha bazar duty and two annas
bridge tax at Pawani and Lakhani.

Sindhi baskets.—They are brought from Pusda, Bhankheda and Chalmadar, etc., and sold at ten annas per 20. Gannu, a Mahar of Wardha, purchases them from the manufacturers in the villages and sells them at the village and the town markets.

Bamboo articles.—Bamboos are imported from Kuttapeth in the Nizam's dominion.

Rafters and timbers.—They are imported from the Darga forests. Forest tax is Rs. 6

for full cart-load, Wardha terminal tax is one anna per maund and Wardha Bazar tax is four annas per cart. Wood from Chicholi, Garpit, Manoli, Endodaka, Hingni and Garamsur forests are also brought here. Timber is sold through the brokers who charge three pies per rupee as their commission.

Fishes.—Dry fish is imported from Bombay and sold at eight annas per seer.

Gur and poha.—They are brought from Paoni near Bhandara.

Gonas.—They are brought from Hingna near Sindhi Bori. At Hingna there are many Gona weavers.

Pottery.—Earthen potteries are brought from Waipath, Waigaon, Salod and Anji. The potters have to pay a bazar tax of four annas per cart-load. One cart contains about Rs. 5 or Rs. 6 worth of pots. The potter sells about Re. 1 to Re. 1-8-0 worth of pots in the bazar. The tax is therefore very heavy.

Sann hemp.—From Ashwin to Baishakh it is brought from Sukli and sold at the rate of Rs. 1-4-0 per maund of ten seers.

The rates of stall taxes levied on goods displayed for sale in this market are given in Appendix F.

2. Hinganghat Weekly Market (Monday).—*Bamboo articles.*—They are brought from the Chanda district. Articles from Chimur 36 miles, Ratnapur, in Brahmपुरi tahsil, Mohni 40 miles and Wagada 48 miles away from Hinganghat, are brought to the Hinganghat market for sale. Bamboo matting, of 8½ cubits square, are sold at six annas each and of 10 cubits square at seven annas and six pies each. About five to ten cart-loads of mats are brought into the weekly market. Bamboo tattas from Virangaon are sold at 12 tattas per rupee. Baskets from Mohni are sold at Rs. 5-8-0 per 160 (= one khandi). Four to eight cart-loads of baskets are sold every week. Bamboo strips imported from Wagada are sold at Rs. 2-8-0 per thousand strips. One bundle consists of 500 strips. They are used for weaving mats. The local Burads also display their manufactures for sale. They make supas, fans, baskets, etc. The fans made by them are very fine and are sold at two pice each.

Gur.—It is imported from Chimur, 36 miles away, in the Chanda district. It is sold at three annas and six pies per 130 tolas. A number of carts are brought to the weekly market for sale.

Poha and rice.—They are imported from the Chanda district. Poha is sold at one anna and three pies per paili and rice at 10 pailis per rupee.

Wooden household articles.—They are brought from Samudrapur.

Handloom clothes.—They are brought from Mandgaon, Bela and Nagpur. Saris of 8½ yards × 45" made of 16's to 20's × 32's yarn are generally sold in this market. Their selling price is Rs. 1-8-0 each.

Pottery.—They are brought from Samudrapur, 11 miles, Sirsi, 26 miles, and Lohara, 18 miles, away from Hinganghat. About 10 to 15 cart-loads are brought to the weekly bazar.

Ghani oil.—One local Teli sells ghani pressed oil and oil cakes.

Shoes.—Local shoe-makers and those from the surrounding villages sell their shoes. They are charged a tax of six pies per stall. Superior kinds of Sambhar shoes brought from Chanda for sale in this market are sold at Rs. 32 per khandi (one khandi = 20 pairs). The mochis purchase them from the manufacturers in the Chanda district and sell them from bazar to bazar. They are taken to the Wardha market also.

Oranges.—They are brought from Satepar, 5 miles, Sonegaon, 10 miles, and Umri, 6 miles, away from Hinganghat and are sold at eight annas per hundred. Oranges are of a very small variety.

Plaintains.—They are brought from Mohi near Sailu in the Wardha tahsil, 40 miles away from Hinganghat and are sold at one anna per dozen.

Sindhi baskets.—They are made at Hinganghat proper and are sold at one anna each.

Timber.—It is brought from Manoli near Sailu, 54 miles and Amgaon, 36 miles away from Hinganghat.

The rates of stall taxes levied on goods displayed for sale in this market are given in Appendix F.

3. Arvi Weekly Market (Thursday)—*Sindhi baskets.*—They are brought from Pipri, 8 miles, Neri, 6 miles, away from Arvi and sold at Rs. 1-4-0 per khandi (one khandi = 20). Agriculturists purchase them. The common size is of 1½ ft. in diameter.

Bamboo baskets.—They are brought from Sendurzena in the Amraoti district and Nandpur in the Betul district. They are made at Arvi also. At Arvi bamboos are sold at two annas each.

Pottery.—Earthen potteries are brought from Dighi in the Chandur tahsil and Kondhali in the Nagpur tahsil. One cart-load of Dighi pots is sold in about 15 days. The potters pay Rs. 1-4-0 as cart hire from Dighi and two annas duty at Arvi. The Kondhali Kumbhars bring one cart-load of three hundred pots costing about Rs. 7 or Rs. 8. They go from market to market and sell the whole lot in about eight days. The Kondhali pottery is superior to all other potteries available here. The local potters also sell their products in the market.

Bamboo sticks.—They are brought from Salbardi, 40 miles away and sold at one anna and six pies each.

Rengis.—They are brought from Mangrul in Chandur tahsil, 16 miles away from Arvi. They are sold at Rs. 5 to Rs. 6 each. One manufacturer takes about eight days to make one rengi.

Hemp ropes.—They are made at Arvi by Kangars and are sold at about two annas each (= 20 cubits.)

Hemp.—It is brought from Tiwsa, 14 miles away, in the Chandur tahsil, five to eight cart-loads of hemp are brought on each market day. It is sold to agriculturists and rope-makers at the rate of Re. 1 per maund (one maund = 10 seers) wholesale, and Re. 1-2-0 per maund retail. The season for sale is from *Divali* to *Asadh*.

Mote and leather ropes.—There are a number of tanners at Arvi who make and sell motes and leather ropes. Ordinarily thick ropes, 30 cubits long, required for motes, are sold at Rs. 4-8-0 to Rs. 5-8-0 each; thin ropes, 25 cubits long, at Re. 1 each and motes at Rs. 5 to Rs. 8 each.

Printed farads.—They are brought from Sukli for sale.

Saris.—They are brought from Sailu and Nagpur. Arvi weavers also sell their saris in the market.

Gonas.—They are brought from Hingni, Virul and Anterdeo. Gonas are sold at about Rs. 4 or Rs. 4-8 each.

Stone dagdies.—They are brought from Kaneri in the Bhandara district.

Cows.—The butchers collect cows from the villages and the markets and take them to Amraoti for slaughter. Cows brought from Samudrapur were found at Arvi. When the agriculturists have no cattle fodder and they are hard pressed for money, they have to sell away their cattle at cheap rates for ultimate destruction. Cow killing is being encouraged by not providing sufficient cattle fodder.

Oxen.—They are brought from Nara near Karanja for sale.

Sugarcane.—It is brought from Jalgaon, Sirpur, etc., for sale.

No stall taxes are levied at this market.

4. Kapsi Jatra—*Sticks* are brought from Dhamangaon.

Rengis are brought from Dhanora.

Cart-wheels are brought from Betul and Samudrapur.

Newar is brought from Menni, 4 miles away from Hinganghat.

250 cubits of newar made from 7's yarn is sold at Rs. 7.

Wooden furniture is brought from Bhandak in the Chanda district.

Tadao and Gonas are brought from Gumgaon, Hingni and Bela.

Printed farads are brought from Wun in the Yeotmal district. There are 40 houses of printers at Wun. Most of them have left this trade. They obtain white chaddars at Rs. 1-15-0 to Rs. 2 each and sell them at Rs. 2-4-0 to Rs. 2-8-0 each after printing. Mahars weave the chaddars measuring 5 × 3½ cubits from 12's yarn.

Earthen toys are brought from Hinganghat and Waigaon.

Wooden toys are brought from Rasulabad and Deoli.

Combs made of wood are brought from Nagpur.

Stone dagdies are brought from Bhandara.

Stone chakkis are brought from Yeotmal.

Leather drums (dhols) are brought from Warora ten miles away from Amraoti. Four families make leather drums at Warakoor.

The jatra was full of imported and machine made goods required by the villagers for their daily use and festivals. It was held on the banks of Wardha river. Arrangements were made on one side of the river by the officers of Wardha district and on the other by those of the Yeotmal district. A few years back the jatra used to be held on a very grand scale and a large number of persons used to go there. But this year it was attended by very few persons and it looked like a weekly market of a town. The shopkeepers were not able to make good sales. This is a sign of the growing poverty of the people.

5. Cotton Markets.—Separate cotton market committees under the Cotton Market Act have not been established at Wardha, Arvi and Hinganghat as yet. The existing cotton markets are under the control of the municipal committees. The charges of the broker, weighman, etc., at these markets have been fixed by the municipal committees. One cart of kapas (unginned cotton) on an average weighs one khandi. The villagers bring unginning cotton to the markets for sale. The formation of separate cotton market committees at Wardha, Arvi and Hinganghat is under the consideration of the Deputy Commissioner, Wardha.

(1) *Wardha.*—Under the rules framed by the municipal committee the seller has to pay four annas and the buyer eight annas per cart of kapas to the broker. The buyer sometimes pays twelve annas per cart to the broker. The villager has to pay the following charges at the market:—

	Per cart
	Rs. a. p.
Terminal tax	.. Nil.
Brokerage	.. 0 4 0
Others	.. Nil.
Total	.. 0 4 0

(2) *Arvi.*—The municipal committee has prescribed the following charges:—

	On seller	On buyer
	Rs. a. p.	Rs. a. p.
Broker	.. 0 4 0	0 4 0
Weighman	.. 0 0 6	0 0 6
Total	.. 0 4 6	0 4 6

The villager has to pay the following charges:—

	Per cart.
	Rs. a. p.
Vehicles tax	... 0 2 0
Brokerage	... 0 4 0
Dharmada	... 0 1 0
Patti	... 0 0 3
Total	... 0 7 3

(3) *Hinganghat*.—The municipal committee has prescribed the following charges:—

	Per cart
	Ra. a. p.
Market dues	0 4 0
Commission agent	0 8 0
Brokerage	0 4 0
Weighman's charges	0 0 6
Total	1 0 6

The villager has to pay the following charges:—

	Per cart
	Ra. a. p.
Market dues	0 4 0
Commission agent	0 8 0
	to
	0 12 0
Dharmada	0 0 3
Discount for metal coins (approximately)	0 0 9
Total	0 13 0
	to
	1 1 0

If goods are brought from Alipore and other villages on the other side of the Wanna river, the villager has to pay three annas more as bridge tax for crossing the river.

Brokerage and weighman's charges are not levied. The charge of dharmada is on the commission agent but instead of paying himself he deducts it from the villager. If the villager takes currency notes, no discount is charged but if he demands metal coins he has to pay a discount at the current market rate. Sometimes the villager sells kapas to the mills direct and saves the agent's commission. But this is very rare.

On account of heavy marketing charges goods are taken to distant markets by the villager instead of selling them at Hinganghat. The Alipore people take goods to Wardha although it takes two days for going and coming whereas it takes one day to complete the work at Hinganghat. Goods are taken to Nagpur market also as the villager obtains higher prices. On account of the existence of cotton mills sufficient kapas are brought to this market as well.

(4) *Nagpur*.—The following charges are paid by the villager:—

	Per cart
	Ra. a. p.
Terminal tax	1 0 0
Brokerage	0 6 0
Dharmada	0 0 6
Total	1 6 6

6. Grain Markets.—A grain gunj has been recently established at Wardha. At Arvi and Hinganghat there are no grain gunjs. The charges of broker, weighman, etc., have, however, been fixed by the municipal committee. When a separate cotton market committee is established the marketing of grain will also go under its control.

(1) *Wardha*.—The villager brings his produce to the grain gunj. Tur, jowar, wheat, gram, mung, groundnut, etc., are the chief articles marketed here. The municipal committee has prescribed the following charges for marketing in the gunj:—

	Per cart.
	Ra. a. p.
Grain gunj charges	0 1 0

	Ra. a. p.	
Brokerage	0 0 6	Per khandi to be paid by buyer and seller each.
Measurers	0 0 6	Per khandi to be paid by buyer and seller each.
Terminal tax	0 0 6	Per maund.

The municipality charges four annas per cart-load of grain as terminal tax even if the weight is more than eight maunds. The terminal tax schedule is under revision and in the revised schedule the tax is four annas per cart-load. One cart-load of grain ordinarily weighs about 2½ khandis of 5 maunds each.

The villager has to pay the following charges on tur:—

	Per cart
	Ra. a. p.
Terminal tax	0 4 0
Grain gunj fee	0 1 0
Weighman's charges at six pies per khandi on 2½ khandis.	0 1 3
Brokerage at six pies per khandi	0 1 3
Patti per bill	0 0 3
Total	0 7 9

(2) *Arvi*.—The villager brings his produce generally on the weekly market days (Thursday). On other days sometimes grain carts are brought and kept in the market place. The municipality has prescribed the following fees:—

Brokerage—Re. 0-0-6 per khandi by buyer and seller each.

Measurer's fee—Re. 0-0-6 per khandi by buyer and seller each.

One cart ordinarily contains 2½ khandis of grain. The villager has to pay the following charges on tur:—

	Per cart.
	Ra. a. p.
Weighman's charges at six pies per khandi for 2½ khandis.	0 1 3
Brokerage at six pies per khandi for 2½ khandis.	0 1 3
Dharmada (at the will of the villager)	0 1 0
Total	0 3 6

Ordinarily no brokers are engaged and the villagers sell direct to the merchants and consumers. Tur is the main crop. The terminal tax is one anna per maund on export. As it is exported to Bombay, the merchants purchase at suitable centres. The terminal tax being heavy and the railway freight to Bombay being higher the produce is diverted to Dhamangaon and Amraoti markets.

(3) *Hinganghat*.—The villager brings his produce to the shop of his commission agent for sale. The following charges have been prescribed by the municipality:—

	Per khandi
	Ra. a. p.
Agent's commission	0 2 0
Brokerage	0 1 0
Measuring charges	0 0 6

There was a terminal tax of one anna per maund on the import of grain. The import by road has now been exempted from taxation (from 21st March 1939). One cart ordinarily contains 2½ khandis of grains.

The villager has to pay the following charges:—

	Per cart
	Rs. s. p.
Agent's commission including hamali at Re. 0-2-6 per khandi for 2½ khandis.	0 6 3
Brokerage at six pies per khandi for 2½ khandis.	0 1 3
Measuring charges at one anna per khandi for 2½ khandis	0 2 6
Total ..	0 10 0

If the cart is brought across the Wanna river a tax of three annas per cart is to be paid in addition.

(4) *Nagpur*.—There is a regular grain gunj. The produce of the Wardha district is brought

to this gunj also. One cart ordinarily contains four khandis of grain. The villager has to pay the following charges:—

	Per cart
	Rs. s. p.
Terminal tax ..	1 0 0
Grain gunj fee ..	0 1 0
Brokerage at three annas per khandi for 4 khandis.	0 12 0
Weighman's charges ..	0 2 0
Hamali ..	0 2 0
Purchaser ..	0 1 0
Dharmada ..	0 0 6
Total ..	2 2 6

One remarkable thing at this gunj is that the number of beggars is more than those of the purchasers. The purchasers and brokers give grain to the beggars from the villagers' grains. The beggars themselves take away grain in the crowd. Although the villagers resent this, they are helpless and it is reported that the municipality does not make any permanent arrangement for removing this nuisance. This requires immediate attention.

APPENDIX
Analysis of

Serial No.	Names of villages and towns	Population	Revenue	Total area	Area under cultivation
(1)	(2)	(3)	(4)	(5)	(6)
			Rs.	Acres	Acres
<i>Wardha tahsil</i>					
1	Sailu	3,687	1,907	1,555.92	1,306.96
2	Sukli	961	74	683.12	541.88
			Government. 1,067 Raja.		
3	Pulai	608	1,373	1,446.10	1,258.36
4	Deoli town	6,209	2,754	6,501.05	5,408.56
			Government. 4,409 Raja.		
5	Wardha town	19,571	...	1,005.39	315.04
6	Anji	2,869	3,453	2,842.88	2,439.45
<i>Hinganghat tahsil</i>					
7	Hinganghat town.	22,601	778	1,561.92	851.93
8	Mandgaon	2,743	6,550	5,548.49	4,475.68
9	Samudrapur	1,110	335	745.51	580.14
10	Waigaon	999	1,042	2,083.15	1,402.53
11	Alipore	4,600	6,016	7,223.06	6,001.88
12	Kapsi	603	396	1,053.50	679.69
<i>Arvi tahsil</i>					
13	Arvi town	16,307	4,196	2,325	1,935
14	Wathoda	1,899	4,699	2,489.12	2,365.93
15	Ithlapur	610	537	386.56	355.26
16	Kharangana	1,412	1,448	807.72	734.42
17	Sirpur	1,600	3,897	1,764.54	1,491.33
18	Rohna	2,700	1,464	1,163.84	1,012.57
19	Virul	3,007	3,685	2,655.01	2,458.22
20	Rasulabad	2,467	2,976	2,654.79	2,283.73
21	Nandpur	1,213	2,382	2,099.54	1,758.31
22	Jalgaon	2,072	5,401	2,763.34	2,654.63
23	Telegaon	1,172	2,132	3,010.86	1,141.30
24	Asti T.	5,881	...	5,202.90	2,430.63
25	Karanja	4,149	2,711	4,664.15	3,879.52

Serial No.	Names of villages and towns	Pucca road	Railway station	Market town
(1)	(2)	(11)	(12)	(13)
		Miles	Miles	Miles
<i>Wardha tahsil</i>				
1	Sailu	Sailu	Paunar	4 Sailu and Wardha 10
2	Sukli	Sukli	Wardha	7 Anji ... 2
3	Pulai	Anji	Dahegaon	8 Do. ... 3
4	Deoli T.	Deoli	Do.	6 Deoli ...
5	Wardha	Wardha	Wardha	Wardha ...
6	Anji	Anji	Do.	9 Do. ... 9
<i>Hinganghat tahsil</i>				
7	Hinganghat T.	Hinganghat	Hinganghat	Hinganghat ...
8	Mandgaon	Do.	Do.	8 Do. ... 8
9	Samudrapur	Samudrapur	Do.	11 Do. ... 11
10	Waigaon	Do.	Do.	15 Do. ... 15
11	Alipore	Alipore	Sonegaon	6 { Do. ... 10 Wardha ... 17
12	Kapsi	Do.	Do.	20 Hinganghat ... 24
<i>Arvi tahsil</i>				
13	Arvi town	Arvi	Arvi	Arvi ...
14	Wathoda	Khupgaon	Khupgaon	2 Do. ... 4
15	Ithlapur	Arvi	Arvi	6 Do. and ... 6
16	Kharangana	Kharangana	Wardha	16 Wardha ... 16
17	Sirpur	Arvi	Arvi	4 Arvi ... 4
18	Rohna	Rohna	Rohna	Do. ... 14
19	Virul	...	Virul	{ Do. ... 18 Pulgaon ... 6
20	Rasulabad	...	Do.	1½ Do. ... 5
21	Nandpur	Arvi	Arvi	2 Arvi ... 2
22	Jalgaon	...	Do.	6 Do. ... 6
23	Telegaon	Telegaon	Do.	7½ Do. ... 7½
24	Asti town	Asti	Do.	14½ Asti ...
25	Karanja	Karanja	Katol	14 { Karanja ... Arvi ... 22

A
General Information.

Post office (7)	Miles	Hospital (8)	Miles	School (9)	Miles	Veterinary aid (10)	Miles
<i>Wardha Tahsil.</i>							
Sailu	...	Sailu	...	Sailu	...	Wardha	10
Anji	2	Wardha	7	Sukli	...	Do.	7
Do.	3	Do.	12	Pulsi	...	Do.	12
Deoli	...	Deoli	...	Deoli	...	Do.	10
Wardha	...	Wardha	...	Wardha	...	Do.	...
Anji	...	Do.	9	Anji	...	Do.	9
<i>Hinganghat Tahsil.</i>							
Hinganghat	...	Hinganghat	...	Hinganghat	...	Hinganghat	...
Mandgaon	...	Do.	8	Mandgaon	...	Do.	8
Girad	9	Do.	11	Samudrapur	...	Do.	11
Waigaon	...	Do.	15	Waigaon	...	Do.	15
Alipore	...	Do.	10	Alipore	...	Do.	10
Do.	14	Do.	24	...	...	Do.	24
<i>Arvi tahsil.</i>							
Arvi	...	Arvi	...	Arvi	...	Arvi	...
Do.	4	Do.	4	Wathoda	...	Do.	4
Do.	6	Do.	6	Dhurwade	1½	Do.	6
Kharangana	...	Wardha	16	Kharangana	...	Wardha	16
Arvi	4	Arvi	4	Sirpur	...	Arvi	4
Rohna	...	Pulgson	10	Rohna	...	Do.	14
Virul	...	Do.	6	Virul	...	Do.	18
Rasulabad	...	Do.	5	Rasulabad	...	Do.	19
Arvi	2	Arvi	2	Nandpur	...	Do.	2
Jaigaon	...	Do.	6	Jaigaon	...	Do.	6
Talegaon	...	Do.	7½	Talegaon	...	Do.	7½
Asti	...	Asti	...	Asti	...	Asti	...
Karanja	...	Karanja	...	Karanja	...	Arvi	22

Water-supply (14)	Industries reported by the surveyors (15)	Remarks (16)	Serial No. (17)
Good	3, 9, 10, 11, 13, 16, 17, 23	Houses washed away by river flood. Sanitary and housing condition very bad.	1
Do.	9, 11, 12, 13, 19	Houses are congested. Bad sanitation	2
Do.	11	...	3
Do.	3, 9, 10, 11, 13, 16	...	4
Not sufficient	1, 2, 3, 5, 18, 22, 23, 27	Village Industries Institutes at Maganwadi and Nalwadi.	5
Good	3, 6, 11, 13, 16, 17, 18, 23, 26, 27	Hand-made paper industry is recently started	6
Do.	3, 6, 8, 11, 16, 17, 18, 22, 23	...	7
Sufficient	3, 11, 14	Water not good for health	8
Scarce in summer	6, 16	Goods taken to Nagpur in preference to Hinganghat for sale.	9
Good	...	Noted for Haldi cultivation. More irrigation is necessary.	10
Do.	3, 5, 6, 11, 22	Houses congested, sanitation very poor. Mucadam indifferent to villagers.	11
Do.	...	Noted for Kapsi jatra.	12
Do.	3, 8, 11, 16, 17, 18, 22, 24	Good tanning industry	13
Do.	6, 9, 12, 15, 16, 24	...	14
Do.	6, 16, 20	...	15
Do.	6, 3, 16, 17, 23	No Pasture land	16
Do.	11, 12, 15	Was noted for gona and ghongada—now the industry is dying.	17
Do.	3, 6, 11, 13, 14, 15, 16, 17, 18, 22, 23, 26	...	18
Do.	3, 6, 9, 11, 12, 14, 16, 17, 23	Noted for gona and ghongada.	19
Do.	3, 6, 11, 16, 17, 18, 25	...	20
Do.	6, 11, 15, 16, 23	Wooden toys are made	21
Do.	3, 5, 9, 28	Castor oil is manufactured by boiling the oil seeds.	22
Do.	3, 4, 6, 10, 11, 14, 15, 16, 17, 23	Gur industry is dying.	23
Not good	3, 5, 7, 11, 28	...	24
Do.	3, 4, 6, 9, 10, 12, 14, 15, 16, 17, 22	Was noted for gur and dairy industries. On head and the other dying.	25

APPENDIX A—concl.

Statement showing area under pasture land, area under grains, etc., for certain villages in the Wardha district.

Serial No.	Name of village	Area of pasture land	No. of cattle in the villages	Area under grains (acres)		
				Juar	Wheat	Bajra
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<i>Wardha Tahsil</i>						
1	Selu	67.05	1,501	487.56	159.04	0.10
2	Sukhi	12.53	688	174.21	..	..
3	Pulai	62.01	409	531.37	30.11	..
4	Deoli	51.72	2,012	1,958.75	562.43	0.25
5	Wardha	146.69	1,123	130.40	18.40	..
6	Anji	63.69	1,357	1,067.57	42.19	..
<i>Hinganghat Tahsil.</i>						
7	Hinganghat	83.87	4,441	153.00	119.00	0.28
8	Mandgaon	614.13	2,312	562.00	1,744.00	..
9	Samudrapur	47.58	613	82.00	160.00	..
10	Waigaon	575.10	700	464.00	257.00	..
11	Allipur	663.28	3,176	1,491.00	1,622.00	..
12	Kapsi	100.86	591	283.00	20.00	0.18
<i>Arvi Tahsil.</i>						
13	Arvi	8.13	3,576	140.40	7.38	..
14	Wathoda	14.75	816	929.62	5.60	1.40
15	Ithalapur	2.88	187	149.64	..	0.05
16	Kharangna	2.98	900	358.94	4.24	..
17	Sirpur	12.40	725	628.43	64.78	0.52
18	Rohna	6.64	1,039	416.44	13.87	..
19	Virul	30.08	2,109	1,117.11	46.65	0.16
20	Rasulabad	178.63	889	920.09	52.48	0.04
21	Nandpur	45.97	523	658.95	193.87	0.38
22	Jelgaon	112.41	933	849.64	33.85	0.84
23	Talegaon	1,562.18	1,062	392.57	2.94	10.62
24	Ashti	2,432.70	1,669	845.26	14.14	0.13
25	Karanja	476.52	2,096	892.52	93.99	0.25

APPENDIX B

Statement showing the castes that generally reside in the villages and the occupations at present followed by them.

Caste	Occupation	Caste	Occupation
Brahmin	.. Begging, agriculture, trade.	Dhor	.. Tanning, leather ropes and shoe-making.
Marwari	.. Trade, agriculture.	Chamar	.. Shoe-making.
Kunbi	.. Agriculture, labour, trade.	Mahar	.. Flaying (dead animals), village watchman.
Teli	.. Agriculture, labour.	Sonar	.. Gold and silver smith.
Mali	.. Gardening, agriculture.	Khatik	.. Animal slaughter.
Kosti	.. Weaving, labour, agriculture.	Rajput	.. Malguzar, agriculture.
Bari	.. Pan, agriculture.	Burad	.. Mat-weaving.
Mahar	.. Labour.	Kangar	.. Rope-making.
Musalman	.. Fruit selling, agriculture, labour.	Bhamti	.. Rope-making, sanhemp producing.
Khati	.. Blacksmith.	Maratha	.. Labour, service.
Badhai	.. Carpentry.	Wani	.. Trade.
Kumbhar	.. Pottery.	Bohra	.. Trade.
Dhobi	.. Washing.	Kasar	.. Brass pot repairing.
Dhimar	.. Fishing, labour.	Bhadbhunja	.. Frying gram, dals, etc.
Goshi	.. Agriculture, labour.	Dyers and Printers.	.. Dyeing and printing.
Bhangi	.. Night-soil cleaning.	Gawli	.. Cow and buffalo keeping, labour.
Mang	.. Drum-making, labour, begging.	Lodhi	.. Cattle tending, labour.
Bairagi	.. Puja, begging.	Gujrati	.. Trade.
Gond	.. Labour, fire-wood selling.	Simpi	.. Tailoring.
Gowari	.. Labour, cattle-tending, agriculture.	Jangam	.. Begging and garland-making.
		Khoja	.. Trade in bones and hides.
		Kachhi	.. Trade.

APPENDIX C

Information compiled from the Wardha District Gazetteer.

Table 1.—Rainfall varies from 34 to 64 inches per year:

Table 2.—Area and population—

Tahsil	Area in square miles	Number of towns	Number of villages	Number of occupied houses	Total population	Density of population per square mile
Wardha	815	4	326	44,002	205,105	252
Arvi	890	2	325	35,284	175,238	197
Hinganghat	729	1	288	28,938	135,923	186
Total Wardha district.	2,431	7	939	108,224	516,266	212

Table 3.—Population is steadily increasing in the towns—

	Population (1931)	Percentage to total population
Urban	85,285	16.5
Rural	430,983	83.5

Table 4.—Percentage of castes to total population of the district—

1. Twice born caste	..	5.3
2. Higher cultivators	..	24.7
3. Higher artisans	..	2.8
4. Serving castes	..	4.0
5. Lower cultivating and labouring class	..	2.7
6. Lower artisans, trading and miscellaneous castes	..	18.6
7. Forest tribes	..	7.3
8. Impure castes (Mang, Mehra, Dhobi, Chamar)	..	18.7
9. Others	..	4.1
10. Miscellaneous not given	..	11.8
Total	..	100.00

Arranged according to their professional occupations they would roughly be as follows:—

Agriculturists—

(2) Higher cultivators	..	24.7
(5) Lower cultivators	..	2.7
Total	..	27.4

Industrialists—

(3) Higher artisans	..	2.8
(4) Serving castes	..	4.0
(6) Lower artisans, trading and miscellaneous castes.	..	18.6
(8) Impure castes	..	18.7
Total	..	44.1

Others—

(1) Twice born	..	5.3
(7) Forest tribes	..	7.3
(9) Others	..	4.1
(10) Miscellaneous	..	11.8
Total	..	28.6

Grand Total .. 100.0

Summary—

Agriculturists	..	27.4
Industrialists	..	44.1
Others	..	28.5
Total	..	100.00

Occupied area—

Old fallow	..	88,072
New fallow	..	68,467
Under crop	..	1,027,604

Total .. 1,184,143

Grand Total .. 1,425,417

Kharif crops—

Cotton	..	332,114
Juar	..	335,255
Arhar	..	62,321
Til	..	8,035
Others	..	81,528

Total kharif crops ... 819,253

Rabi crops—

Wheat	..	137,255
Gram	..	12,574
Linseed	..	36,160
Others	..	15,928

Total rabi crops .. 201,917

Area double cropped	..	5,093
Irrigated area	..	6,601
Irrigation tanks	..	29

Irrigation wells—		
Temporary	..	5,654
Durable	..	5,229
Number of ploughs	..	48,945
Number of plough cattle	..	98,976

Unoccupied area under tree, forests, scrub-jungle and grass	84,956	86
---	--------	----

Number of plough cattle. 98,976 100 = .86

Table 5.—Chief language—Marathi.

Table 6.—Diseases causing death—

(1) Fever—Mainly
(2) Cholera—Chief epidemic.
(3) Smallpox—To some extent.
(4) Plague—Negligible since the last ten years.

Table 7.—Statistics of cultivation (1935-36)

	Acres.
Total area	.. 1,553,681
Government forest	.. 128,669
Village area	.. 1,425,012
Unoccupied area—	
Trees, forest, scrub jungle and grass.	84,956
Groves, water, hill and rock, roads and buildings	156,318
Total	241,274

Table 8.—Outturn of crops (1935-36).

Normal outturn—13.3 annas.

Kharif—

Juar—8 annas.
Tur—6 annas.
Rice—13 annas.
Cotton—7 annas.
Til—12 annas.

Rabi—

Wheat—10 annas.
Gram—8 annas.
Linseed—13 annas.

Table 9.—Loans (1935-36)

	Land improvement	Agricultural
	Rs.	Rs.
Outstanding principal	81,030	2,61,731
Advance	16,850	61,705
Demand for collection—		
Principal	45,072	1,85,371
Interest	2,371	11,066
Total collection—		
Principal	10,929	49,219
Interest	2,371	11,066

Ten years before cultivators used to pay off the total demands of principal and interest every year. This year less than one-fourth of the principal has been realized.

Table 10.—Forest area and revenue (1935-36).

Area of Government forests—20	1 square miles	
	Receipts	Charges
	Rs.	Rs.
Timber and other produce removed from the forests by Government agency.	14,432	14,659
Other revenues	45,387	10,060
Formation, protection and improvement of forests.	..	10,846
Total	59,819	35,565

Table 11.—Retail prices (1935-36).

Juar	..	15.08	seer per rupee.
Wheat	..	12.50	"
Common rice	..	10.95	"
Gram	..	13.35	"
Salt	..	13.30	"

Table 12.—Wages monthly (1935-36).

Agricultural labour—Rs. 5 to Rs. 7-8-0.
Mason—Rs. 22 to Rs. 30.
Carpenter—Rs. 15 to Rs. 22-8-0.
Blacksmith—Rs. 15 to Rs. 30.

Table 13.—Number of Railway Stations—15.

Table 14.—Roads.

Maintained by Public Works Department	222 $\frac{1}{8}$ miles. Have 10 dâk bungalows
Maintained by District Council	34 $\frac{3}{4}$ miles.

Table 15.—Post and Telegraph offices.

Post offices—	
Number of distributing and collecting centres—sub-offices	.. 7
Number of branch offices	.. 32
Number of telegraph offices	.. 7

Table 16.—Crimes.

Mainly theft; riot and unlawful assembly; bad living; cattle theft, etc.

Table 18.—Civil suits (1937).

Between landlord and tenant—3,776.
Increased more than three times during the last ten years.

Table 22.—General Revenue (1935-36).

	Rs.
Land revenue	.. 7,60,887
Cesses	.. 52,393
Stamps	.. 2,67,417
Excise	.. 1,90,761
Income-tax	.. 88,841
Registration	.. 22,128

Table 23.—Income and Expenditure of District funds (1935-36).

Income heads	Income	Expenditure heads	Expense
	Rs.		Rs.
Local rates	.. 57,576	Establishment	.. 16,123
Cattle Trespass Act	.. 22,860	Cattle-pound charges	.. 8,274
Education	.. 220	Education	.. 93,138
Rent on nazul land	.. 69	Medical charges	.. 5,562

Income heads	Income	Expenditure heads	Expenses
	Rs.		Rs.
Ferries	2,097	Civil works	5,937
Contributions	61,683	Veterinary charges	1,793
Other receipts	14,249	Other expenditure	24,432
Total receipts	1,60,107	Total expenditure	1,55,259

Table 24.—Income and Expenditure of municipalities (1935-36).

Heads of income	Wardha	Arvi	Hinganghat	Deoli	Pulgaon
	Rs.	Rs.	Rs.	Rs.	Rs.
Terminal tax or octroi duty	43,230	21,436	55,374	...	...
House tax	...	...	...	2,963 (Halsiyat tax.)	3,269
Water rate	34,192	12,928	38,185	...	...
Conservancy	13,233	4,187	10,735	1,981	4,206
Pounds	2,029	1,251	865	523	566
Markets and slaughter-houses	4,373	6,869	2,461	412	2,728
Loans	62,000	...	...	...	...
Animal and vehicle tax	1,846	...	...	2,030	...
Roads and ferries tolls	...	...	...	...	1,937
Market dues	4,808	...	...	1,347	...
Fee and revenue from educational institutions	...	11,987	...	...	...
Rents of land, houses, sarais, dak bungalows	4,650	...	...	...	625
Grants and contributions	5,634	...	13,187	...	4,157
Other receipts	30,594	19,730	67,765	5,741	10,751
Total income	2,06,589	78,388	1,88,572	14,997	28,239

Heads of expenditure	Wardha	Arvi	Hinganghat	Deoli	Pulgaon
	Rs.	Rs.	Rs.	Rs.	Rs.
General Administration	7,587	5,783	9,276	1,314	2,987
Collection of taxes	5,859	3,762	2,394	267	1,845
Refunds	...	64	385	...	30
Lighting	10,178	3,541	11,616	540	1,125
Water supply	36,666	1,522	43,490	...	29
Drainage	4,846	1,354	1,868	9	149
Conservancy	17,582	9,317	18,765	2,305	4,271
Medical and vaccination	1,603	3,588	7,438	80	2,205
Markets and slaughter-houses	440	846	604	268	15
Roads	11,269	698	735	24	61
Education	21,977	29,161	51,704	8,048	10,906
Re-payment of loans	...	5,604	...	...	...
Other expenditure	41,577	8,913	30,454	1,916	3,265
Total expenditure	1,59,584	74,153	1,78,729	14,983	26,888

Table 25.—Education—Literacy (1931).

	Population	Literate	Percentage of literate to total population	
			(1931)	(1921)
			Male	261,394	32,204	12.3	10.64
Female	254,872	2,768	1.08	0.73
Total	516,266	34,972	6.7	5.75

Table 26.—Education—Number of Institutions and scholars (1935-36).

	Primary education	Secondary education	Percentage of male scholars to male population and female scholars to female population of school-going age
	Number of schools	174		36	...
Number of scholars—			
Males	8,531	4,345	41.9
Females	1,136	162	4.1
Expenditure	130,124	159,867	...
		Rs.	
From Provincial Funds	..	1,28,211	
Local funds	..	98,613	
Fees	..	60,039	
Other sources	..	3,128	
Total	..	2,89,991	

Table 27.—Dispensaries—1937.

	Average daily patients		Income from—		Rs.
	Indoor	Outdoor	Government	Local funds	
Wardha main	33	265	..	18,370	
Arvi	4	213	..	16,613	
Asti	1	110	..	5,043	
Pulgaon	1	144	..	1,975	
Karanja	1	71	..		
Sindhi	0.3	109	..		
Deoli	1.5	147	..		
Hinganghat	9	341	..		
Total	40.8	1,400	Total	42,001	

APPENDIX D

Statement showing the population and percentage, in the Central Provinces and Berar, of Agriculturists, Industrialists and others to the total population according to their hereditary occupation (as per census report of 1931. Part I page, 371).

Central Provinces and Berar		Population (in thousands)		
		..	17,991	
Agriculturists—				
(1) Landlords	..	793		
(2) Cultivators	..	2,757		
(3) Labourers	..	77		
Total	..	3,627		
Industrialists—				
(5) Graziers and Dairymen	..	1,063	(21) Potters .. 131	
(6) Fishermen	..	549	(22) Blacksmith .. 203	
(7) Hunters and fowlers	..	16	(23) Goldsmith .. 143	
(12) Writers	..	39	(24) Oilpressers .. 1,023	
(13) Musicians, dancers, jugglers, etc.	..	103	(25) Toddy drawers, Kalars, etc. 219	
(14) Traders	..	254	(26) Butchers .. 20	
(15) Carriers	..	204	(27) Leather workers .. 997	
(16) Barber	..	195	(28) Basket-makers .. 62	
(17) Washermen	..	188	(29) Earth salt workers .. 39	
(18) Weavers, carders and dyers	..	2,063		
(19) Tailors	..	51		
(20) Carpenters	..	112		
Total	..	7,674		
Others—				
(4) Forest and hill tribes	..	4,156		
(8) Priests and devotees	..	613		
(9,10) Genealogists, Bards and Astrologers.	..	5		
Village watchmen and menials	..	62		
Sweepers	..	38		
Others	..	1,816		
Total	..	6,690		
		Hereditary occupation.	Population	Percentage to total population.
		Agriculture	.. 3,627	20.1
		Industry	.. 7,674	42.7
		Other than agriculture and industry.	6,690	37.2
Total		Total	.. 17,991	100.00

APPENDIX E

Statement showing the number of persons who need occupation other than agriculture in the villages

Serial No.	Village	Area under cultivation Acres	Number of economic holding at 20 acres per holding	Number of persons who can be supported by agriculture at 4 persons per holding	Number of persons who are to be provided in other occupations	Total population
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Sailu	1,338	66.9	268	3,419	3,687
2	Sukli	540	27	108	853	961
3	Pulai	1,180	59	236	372	608
4	Deoli	5,370	268.5	1,074	5,135	6,209
5	Wardha	315	15.7	63	19,508	19,571
6	Anji	2,550	127.5	510	2,359	2,869
7	Hinganghat	936	46.8	187	22,414	22,601
8	Mandgaon	5,090	254.5	1,018	1,725	2,743
9	Samudrapur	591	29.55	118	992	1,110
10	Waigaon	1,688	84.4	337	662	999
11	Alipore	6,665	333.25	1,333	3,267	4,600
12	Kapai	680	34.0	136	467	603
13	Arvi	1,935	96.75	387	15,920	16,307
14	Wathoda	2,396	119.8	479	1,420	1,899
15	Ithlapur	364	18.2	73	537	610
16	Kharangana	734	36.7	147	1,265	1,412
17	Sirpur	1,491	74.55	298	1,302	1,600
18	Rohna	1,013	50.65	203	2,497	2,700
19	Virul	2,458	122.9	492	2,515	3,007
20	Rasulabad	2,655	132.75	531	1,936	2,467
21	Nandpur	1,985	99.25	397	816	1,213
22	Jalgaon	2,654	132.7	531	1,541	2,072
23	Talegaon	1,297	64.85	259	913	1,172
		2,430	121.5	486	5,395	5,881
25	Karanja	3,879	193.95	776	3,373	4,149

MUNICIPAL TAXES

TABLE 1.—WARDHA (TERMINAL TAX)

Rules.

1. On the following goods exported by rail, a terminal tax shall be levied at the rate noted against each :—

At 2 annas per maund of 40 seers—Cotton, ghee, bran, hides and skins and linseed.

At 6 pies per maund of 40 seers—Hay and straw, oilcake and cotton-seed.

2. On the following goods imported by rail or road, a terminal tax shall be levied at the rate noted against each :—

At 3 annas per maund—Cloth (except hand-spun and hand-woven khaddar cloth).

At 2 annas per maund—Chillies, sugar, kirana, other metals, dried fruits and nuts, gunny bags, wines and spirits, oils (other than kerosene and crude-mineral oil) tobacco, gur and rab.

At 1 anna per maund—Rafters, bamboos and timber and linseed.

At 6 pies per maund—Grains and flour, coal and coke, marble and stone, kerosene oil, crude (mineral) oil, salt, fire-wood and oil-cake.

3. The following articles will be exempted from taxation :—

(i) All articles being the property of Government or municipality imported or exported on behalf of Government or municipality.

(ii) All separate consignments less than 15 seers in weight whether imported or exported.

(iii) All parcels imported or exported or despatched through the Post Office.

(iv) All *bona fide* personal luggage of railway passengers coming to or going out of the town including the luggage of circus or theatrical companies and travelling exhibitions.

(v) Railway stores and materials which are required for use on the railway whether in constructing, maintaining or working the same, which are removed outside the railway land boundaries, but not stores imported into the municipal limits for purchase and consumption by the railway employees nor stores with which the Railway Co-operative Stores are stocked for sale to the members.

(vi) Household effects of railway servants transferred on duty from one station to another, provided that they are certified by the owner or his responsible representative to be such household effects.

(vii) All excisable articles (other than wines and spirits), mahua and casks used for carrying liquor.

NOTE.—All consignments more than 20 seers will be charged as one maund. Fractions of 20 seers in excess of one maund will be charged as 20 seers.

TABLE 2.—WARDHA (BAZAR DUES RULES)

1. The whole stock in trade of every seller of goods brought by him into the bazar shall be subject to a single charge according to the following scale :—

(a) A charge of six pies per head-load.

(b) A charge of one anna per load borne by any beast of burden or such other load which in the opinion of the secretary or such officer or servant of the Committee duly authorized by the Committee in this behalf, is heavier than a head-load.

(c) A charge of four annas per cart-load.

Proviso.—In the case of cart-loads of timber and other wood that are brought in for sale in the bazar while passing through more than one hand, an additional four annas for each transaction shall be charged.

2. Stock in trade consisting of the following articles is exempt from dues when brought into the bazar as head-loads :—

Fuel, grass, kadbi, ropes and cobbling materials.

TABLE 3.—WARDHA (BYELAW FOR REGULATING THE GRAIN MARKET)

The following fees shall be paid for the use of the market and its conveniences :—

(1) A cart with grain, ghee or gum—One anna.

(2) A pack animal with grain, ghee or gum—Six pies.

(3) A head-load with grain, ghee or gum—Three pies.

NOTE.—No grain market fees shall be levied on Sunday when Sunday market dues sanctioned under Central Provinces Gazette Notification No. 900, dated the 15th July 1907, shall be levied.

TABLE 4.—HINGANGHAT (TERMINAL TAX)

The tax shall come into force two months after the publication of this notification in the *Central Provinces Gazette* (published in the *Central Provinces Gazette*, dated the 10th April 1926) and the following taxes shall be abolished from the same date :—

(i) octroi tax,

(ii) grain market fees, and

(iii) toll tax on oil-seeds.

1. On the following goods exported or imported by rail or by road within the limits of the Hinganghat municipality, a terminal tax shall be levied as laid down in the schedule below :—

NOTE (1).—Persons taking goods (*i. e.*, cloth only) out of the terminal tax cordon by road for sales in the interior of the district shall be granted from the Municipal officer an exit pass. On the reimportation of the articles covered by the pass no terminal tax will be levied at the importing outpost by road only. Such a pass will remain current for a period of thirty days.

NOTE 2).—(Grains and pulses when imported by road shall not be taxed.

SCHEDULE

On export.

At 4 annas per maund of 40 seers—Piece-goods.

At 1 anna per maund of 40 seers—Oil seeds and cotton seeds (excepting cotton seeds exported by agriculturists for their use in loose condition).

At 2 annas per maund of 40 seers—Ginned cotton.

On import.

At Rs. 6 per maund of 40 seers—Manufactured tobacco.

At Rs. 2 per maund of 40 seers—Colours, dyes and paints.

At Rs. 1-8-0 per maund of 40 seers—Brass and copper.

At Re. 1 per maund of 40 seers—Electric fittings and appliances.

At 10 annas per maund of 40 seers—Oilman's stores, tea, coffee, tinned and bottled provisions.

At 8 annas per maund of 40 seers—Betel leaves, glass, stationery, piece-goods excluding khadi hand-spun and hand-woven by the Maharashtra Khadi Vastragar of Wardha.

At 6 annas per maund of 40 seers—Dry fruits, spices and kirana.

At 5 annas per maund of 40 seers—Tobacco unmanufactured and bidi.

At 4 annas per maund of 40 seers—Chillies, hemp, jute, gunny bags, hessian cloth, mill stores, maniyari, crockery, cotton and coir ropes, string, betel nuts, oils of all kinds other than kerosene, manufactured wooden articles and planks, chemicals and drugs.

At 4 annas per ton—Coal and coke.

At 3 annas per maund of 40 seers—Iron and other metal (excluding brass, copper, machinery and its component parts), tin, galvanized iron sheet, german aluminium, zinc, lead, sugar and candy.

At 2 annas per maund of 40 seers—Jaggery (gur), rab and cocoanut, sulphate of ammonia, superphosphate, sulphate of potash, leuna-diammonphose and nitrochalk.

At 1 anna per maund of 40 seers—Grain, pulses, flour and kerosene oil.

At 9 pies per maund of 40 seers—Timber and rafter.

At 6 pies per maund of 40 seers—Salt.

2. The following articles will be exempted from taxation :—

- (i) Machinery and all its component parts and all articles the property of Government or municipality.
- (ii) All separate consignments less than 15 seers in weight whether imported or exported.
- (iii) All parcels imported or exported or despatched through Post Offices.

(iv) All *bona fide* personal luggage of railway passengers coming to and going out of the town including the luggage of circus or theatrical companies and travelling exhibitions.

(v) Railway stores and materials which are required for the use on the railway whether in constructing, maintaining or working the same which are removed outside the railway land boundary but not including stores imported into the municipal limits for purchase and consumption by railway employees nor stores with which the Railway Co-operative Stores are stocked for sale to members.

(vi) Household effects of railway servants transferred on duty from one station to another provided that they are certified by the owner and his responsible representative to be such household effect.

(vii) All excisable articles (mahua and casks used for carrying liquor).

(viii) All hand-spun and hand-woven khadi imported or exported by the Maharashtra Khadi Vastragar of Wardha.

NOTE.—(a) All consignments more than 20 seers will be charged at one maund. Fractions of 20 seers in excess of one maund will be charged at 20 seers.

(b) The tax will be levied on the gross weight of consignments including packing of articles either exported or imported.

TABLE 5.—HINGANGHAT (MARKET DUES)

For persons exposing goods for sale in the Monday weekly market within the limits of the Hinganghat municipality.

The market dues shall be imposed on the shops at the following rates (from 1st April 1932, *vide* Municipal Committee's resolution of 14th February 1932) :—

Class I—

Large shops—2 annas.

Small shops—1 anna.

Class II—

Large shops—1 anna.

Small shops—6 pies.

Class III—

Large shops—6 pies.

Small shops—3 pies.

NOTE.—A large shop is one occupying not more than 100 square feet.

A small shop is one occupying not more than 25 square feet.

A large shop occupying more than 100 square feet shall pay additional market dues as laid down for small shops of similar class for every space of 25 square feet or fraction thereof, occupied by it.

Class I.—Shops dealing in gold, silver, brass, copper and bell-metal, sweetmeat and ghee, grains and cloth.

Class II.—Shops dealing in meat, kirana, tobacco, fruits, vegetables, maniyari, ornaments other than gold and silver, tin, iron, cotton, lac, hide, harra, timber, bamboo and all other articles not coming under classes I and III.

Class III.—Shops dealing in karbi, grass, fuel, earthenware, baskets pan, bangles, and fish and live-stock.

TABLE 6.—HINGANGHAT (COTTON MARKET RULES)

Every person bringing cotton for sale or otherwise into the market shall, on entering the market limits, pay a fee at the following rates :—

- (i) On every cart laden with unginced cotton—4 annas.
- (ii) On every package (akha) of ginned cotton—4 annas.
- (iii) On every animal load of ginned or unginced cotton—2 annas.

TABLE 7.—ARVI (TERMINAL TAX)

Schedule.

1. On the following goods exported by rail or by road, terminal tax shall be levied at the rates noted against each :—

- (1) Ghee—Four annas per maund of 40 seers.
- (2) Rui (ginned cotton)—Three annas per maund of 40 seers.
- (3) Skins and hides—Two annas per maund of 40 seers.
- (4) Juar and tur—One anna per maund of 40 seers.
- (5) Cotton seed—Six pies per maund of 40 seers.

NOTE 1.—Ginned cotton when exported in pressed bales by roads shall be charged at Re. 0-15-0 per bale.

NOTE 2.—Cotton seed when exported by road shall not be taxed.

2. On the following goods imported by rail or by road within the limits of the Arvi municipality, a terminal tax shall be levied at the rates noted against each :—

- (1) Manufactured tobacco—Rs. 6 per maund of 40 seers.
- (2) Oilman's stores, tea, coffee, tinned and bottled provisions—Ten annas per maund of 40 seers.
- (3) Cloth, piece-goods (except khadi, i.e., cloth hand-woven and hand-spun)—Eight annas per maund of 40 seers.
- (4) Dry fruits, spices, kirana, bidis, chemicals and drugs—Five annas per maund of 40 seers.

NOTE.—"Kirana" includes all edible groceries other than grain, vegetables, fresh fruits and sweets.

- (5) Rab, manufactured wooden articles and planks, hessian cloth, maniari, crockery—Four annas per maund of 40 seers.

NOTE.—"Maniari" means fancy goods except stationery.

- (6) Colours, dyes and paints, brass, copper, aluminium, German silver, sugar, jaggery (gur), betel-nuts and tobacco unmanufactured—Three annas per maund of 40 seers.
- (7) Cocomanuts, glass—Two annas per maund of 40 seers.
- (8) Gin-stores, stationery and gunny bags—One anna per maund of 40 seers.

NOTE.—"Gin-stores" means all articles required for the working of ginning factories.

- (9) Oil-seeds (other than cotton seeds)—Nine pies per maund of 40 seers.

- (10) Grain, pulses (except juar and tur), flour, coal, charcoal, iron and other metals (excluding brass, copper, aluminium and German silver), tin, galvanized iron sheet, zinc, lead and timber—Six pies per maund of 40 seers.

- (11) Tiles (excepting country tiles), stones (excluding country stones and marble)—Three pies per maund of 40 seers.

NOTE.—(a) Goods taken out from Arvi to other markets for sale under passes issued from the municipal committee and brought back within 48 hours shall not be taxed as imports by road.

(b) All consignments in excess of 15 seers but not in excess of 20 seers shall be charged as for 20 seers; those in excess of 20 seers but not in excess of one maund shall be charged as for one maund. Fractions of 20 seers in excess of one maund shall be charged as for 20 seers.

(c) Terminal tax shall be collected in case of goods in bulk on the same weight on which railway freight is charged.

(d) The tax shall be levied on the gross-weight of consignments, including packing of articles either exported or imported.

3. The following articles shall be exempted from taxation :—

- (1) All articles being the property of Government, municipality, or district council imported or exported on behalf of Government, municipality, or district council.
- (2) All separate consignments less than 15 seers in weight whether imported or exported.
- (3) All parcels imported or exported or despatched through the Post Office.
- (4) All *bona fide* personal luggage of railway passengers coming to or going out of the town including the luggage of circus or theatrical companies and travelling exhibitions.
- (5) Railway stores and materials which are required for use of the railway whether in constructing, maintaining or working the same, which are not removed outside the railway land boundary, but not stores imported into the municipal limits for purchase and consumption by railway employees nor stores which the Railway Co-operative Stores stock for sale to members.
- (6) Household effects of railway servants transferred on duty from one station to another, provided that they are certified by the owner or his responsible representative to be such household effects.
- (7) All excisable articles, mahua and casks used for carrying liquor.

TABLE 8.—ARVI (VEHICLE TAX RULES)

On every vehicle carrying a load and entering municipal limits, a tax shall be levied at the rate of annas two per vehicle.

Proviso I.—Vehicle carrying goods liable to octroi tax, passengers and their personal effects only, and vehicle carrying, kutar, kati-fas, cow-dung cakes, turathi, parathikada, machan poles, vegetables, fruits, stones, earth, water, ambadi, boxes containing current coins, or silver or gold and manure are exempted.

Proviso II.—Vehicle carrying goods the property in which is vested in the Government at the time when they pass the vehicle tax naka and which are intended for the use of Government shall pass free if accompanied by a pass with the endorsement of the proper Government officer certifying that they are the property of Government and are intended for Government.

Proviso III.—Vehicles bringing in the personal effects and other baggage belonging to the citizens of the town who have vacated the town on account of plague, and are returning from their respective camps to the town are exempted.

TABLE 9.—NAGPUR (TERMINAL TAX)

As amended up to 31st March 1934.

The revised schedule came into force from 1st December 1931. The cart rates on cotton, oranges and fresh fruits, grain, bricks and tiles, boulders, gittee, kankar stones, lime, geru, yellow earth and cement include three annas vehicle tax.

Description and rate.

- (1) Apparel, including drapery, millinery, accoutrements, cotton, wool, and silk piece-goods and stuff—Rs. 1 per maund.
 - (2) Umbrellas and their parts—Rs. 1 per maund.
 - (3) Boots, shoes, leather and manufactures of leather—Rs. 2 per maund.
 - (3-a) Colour and paints including alizarine, aniline cutah, indigo and varnishes—Rs. 2 per maund.
 - (3-b) Uncoloured leather—4 annas per maund.
 - (4) Kirana including spices betel-nuts, dry fruits, drugs, chemicals, oilman's stores and coffee, tinned and bottled provisions and betel leaves—8 annas per maund.
 - (5) Mild steel and wrought iron and their manufactures including tin, lead, zinc, other metals not mentioned in the schedule and their products and electric goods including bulbs—2 annas per maund.
 - (6) Scrap iron (old)—6 pies per maund.
 - (7) Brass, copper and their manufactures and bronze, aluminium and German silver and their products—Rs. 1-8-0 per maund.
 - (8) Aluminium, brass and copper scraps—2 annas per maund.
 - (9) Oils of all kinds—4 annas per maund.
 - (10) Manufactured tobacco including cigars and cigarettes—Rs. 2 per maund.
 - (11) Unmanufactured tobacco including bidis, scented tobacco and snuff—8 annas per maund.
 - (12) Sugar (manufactured and refined), sugar-candy and honey—3 annas per maund.
 - (13) Jaggery and cocoanuts—2 annas per maund.
 - (14) Dry chillies, tamarind and garlic, resin, soap-stone and tea—4 annas per maund or Rs. 2-8-0 per cart.
 - (15) Coal and coke—2 annas per ton.
 - (16) Stack coal—1 anna per ton.
 - (17) Oil seeds—2 annas per maund or Rs. 2-8-0 per cart.
 - (18) Hemp, jute, gunny bags and their fabrics and coir ropes—4 annas per maund or Rs. 2-8-0 per cart.
 - (19) Wood (unmanufactured), bullies and beams—1 anna per maund or Re. 1 per cart.
 - (20) Planks and manufactured wood—2 annas per maund or Rs. 2 per cart.
 - (21) Cotton ginned or unginned coming by road—Re. 1 per cart.
 - (22) Pressed cotton bales imported by rail or road—8 annas per bale.
 - (23) Grain of all kinds and pulses and flour—1 anna per maund or Re. 1 per cart.
 - (24) Oranges and fresh fruits—1 anna per maund or 14 annas per cart.
 - (25) Bricks and tiles by rail—Re. 0-2-6 per ton or Re. 0-5-6 per cart.
 - (26) Stationery including paper and paper manufactures (but excluding books and news paper), maniaris including cigarette holders and pipes—6 annas per maund.
 - (27) Rubber tyres and tubes and other manufactures of rubber for sale—Rs. 2 per maund.
 - (28) Boulders, gittee, kankar, stones, lime, geru, yellow earth and cement—3 pies per maund or 4 annas per cart.
 - (29) Twist and yarn—4 annas per maund.
 - (30) Ghee, butter and khowa—10 annas per maund.
 - (31) Cocogem, vegetable oil, imitation ghee and solidified oil—13 annas per maund.
 - (32) Kerosene oil and liquid fuel—2 annas per maund or 3 pies per gallon.
 - (33) Cotton seed on export by rail only—6 pies per maund.
 - (34) Tallow and grease including soap toilet and candles—10 annas per maund.
 - (35) Fodder, including grass, straw, bhusa and karbi—3 pies per maund or 5 annas per cart.
 - (36) Sugarcane—3 pies per maund or 5 annas per cart.
 - (37) Vegetables—6 pies per maund or 3 annas per cart.
 - (38) Bullocks, cows, calves and pigs for sale—6 annas each.
 - (39) Sheep and goats for sale—2 annas each.
 - (40) Poultry and game—3 pies each.
 - (41) Charcoal—9 pies per maund or 10 annas per cart.
 - (42) Fire wood by rail—5 annas per cart.
 - (42-b) Fire-wood by road—Re. 0-2-6 per cart.
 - (43) Cycle or cycle frame—4 annas per maund.
 - (44) Typewriters—4 annas per maund.
 - (45) Motor cycles or motor vehicles—4 annas per maund.
2. The following articles shall not be liable to payment of terminal tax :—
- (a) Arms and ammunitions.
 - (b) *Bona fide* personal luggage of passengers arriving by rail and conveyed in the same carriage or booked to be carried by the same train they themselves travel in, including the luggage of circus or theatrical companies and travelling exhibitions.
 - (c) Articles intended for private and personal use which have already been in use before being brought within municipal limits.

- (d) Machinery and component parts thereof exempted from customs duty by Indian Tariff Act for the time being in force and machines worked by manual power for the *bona fide* use of educational institutions.
- (e) Articles delivered through the Post Office.
- (f) Necessaries (not being articles of food or drink), equipments and of clothings, imported by officers in command of troops for the direct and exclusive use of their men and camp followers, if and when accompanied at the time they enter the municipal limits by a certificate of the officer commanding that they are so intended.
- (g) Articles, the property in which is vested in the Government at the time they enter the municipal limits, if and when accompanied by a certificate in that behalf of an officer of Government who shall either be a Gazetted Officer, or an Officer authorized by the Head of Importing Department to grant such certificate. The certificate besides stating that the articles are the property of Government shall state that they are not intended for private use or for sale to the public.
- (h) Articles, the property in which is not vested in the Government at the time they enter the municipal limits, but which are imported by a contractor or any other person with a view to the fulfilment of a Government contract or undertaking shall not be exempted and no refund of the tax on such articles shall be granted on the ground that they have subsequently become the property of Government or been applied to Government use.

NOTE.—All minerals, bricks and tiles intended for Government works will pay tax on entering the municipal limits but the tax will be refunded on the production of the terminal tax receipts in support of the claim together with a certificate signed by the Executive Engineer, Public Works Department, stating that the refund here claimed has been entered into a running account bill and giving the name of the work for which the materials were utilized.

- (i) Articles, the property in which is vested in the municipal committee at the time they enter the municipal limits, if and when accompanied by a certificate in that behalf from the president, the vice-president or the secretary, that they are the property of the municipal committee and are not imported for private use or sale.
- (j) Articles, the property in which is vested in the Nagpur University at the time they enter the municipal limits, if and when accompanied by a certificate in that behalf, of the Registrar, Nagpur University, and are not intended for private use or sale to the public.
- (k) Railway stores and materials which are required for use on railways whether in constructing, maintaining or working the same which are not removed outside the railway land boundaries, but not stores imported into municipal limits for purchase and

nor stores with which the Railway Co-operative Stores are stocked for sale to members.

TABLE 10.—NAGPUR (MARKET DUES)

1. Market dues shall be levied according to the means by which such goods are exposed for sale at the following rates:—

Per cart—Two annas each bazar day.

Per pack animal—One anna each bazar day.

Per kawar—One anna each bazar day.

Per head-load—Six pies each bazar day.

NOTE.—“Cart” includes renga, bundi or big cart.

2. Market dues for the right to expose goods for sale shall be levied as follows for each bazar day:—

Class I.—Shops dealing in sweetmeat, wooden furniture (old and new), grain and merry-go-round shows—

Big shops—Four annas.

Small shops—Two annas.

Class II.—Shops dealing in fish, vegetables, provisions, cloth except that sold by mahars, kirana, tobacco, bangles, manihari (fancy goods), pan bidis, meat, poultry, brassware, ironware, betel-leaves, fire-works and other articles not specified in classes I and III—

Big shops—Two annas.

Small shops—One anna.

Class III.—Shops dealing in snuff, sindhi baskets, chamars (repairers and new makers), panchals, small sharaff, patwis, book and picture sellers, perfume sellers, ghee sellers, sellers of cloth, such as mahars, tailors, rope sellers, bread sellers, petty sellers of medicine and petty salt sellers—

Big shops—One anna.

Small shops—Six pies.

NOTE.—(1) A big shop means a shop occupying a space exceeding 85 square feet but not exceeding 100 square feet.

NOTE.—(2) A small shop means a shop occupying a space not exceeding 25 square feet.

NOTE.—(3) A big shop occupying more than 100 square feet space pay additional market dues as laid down for small shops for similar class for every space of 25 square feet or fraction thereof occupied by it.

Provided that those who have paid under rule 1 shall not be required to pay any dues under this rule.

Provided, further, that those shops which pay fees under the byelaws framed under section 179 (1) (b) shall not be liable to pay any dues under this rule.

TABLE 11.—COTTON MARKETS IN THE WARDHA DISTRICT (UNDER THE COTTON MARKET ACT, 1932)

- (1) Wardha.
- (2) Hinganghat.
- (3) Arvi.
- (4) Pulgaon.
- (5) Deoli.
- (6) Sindhi.

Fees are levied at the following rates in the market proper on merchandise brought for sale—

- (i) On every bojha or package of ginned cotton—6 pies.

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SECTION I-B.—BALAGHAT DISTRICT

CHAPTER I.—INTRODUCTION

The Industrial survey of the Balaghat district was entrusted to me by the Industrial Survey Committee appointed by the Government of the Central Provinces and Berar. With the following batch made up of one worker and nine students of the Gram-sevak Vidyalaya, Maganvadi, Wardha, I started from Wardha on the night of 22nd January reaching Balaghat the following morning:—

- (1) Sjt. Vinayak, Worker, All-India Village Industries Association.
- (2) Sjt. Narayanan Eluthachan.
- (3) Sjt. Morumal Pinjani.
- (4) Sjt. Bhamerlal Bhatt.
- (5) Sjt. Maneklal Kotecha.
- (6) Sjt. Bansidhar.
- (7) Sjt. Shaukat Ali.
- (8) Sjt. Chandra Seth.
- (9) Sjt. Syed Mohammad Zahid.
- (10) Sjt. Narayanan D. Patil.

The programme was chalked out in the meeting convened by the Deputy Commissioner at which the three Extra-Assistant Commissioners and the Tahsildars of Balaghat and Waraseoni tahsils, the 10 surveyors and myself, were present. The actual field work was begun from 24th January. Students were sent out to the various villages in batches of two. During our stay in the district from 23rd January to 7th February 1939, the numbers of villages surveyed according to tahsils are as follows:—

Balaghat—31.
Waraseoni—14.
Baihar—4.

We have concerned ourselves with village industries and whatever facts and figures we collected were verified from records and reports and on the basis of these this report has been prepared. We tried to elicit accurate information about the industries and we hope the report gives a true picture of the conditions prevailing in the district.

During my short stay in the district, I had general discussions with Sjt. Smellie, the Deputy Commissioner, Sjt. R. B. Agrawal and Sjt. Gupta, Extra-Assistant Commissioner, Sjt. Bajpai and Sjt. Trivedi, the Tahsildars of Balaghat and Waraseoni, respectively. Sjt. N. K. Kelkar, a prominent public man, and an ex-Minister of Central Provinces, Sjt. Kannaiyalal, M.L.A., the President of the District Congress Committee, Sjt. Badri Narayan Agarwal, M.L.A., Sjt. Mohanjibhai, the Harra Contractor, Sjt. Khan Bahadur Mulla, a prominent businessman and a member of the Lac Committee, appointed by the Government of India, Khan Sahib Abdul Jabbar Khan of Balaghat, Sjt. Thakur Hemraj Singh, Secretary, Municipal Committee, Balaghat, Sjt. Pawar, the Secretary of the District Congress Committee, Sjt. Mohrirkar, Pleader, the Secretary, Tahsil Congress Committee, Sjt. Abbaji, President, Mandal Congress Committee, Lanjhi, and Sjt. Phanindra Nath Gosai of Balaghat.

I am thankful to them all for supplying us with valuable information and giving practical suggestions.

I myself visited some of the villages like Kirnapur, Waraseoni, Lanjhi, Katangi, Laburrah, Baihar and Garhi, and some of their important bazars to acquaint myself with local conditions.

The expenses of the survey amounted to Rs. 153-4-0 including travelling to and from Balaghat.

I am very thankful to Sjt. B. A. Smellie, the Deputy Commissioner, for making arrangements for our stay, for planning our itinerary and for placing at our disposal the necessary help from Government officials.

T. B. BHATT,
Group Leader.

CHAPTER II—GENERAL INFORMATION

This district has an area of 3,557 square miles and is situated on the northern side of Central Provinces. It has Bilaspur and Drug on the east, Mandla and Seoni on the north, Chhindwara on the west and Bhandara on the south. The district comprises of three tahsils, Balaghat, Waraseoni and Baihar. The name of the district suggests that it contains "Ghats". The headquarters of the district is Balaghat town which was originally called Burha. In the whole of the district, there is only one town, with a population of about 10,000. The total population of the district was 561,602 according to the last census report. The languages of the people are principally western Hindi (315,501), Marathi (160,428), and Gondi (74,705).

There are about 3,000 castes in the district. According to religion the population can be divided as follows:—

Hindus—
Population—405,659.
Percentage—72.2.
Scheduled castes (Harijan)—
Population—75,861.
Percentage—13.5.
Tribal religion—
Population—67,404.
Percentage—12.
Muslims—
Population—11,121.
Percentage—2.
Others—
Population—1,557.
Percentage—3.
Total—
Population—561,602.
Percentage—100.

The number of males (276,898), is not exceeded appreciably by that of women (284,704). The number of occupied houses is 101,312, so the average number of members

in a family comes to about five. The population of the district is almost entirely rural it being as high as 98 per cent.

The number of illiterate, according to the census report of 1931, was 536,898, i.e., about 95 per cent of the total population.

Occupations.—The occupations of the rural population are agriculture and its allied industries and to a very small extent dairy farming. Leaving aside various professions of personal services such as washermen, barbers and also employees in the Government and public institutions, the whole of the population is engaged in one or more of the rural industries mentioned in the chapter on "Industries". The organized and large-scale industries are only rice-mills and manganese mines.

There are 22 post offices in the district. Compared to the number of villages, the hospitals run by the district council are very few. At present there are only seven situated in big villages. We would like to take this opportunity to suggest that the number of hospitals should be increased. One of the drawbacks in the system of running the hospitals is that the doctors are allowed to have private practice. The Government should pay them full salary if it is not adequate at present, and the doctors should give their full time to hospital work. Another thing we would suggest is that the natural resources of herbs and drugs which are abundant in the forest should be utilized for medicinal purposes. Every year the district council spends a sum of about Rs. 3,000 to Rs. 4,000 on medicines, a large part of which can be spent on ayurvedic medicines. Besides running hospitals, the district council should educate the people to make use of simple ayurvedic medicines prepared from herbs which are generally found in the villages or in the forests nearby.

There are fairly good roads in the Balaghat and Waraseoni tahsils, but in Baihar, there are very few good roads it being mostly a forest area. The tahsil requires a network of roads to bring the forest produce to the market places.

There are ten stations of the Bengal-Nagpur Railway in the district and the railway line covers about 80 miles.

The market towns for export are mainly Waraseoni, Balaghat, Lanjhi, Baihar and Lalburra. Weekly bazars are held in about 200 villages. Most of the buying and selling of goods is for cash.

Night-soil is not used for any purpose at all. The people ease themselves in open fields and leave the night-soil to decompose and putrify in the sun. The dung of the cattle is used to some extent as manure, but the greater portion of it is turned into cakes for fuel.

There are a good many tanks and rivers in which plenty of water for bathing and washing purposes is available in the monsoons and in winter. There are wells in every village for drinking water, but Harijans are not allowed to draw water from them. The district board has dug about 100 public wells in the district, and as they are used by the Harijans, most of the higher caste people do not draw water from them.

The total revenue received by the Government from this district under the various heads is given below :—

	Rs.
Land Revenue	6,26,101
Excise	2,25,060
Income-tax	14,528
Stamp	85,914
Forest	2,14,739
Registration	13,730
Total	11,80,072

Thus the incidence of taxes comes to about Rs. 2 per head.

For the year 1937-38, the revenue of the district board was Rs. 70,000. The district council runs seven hospitals the expenses of which amount to Rs. 10,464.

There are ten secondary and 131 primary schools in the district. The primary schools are run by the district council the expenses under that head amount to Rs. 70,338.

The total number of students receiving education in these schools is as follows :—

	Males	Females
Secondary	1,422	..
Primary	6,650	290
Total	8,872	290

Dues at the rate of half an anna per head-load and two to four annas per cart-load are charged at the bazars.

The popular sources of finance available are the Government, malguzars, mahajans and co-operative societies.

The total indebtedness of the district according to the Banking Enquiry Committee was Rs. 66,12,557 in the year 1929-30. The bulk of the credit, about 78 per cent, is supplied by the mahajan and 19 per cent by the malguzars while the co-operative society has advanced only a small amount, the percentage being not more than three. The average indebtedness per agricultural family will be about Rs. 100 to Rs. 150. As regards artisans, it seems that many of them are not indebted, not because they do not require money, but because the sahukars are unwilling to lend them any on personal security. Only at the time of social functions do they have to contract debts. The rate of interest charged by the Sahukars is 12 to 36 per cent and by the co-operative society and the Government, less than 12 per cent.

The Houses.—Harijans generally dwell in the village itself. Many of the caste Hindus do not mind touching them, though fetching water from the common wells is not usual. In the schools run by the district council, untouchability is not allowed.

The number of persons addicted to drinking is large, especially in Baihar tahsil, where every Gond or Baiga is a drunkard. Most of the best crops are sold away and the money is squandered away on liquor. In the southern tracts the Harijans and other artisan castes are most addicted to drink, and as a rule on festival days, much money is wasted on it.

As regards sanitation, the villages are not badly kept. The houses of the Harijan communities require special mention, as they are neat and clean and washed with a kind of earth available locally. People go to the fields to ease themselves and on the whole the small villages are fairly clean and sanitary. In the big villages, the sanitary conditions are not satisfactory.

CHAPTER III.—AGRICULTURE

The main crop of the district is rice. The total area under cultivation was 724,600 acres in the year 1935-36, out of which 385,923 was under paddy. The average rainfall of the district is 50 to 70 inches.

Wheat, gram, urad, tora, kodon, kutki, linseed, mustard, sarsaon and other oil seeds are some of the other important food crops. All these are sold in the local bazars except rice which is generally exported to Mandla and Gondia. This year the price of rice has fallen to 30 to 40 lb. for a rupee. About 8,000 acres of land are under sugarcane cultivation but as the price of gur went down, cultivators suffered a great loss last year. This year the price having improved, it is hoped that more land will be brought under sugarcane cultivation. Tobacco is also grown to a small extent. For the last fifteen years the experience of agriculturists has been that the yield per acre is gradually going down. The reasons ascribed to this are that (1) the same kind of crop is raised every year and (2) the insufficiency of manure.

Payments for services are made in kind to carpenters, barbers and blacksmiths. Now-a-days, since ready-made implements are brought by the farmers, they are reducing the payments made to artisans.

The rainfall being as high as 60 to 80 inches the fields do not generally require (artificial) irrigation, though there are tanks which are used for irrigation purposes. There is a net work of canals in the northern parts of the district but at the present their water is not fully utilized by the people. The people's grievances are that canal water is neither supplied in time nor in sufficient quantities. Further, the rates charged by the Irrigation Department are considered to be high. The irrigation scheme at present seems to be more for protective purposes than for productive ones. It would be helpful to production if the canals which are built at a cost of several lakhs of rupees could be utilized all through the year. We suggest that more rabi crops such as wheat, gram, etc., and more sugarcane crops be raised.

Dues charged by the Irrigation Department are over and above the ordinary land revenue and are about Rs. 3 per acre.

In the village, the average holding per family comes to about five acres, which is too small for maintaining a family of five persons. Ten to 15 acres of land are required to make a net profit of Rs. 150 to Rs. 200, which is generally considered to be the amount required for maintaining a family on a reasonable standard.

Fruit trees such as plantains, papaya, and oranges have newly been introduced by some enterprising agriculturists. There are

other local fruit trees the fruits of which are not marketed. They are generally utilized in the villages where they are produced and sometimes, they rot on the trees or fall to the ground and remain unutilized. In Garhi in Baihar tahsil we saw one enthusiastic agriculturist growing vegetables profitably on a small piece of land. Within a short period, with an expenditure of Rs. 10 or so, he was able to sell vegetables worth Rs. 30. There are great possibilities for intensive agriculture and fruit culture, as most of the lands in Baihar tahsil is virgin soil. In other tahsils too, with canal and well irrigation agriculturists can very well profit by intensive agriculture and vegetable growing.

No palm trees are grown in the district. There are mahua trees, the flowers of which are used for preparing liquor.

The agriculturist is busy during the months—June to November—after which he generally remains unemployed. Many of the village industries mentioned in the chapter on "industries" can be started by them with a small capital, at small expense on equipment and raw materials.

CHAPTER IV.—INDUSTRIES

General.—Balaghat is one of the prosperous districts in the province and abounds in valuable forest and mineral products. The big river Wainganga flows through across the middle and along the boundaries of the district. The valley of the river is so fertile that we have in Balaghat the best rice producing fields of Central Provinces. There is plenty of rain for four months in the year and the climate is also good. But yet the plight of the people inhabiting the area is pitiable and is not very different from that of people elsewhere in India.

The people are engaged in agriculture for four or five months and the problem is, as it is anywhere else, to give them work during the rest of the year. In the off season many agriculturists are engaged in the transport of forest products with their bullock carts. There is comparatively great scope for them in this occupation, even though they are being displaced by a few motor lorries.

Though there are good many industries and large percentage of people following them, yet due to the vast amount of cheap foreign articles dumped into their bazars most of them are thrown out of employment and have therefore had to fall back on land as their last resort. Those who have not done this, cling up to their industries and are hardly able to earn enough for the primary needs of existence. For most things except food they depend upon foreign products and it is painful to note that in the distant jungle villages where there are no means of regular transport, one can find many articles of Japanese and German manufactures such as mirrors, combs, toys, etc.

The Government being busy collecting taxes and revenues has no time and inclination to look to the poor craftsman and his work. In the Government records there are not even accurate statistics, regarding various industries and the number of persons engaged in them. The following table gives

the number of persons engaged in some of the industries which we were able to make out from the columns of the census report of 1931 :—

- (1) Cultivators—275,348.
- (2) Agricultural labourers—160,072.
- (3) Mill yarn weavers—10,327.
- (4) Those who are engaged in fishing—5,109.
- (5) Silk spinning and weaving—10.
- (6) Calico printing and dyeing—114.
- (7) Tanning—431.
- (8) Carpentry—564.
- (9) Bamboo basket making and similar work—2,105.
- (10) Blacksmithy—1,951.
- (11) Working in brass, copper, bell-metal, etc.—131.
- (12) Brick and tile making—160.
- (13) Rice pounding, husking and flour grinding (mainly in rice mills)—137.
- (14) Boot, shoe and sandal making—578.
- (15) Making jewellery and ornaments—1,459.

The following are the industries carried on in the district :—

- (1) Paddy husking.
- (2) Flour grinding.
- (3) Oil pressing.
- (4) Gur making.
- (5) Honey production.
- (6) Pottery.
- (7) Brick and Tile making.
- (8) Hand loom weaving.
- (9) Niwar making.
- (10) Silk weaving.
- (11) Carpentry.
- (12) Blacksmithy.
- (13) Mat weaving and broom making.
- (14) Rope making.
- (15) Tanning and shoe making.
- (16) Fishing.
- (17) Poultry farming.
- (18) Dairy farming.
- (19) Dyeing.
- (20) Brass and Metal wares.
- (21) Lac culture.
- (22) Bamboo work.
- (23) Bidi making.
- (24) Manganese mining.
- (25) Harra collecting.
- (26) Other Forest Industry.

All these cottage industries were carried on in the district since long. Their difficulties and the aid they require are almost the same in each one of the industries. It is mainly on the tradition of some well-to-do communities to wear, on certain ceremonial and other occasions, clothes with particular designs and borders prepared by the local weavers that the handloom workers now mainly depend for their work. People know that clothes woven on the handloom are more durable than the mill-made ones, but the poor purchaser has to look mainly to his immediate resources while he buys things. The weavers at present work from sunrise to sunset or even later and yet they hardly earn two annas a day. Even so, they have to carry on with the work as they have no other

occupation left to fall back on. The weavers were found with pale anæmic faces, sunken eyes and a look of disgust. This indicates also the fate of the industry itself.

Many of the workers engaged in cottage industries have to depend on the sahukar for the small capital they require every time, for yarn, dye or leather as the case may be and he exacts interest ranging from 24 to 86 per cent. Often they take yarn or other raw material from him, work as his labourer and return the finished product to him receiving in exchange whatever wages he gives them.

In some cases the independent artisans also sell their goods to the Sahukar i.e., the niwar makers, bamboo basket makers and others. The lot of the niwar maker is pitiable. After working for about three months, each niwar maker takes up his bundle of niwars costing about Rs. 150 and goes from house to house and town to town in Nagpur, Bombay, Poona and other such distant places, pays railway fares, municipal taxes, etc., and returns with what paltry sum he has left with him. The potters, gur makers and others also, after one week's labour, have to take their articles from market to market or house to house and sell them at whatever price they get, as they have no resources to fall back upon.

Therefore, the primary needs of the people engaged in these industries are—

(1) Adequate credit facilities for beginning work each time.

(2) Regular marketing facilities.—Co-operative societies can in fact do the work of lending money at low rates of interest and taking back articles at reasonable prices. It should be the look-out of the societies to provide a good market for the goods. Co-operative societies have failed in most cases but that was mainly because money was lent for unproductive purposes or for clearing old debts and because they never cared for increasing the productive or earning capacity of the debtor. It should also be the aim of our societies to see to this vital question.

Then there is the question of the competition of factories with cottage industries. It is easy to say that we should tax the mills but there are so many complicated problems involved in it. For example, take the rice-mill: If we tax rice-mills in the Balaghat district, the price of rice will rise and it will tell upon the export of rice, which is the chief product of the district. If the imported rice is not taxed that will be sold much cheaper in the district than the local product. Or, if we desire that the local consumption shall be met from hand-pounded rice, we have to make such rules as would make it impossible for rice-mills to dehusk quantities less than a stated amount, say 50 khandis of paddy (since small agriculturists bring in small quantities to the mills or sell their paddy instead of husking it themselves in exchange for lower and cheaper varieties). The whole problem is so difficult and complicated that the Gordian Knot cannot be cut by one stroke. However, the small producer should be given protection from the mighty factories.

For these small industries, the Government should only give indirect aid and create circumstances favourable for their growth.

However, in the case of the three big industries in the district, viz., manganese, harra and lac the Government itself has to conduct them. The Central Provinces is in fact producing 80 to 90 per cent of the total output of manganese in India and that too unsurpassed in quality, and Balaghat contributes one-third of the total produce from India. The case is similar with harra and lac. Paper-making and match manufacture are two new industries that can be introduced in the district.

As far as cottage industries are concerned they are carried on on the same lines as 50 years ago, the implements and processes all being the same. Improvements in their implements and in the appearance of their finished products are quite essential.

"But mere introduction of labour saving devices and improved mechanical methods can serve little purpose when the real problems are of finance and of providing markets for increased production." Research work should also be conducted in university laboratories for making dyes, paints, alcohol, power alcohol and many kinds of products that can be easily made in the country.

Besides all these, the public should be taught better living, health and hygiene as well as modern currents of thought. Text-books for students should contain lessons on the qualities of hand-husked paddy, hand-ground flour, bee-keeping, hand-made paper and such industries. Universities should make it a point to give degrees to graduates only after a year of successful service in a village.

N.B.—The havoc that motor lorries are causing needs special mention. It is good to have lorries and aeroplanes but where has the villager the earnings to pay for all these and what work can we give to the vast numbers thrown out of employment by the introduction of a few of these? One motor lorry will displace at least 100 bullock carts and all those cartmen and their families are left in the wilderness. In a certain district, probably there is a rule that 25 per cent. of the transport should be left to the bullock carts. Wherever it is possible and not inconvenient for the work to be done by the bullock cart, it should be left solely to them. The following is the number of motor lorries, buses and cars running in the district according to the Traffic Department :—

Year	No. of lorries carrying goods	No. of Buses	No. of private cars	No. of Motor cycles	Total revenue collected in the year
1936	8	22	47	8	4,132 15
1937	15	34	51	15	5,673 2
1938	12	36	57	15	5,950 0

The earnings of the village artisan will be about Rs. 100 a year if he works throughout the year which in fact he does not do. The expenses for the year on food and clothing will come to about Rs. 130 and hence either they have to starve or the balance has to be met by contracting debts. Both are resorted to and hence unhealthiness and indebtedness are on the increase.

CHAPTER V.—DETAILS OF EXISTING INDUSTRIES

1. Paddy-Husking.—Paddy is extensively grown in this district and rice is the staple food of the people, hence this industry is of primary importance. Before the advent of rice mills, people used to husk paddy by the hand-process. There is no competition from outside; on the contrary, the district exports a large quantity of rice. Of course, the demand for hand-pounded rice is still there, but as mill polished rice is cheaper, people have become accustomed to eat highly polished rice and thus an artificial demand has been created for mill rice. At present, about 20 rice mills are working and the capital invested in them is about a lakh of rupees. A rice mill attracts paddy growers within a radius of more than 20 miles. They bring their paddy in carts and get it husked at the mills at about three annas per khandi. The advantages of husking are reported as follows :—

- (1) The work is done in a short time.
- (2) The cost of mill husking is low.
- (3) As the people grow rice for sale, they find it difficult to get all their paddy husked at one time and so they sell it immediately to meet their liabilities such as land revenue and other cash payments for old dues.
- (4) Some of the people have developed a liking for highly polished rice, and it is daily growing; the agriculturists therefore are forced to get their rice highly polished.

Where transport facilities have been created, the rice mills have made their inroad. In the interior of the district, people are still husking their paddy with indigenous instruments. The export of rice in this case is very limited. There is no special reason for husking paddy. It is carried on in every house generally by the women. But the malguzars and other agriculturists who produce a large quantity of paddy used to get it husked by local labourers, who were called "Bhusari". The process of paddy-husking by hand as practised today is simple and all the women folk are generally trained in this art from childhood. Every worker does all the processes and so there is really no division as skilled and unskilled labour. Before the advent of rice mills thousands of people were employed in this work and paid 12 annas per khandi, i.e., a labourer used to get at least three annas per day. The usual method was payment in kind, the broken rice having generally been given as wages. But nowadays many of the working class people have left husking rice as they say that it is too laborious to work chakkis and dhenkis for the whole day. Some of them are even becoming so indolent, that they themselves get rice polished in the mills. The old instruments are fast disappearing. In the village of Menhdiwada, where a rice mill has been started only recently, it was after a long search that we were able to find out old instruments in some houses.

The indigenous instruments require very little capital. The earthen chakki is prepared by the agriculturists themselves and if there is any cost, it is only the labour of

making it. Anyhow if the chakki is to be evaluated, the price will not be more than one anna. The winnowers and sieves cost about three to four annas. A dhenki will cost about Re. 1-8-0. All these instruments being very simple, they can be worked even by unskilled labourers. Repairs can also be made easily.

2. Flour-grinding.—As the general diet consists of rice, flour-grinding is not an important industry at present. In the houses, there are small stone chakkis to grind cereals or pulses occasionally. The size of the chakki is very small, the diameter being only 12" to 14". The upper stone is fitted on a raised earthen platform of 2 to 3 inches. There is no arrangement to adjust the stones or to receive the flour in a wooden receptacle. The output is also very low about 2½ lb. per hour. The chakki stones are found locally in the district and sold at 10 to 12 annas per pair.

We would suggest that the size of the stones be made bigger, i.e., about 18" in diameter and also that arrangements be made to lower or raise the upper stone. A small raised platform even of earth will serve the purpose of collecting the flour, so that it does not get mixed with the dust on the floor.

3. Oil-pressing.—Oil is also a primary article of food and oil-pressing has been carried on in villages from time immemorial. Formerly every village had at least one oil-press. But the situation has been changed because of the oil imported from other districts. These are generally produced on a large scale and big merchants import them from Gondia. There is an oil-mill at Gondia which to some extent is supplied with the raw material—oil seeds—from this district and the finished goods are then imported. There is keen competition between ghani-pressed and mill oil and on account of the manoeuvring of oil merchants, the tricks of selling adulterating ghani-pressed oil with cheaper mill oil, the poor oilman has been hit hard. Since he has to sell his oil at any price or be faced with starvation he reduces the price of ghani oil so as to stand the competition of mill oil, thereby reducing his margin of profit. As the industry is not a paying concern many of the oilmen have left pressing seeds, though some are carrying on the trade to some extent by mixing mill oil with ghani-pressed oil and selling to the people as pure ghani oil. The people having lost faith in them because of the uncertainty of getting pure ghani oil even at a higher price, they have been induced to buy mill oil. As the consumers' purchasing power in cash has gone down, they are getting their oil from the sahukar who sells it on credit. It is very difficult to say what percentage of the oil sold in the village comes from mills; but as we look at the situation created by imported oil, viz., that many of the telis have left their occupation we can safely say that more than 60 per cent of the oil sold is imported from outside. Not only has the demand for ghani-pressed oil gone down for edible purposes but also for burning and lighting purposes because of the advent of kerosene oil and gas lamps, torches, etc. The old way of burning vegetable oil

in "divas" is fast disappearing and the people, poor and rich alike, take every opportunity to have a Dietz lantern and a torch.

There has been no improvement in the process of production. The oilman of one village is often unaware of the ways of extracting oil in the neighbouring village. In most villages, we found that the oil is taken out through a hole at the lower end of the ghani, though in some villages, people still follow the crude way of inserting a piece of cloth in the mortar and squeezing out the oil. The oil is generally used for edible purposes. Various types of oil-seeds are crushed, e.g., sesamum, linseed, gulli (mahua), mustard and castor, oil from the last being generally used for burning, dyeing and lubrication and for medicinal purposes.

The community or caste which is engaged in this work is called "Teli". Being an ancestral profession, no caste other than "Teli" does oil-pressing, but now as they are not able to sell their oil at profitable rates, nay find it difficult even to sell at the mill rate, they have taken to agriculture and its subsidiary occupations. The profession requires two persons, one skilled, i.e., Teli, and one unskilled to sieve the oil seeds, to look after bullocks and sometimes even to drive the bullocks while the ghani is working. It is difficult to give the earnings of the skilled and unskilled persons separately as they belong to the same family. If the ghani is worked continuously for a day the following will be the expenditure and income of a Teli:—

Expenditure—

Three ghanis a day.

	Rs. a. p.
15 seers of oil-seeds— ..	1 8 0
For bullock, 2 seers of oil cakes grass, etc.—	0 3 0
Repairs and depreciation— ..	0 0 6
Bazar tax to sell oil— ..	0 0 6
Profit— ..	0 8 0
Total ..	2 4 0

Income.

Oil produced 3½ seers at—0-8-0..	1 14 0
Oil-cakes 11 seers— ..	0 6 0
Total ..	2 4 0

The above statement will show that the earnings of three members (1 male, 1 female, and 1 boy) of a family are hardly eight annas in a working day of 12 hours. It may be mentioned that he has to spend one day in the market to dispose off the oil and if the oil is not sold, he has to stop working, as he finds it difficult to raise loans to keep a stock. In the monsoon, sometimes they have to keep ghanis idle because of heavy rains. Taking all these factors into consideration the income of the Teli will not be more than Rs. 150 per year, including wages or profit derived from agriculture. The income is meagre for the maintenance of a family and for carrying on his trade on a large scale with a good margin of profit. He has to borrow money sometimes to buy oil seeds in many cases to meet large expenses such as marriage, death etc. In

Menhdiwala we found that in repayment of such old dues, a younger brother of the debtor had to serve at the sahuksar's place for many years.

The capital required for equipment is not much. The ghani is prepared by the local carpenter at a cost of Rs. 15 to Rs. 10 from khavi, kosam, or tamarind wood. The construction of the ghani is very simple. The ghani is so small that the height of the pestle is only about 3.6 ft. and the mortar $2\frac{1}{2}$ ft. The capacity of the mortar is too small to contain a large quantity of oil seeds. The time taken for a charge is comparatively very long and hardly three charges are taken in a day. The ghani is small in size and simple in construction, but the output is very low.

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Whatever oil is produced by the Telis is sold in the local bazar for local consumption. If the demand for ghani oil is increased by better marketing facilities and if the processes of production can be improved, prices are not likely to fluctuate very much. If all the requirements of oil are to be met from the local ghanis it may not be possible to maintain the present price level but since wood is available at a cheap price, the number of ghanis can be increased and the demand easily met.

As previously stated the extraction of oil is not done in a hygienic way. In many villages the outlet is not made at the lower part of the ghani and hence the oil is to be squeezed out by hand with a piece of cloth which is generally unclean. The earthen pots in which the oil is stored and brought to the market for sale are dirty from within and without as they are never cleaned at all. A thick layer of dirt soaked with oil is always found on them. With the spread of education and better taste for articles, people are likely to discard oil kept in such dirty utensils.

This industry leaves a by-product—oil-cakes—which is generally given to cattle. The oil-cakes from sesamum seed find an additional though limited use in the preparation of sweetmeat for human consumption.

The art of pressing oil is handed down from father to son. Even before adolescence, the son is taught to look after the bullock, to drive it when at work and help his father in many other ways. If an educated youngman desires to learn oil-pressing as is done in the villages, he will be able to pick it up within two months or so.

Seeds used—Tilhan, Sarsaon, Irandi, Alsi.

Process.—One charge consists of two to five seers of seeds

First when the seeds are washed cold water is added to make the seed wet. After this also, cold water is added at intervals. The quantity of water varies from 5 to 30 tolas but the time between these intervals is not known to them.

They only know empirically that they adjust the time according to the condition of the seeds. They generally put the water at one time.

After about an hour and a half they commence stirring. Afterwards they stir for

about two or three more times and then stop stirring thus allowing the oil to come through the pipe below.

While pressing the charge, one man sits on the weight beam. The weight consists of the person sitting on it and about half a maund more of stones, etc. At intervals the person running the ghani gets off the weight beam with the belief that he is thereby giving relief to the bullock.

There is no trench for the bullock to walk. The rope tied to its neck comes not parallel but at an angle to the ground.

The time taken per charge varies from three to four hours. Due to this, the oilmen are hardly able to complete three charges in the day. Generally they complete only two charges per day.

The percentage of oil extracted is only 25, though in a few cases some are able to extract 36 per cent of oil.

The weight over the weight beam being little, the pestle being small about three to five feet long and weighing not more than 20 seers, the pressure for the extraction of oil is insufficient, consequently oil is not fully extracted with the result that the cakes are thicker than they ought to be.

Cakes of all kinds of seeds are given to animals as fodder. The price of one seer of cake varies from 2 pice to $2\frac{1}{2}$ pice only. The oilmen give the powder of the cake to their bullocks and sell away the whole pieces to others.

With the sole exception of sesamum, cakes are not used for eating purposes.

The industry is dying out gradually. The difficulties of the Telis are many—

- (1) Due to the lack of financial resources they are not able to stock oil-seeds for the year in the proper season.
- (2) They borrow or buy seeds at the local market where the prices are generally high, and thus the margin of profit is diminished.
- (3) When they borrow money, or seeds from the sahuksar, they have to pay a high rate of interest ranging from 24 to 75 per cent. If the Co-operative Bank or the sahuksar advances money on a long term basis (say about six to eight months) at a low rate of interest on personal security, there is a chance for the revival of the industry.
- (4) Financing is not such a difficult problem as the competition from mill oil imported from outside.

If the industry is to thrive in future, some kind of restrictions will have to be put on mill oil. Increasing the financial stability of the Teli will enable him to make a good sale on credit also.

Propaganda in favour of ghani-pressed oil is essential and especially in favour of better and bigger sized ghanis and strong bullocks so as to increase the production. As is done in Maganvadi, a person should be able to run two ghanis simultaneously and thereby earn more. The old system of buying the oil seeds by the consumers themselves and getting them crushed in the ghani should be revived. The utensils used for storing the oil should be kept clean.

(4) **Gur-making.**—Gur-making is carried on in some villages of the district. Though the demand for gur is great, the cultivation of sugarcane is not done on a large scale, the reasons being:

- (1) the unsuitability of the soil,
- (2) the lack of financial resources to cultivate sugarcane and wait till the crop is raised and the gur manufactured.

The wide fluctuation in the price of gur greatly affects the cultivation of sugarcane. Last year the price of gur had gone down to the low level of 15 to 20 seers a rupee. Because of this many agriculturists were ruined and many stopped the cultivation of sugarcane this year. Market prices outside the district have now gone up and gur is now sold at five to seven seers a rupee.

Whatever gur is produced in the district is locally consumed and some gur is imported from outside to meet the demand. A taste for refined sugar is created in the town and big villages but in the interior of the district, people have a great liking for and appreciation of gur.

The Balaghat district, especially Lanji circle, is famous for its gur manufacture, so much so that the Agricultural Chemist to the Government of India had to remark as follows:—

“The juice of the cane at this village (Lanji) was not only far superior to any met with in the other villages, but was better than any I have met with in India; and was as good as or better than any other that is produced in other countries.”

(Settlement Report.)

Although the district is highly praised in respect of gur-making, there are still many farmers who do not manufacture gur of high quality. Of course, though this discrepancy may be ascribed to geological reasons to a large extent, the improved method of gur-making, if taught to them, would fetch them better prices for their products. In this connection I would like to mention that Sjt. Abbaji, a public worker of Lanji, has interested himself in gur-making and produces a very good quality of gur. He uses various things such as bhindi, saji khar, etc., to purify the gur, while it is in the process of boiling, and thus produces gur which is white and crystalline like sugar. He has been able to sell his produce at a higher price. The inability of the farmers to improve their methods of manufacture mars the quality of their gur. Gur is used as an article of food, and also in the distillation of alcohol, the use in the latter being very negligible. There is no special community or caste engaged in the manufacture of gur, but those agriculturists who cultivate sugarcane, manufacture gur too. The person who sits near the pan to see and test the gur is supposed to be a skilled man in the art, the others just get the cane crushed, prepare the kiln, and when the gur is ready they put it in moulds. As the cultivator himself is the gur manufacturer, it is difficult to give the separate earnings of gur-making. The following figures will give a rough idea of the net profit gained in

the cultivation of sugarcane and in the manufacture of gur:—

<i>Expenses.</i>		Rs.
Land revenue	...	3
Irrigation	...	3
Ploughing	...	20
Seedlings	...	30
Planting	...	5
Fencing	...	5
Six months operations	...	20
Miscellaneous, watching, etc.	...	14
Total	...	100
Gur-making at Rs. 2 per maund		40
Total	...	140
Profit		100
Total	...	240

<i>Income.</i>		Rs.
One acre of land will produce about 40 maunds of gur—		
Forty maunds at Rs. 6 per maund		240
Total	..	240

The following gives in detail the expenses for preparing 80 seers of gur:—

	Rs.	s.	p.	
Bullock pair one	...	1	0	0
Four persons' labour	...	0	12	9
Other expenses	...	0	3	3
Total	...	2	0	0

The tendency to grow sugarcane of thinner varieties is growing among the agriculturists on the ground that these will grow with a small quantity of water. But it is found that the price of this variety of sugar is lower neither does it produce the best quality of gur.

Improvements in the methods of manufacture have been effected. Due to the propaganda carried on by the Agricultural Department, iron machines have been imported to crush sugarcane. There are two advantages in this—

- (1) More juice can be extracted.
- (2) The time taken for crushing is less.

As people are now growing sugarcane of thinner variety, it is necessary to use the iron machine, because the wooden machine does not extract its juice properly.

The cost of the equipment will be as follows:—

	Rs.	
Iron cane crusher	...	150
Iron pan	...	30
Pots, laddle, etc.	...	5
Total	...	185

The agriculturists themselves take the gur to the weekly bazars for sale. Most of the gur is consumed by the village people themselves. In the bazar, they have to pay half an anna per head-load as fees and three to four annas for the cart-load.

There is no subsidiary industry arising out of gur-making. Formerly when sugarcane was crushed in wooden machines the stalk of the half crushed sugarcane were used for

making huts. But now as most of the crushing is done by iron machines the crushed stalks are used only for burning purposes.

The art of gur-making is simple but it requires a thorough knowledge of the formation of "kani" at the time of boiling the juice as over-boiling or under-boiling will spoil the whole preparation thus causing a waste of about Rs. 15 at a time. In regard to this industry, as there is great scope, the cultivation should be increased. The Government should provide facilities for irrigation and banks and sahukars should provide loans for longer periods. The marketing of gur should be well organized so that great fluctuations of prices do not occur.

5. Bee-keeping.—There is no industry carried on in the district as bee-keeping. But more than one-third of Balaghat district is covered with dense forests containing trees and plants rich in flowers, and extraction of honey, or rather exploitation of bees, is conducted in the forests in the crude old way. Due to the exuberance of nature, honey got from the forests is so plentiful and cheap that they ordinarily sell it at six or seven annas a seer while honey from bee-keeping centres is sold at Re. 1-8-0 per seer. Besides the unavoidable impurities due to the imperfection of the method, the quality is not all inferior. Therefore, there is great scope in the district for taming the khera or Indian bee and conducting bee-keeping as a cottage industry on modern lines. It may be better for the Government to select and train a few sincere workers who are employed in the Forest Department and also run some bee-keeping centres in the district so as to educate and give an impetus to the people at large. Moreover, the public should be educated to take honey as an article of food. At present only a small quantity is used and that for medicinal purposes the rest of the honey collected is exported.

Honey is generally got from the Baihar tahsil and the people who collect it are called "Baigas". About 200 tins of honey are exported yearly from the Government forests and the forests given to Messrs. P. M. & Co. on lease for taking honey.

6. Pottery Work.—The "Kumbhar" community has been making earthenware from time immemorial. They are distributed in almost all the villages of the district. We found them in Katra, Patharga, Paraseoni, Balaghat, Samnapur, Lamta, Rampaily, Manegav, and also in six or seven villages in Hatta.

In this district there is no factory for the manufacture of pottery on a large scale, but yet the demand for the Kumbhars' utensils has decreased greatly owing to the importation of China clay, German silver, copper, brass, and aluminium vessels. Not only are these more durable, attractive and handy but they also satisfy some false ideas of prestige. The Kumbhars say that food cooked in earthen pots tastes better, is more healthy and hygienic, that eatables can be preserved longer in mud utensils and that in these water can be kept cool in the summer. These are points in favour of their goods besides the advantages of production.

Kumbhars have also many other obstacles in their work, e.g., taxation. Cost of production and transportation have increased but yet the prices are forcibly kept down and the people who deal in it have grown very poor. Due to these reasons the sales are only one-fourth of what they were in former times.

In olden days, the cost of transportation was only four annas per cart-load of firewood while it is six annas at present. They usually get mud from the fields of the malguzar or zamindar and for that they have to pay one rupee for five cart-loads whereas in the past they used to give only some utensils to the owner of the field but now it has come to hard cash. In a week a family of five members produce vessels for Rs. 5 and then take them to the market to sell. Of this, wood will have cost Re. 1-4-0, mud about eight annas and sand, four annas. They will get only two to two and a half rupees a week for their labour if all their articles are sold. They do pottery work only 10 months in a year and while during the remaining two months when it rains, then they go to the fields as labourers.

The Kumbhars, just as other communities, are not making any improvement either in their implements or in their technique of production. They are not also having any variety in the vessels produced either, to make it more attractive. Malka, handi, kadhayit, gamela, gangal, chimni, and gunj, are of some of the different kinds of vessels they make. They also polish some of their vessels with a particular kind of mud that they collect themselves.

Their instruments are all simple and will cost only about Rs. 3 to Rs. 4. One rupee for the rotating wheel, one rupee for the moulding stone, one rupee for the kiln, and three annas for three wooden hammers and five annas for the chipdi to give the pots a finish. Their boys begin to work at the industry at the age of seven or eight and become good workmen when 13 or 14.

Some improvement in their instruments will be of great benefit to them. For example, they have to turn the wheel by hand for three or four minutes and then when the wheel revolves at a good speed they mould vessels with the mud on it. But after four or five minutes the wheel stops and then they have to leave moulding the utensil and begin rotating the wheel again. If some simple device can be found by which they can rotate the wheel with the feet and mould with the hands, much time can be saved as well as better attention paid to the making of pots.

7. Brick- and Tile-making.—These industries are carried on in many villages in the different tahsils of the district. Lamta, Dadia, Waraseoni, Mohediwada, Ghelava, Lanchi, Gidi, Balaghat district, Manpur, Bhua and Hiri are some of the important places where bricks and tiles are being made in plenty. Due to the change in the outlook of the people and the desire to adjust themselves to modern conditions, many have taken a fancy for tiles in place of leaves and grass for the roofs of their houses. Also, many new buildings are being constructed in

the towns and their suburbs which also contribute to a greater demand for tiles and bricks. Therefore, it can be safely asserted that the industry has grown in recent days.

There are, however, a few important factors which have a deleterious effect on their expansion. Factory-made tiles are being imported into the district and the Government seems to have made it a point to buy only such tiles for buildings although hand-made tiles may be cheaper. Further, up-to-date buildings on the western model are being built without slanting roofs but with flat concrete roofs.

At present there is no particular community as such that is engaged in these industries. The "Kumharas" used to do it though at present only very few of them are engaged in it. Their tiles, perhaps due to their greater durability, being made comparatively slowly on wheels, are costlier and hence people buy the cheaper ones costing about Rs. 2-8-0 per thousand.

Tile-making.—The process is easy. Some six or seven village-potters form a partnership and all of them work in a small field nearby and make tiles. Sometimes some wealthy villager or malguzar also owns such small factories. Mud is dug out from the field trampled and then made into flat tiles in wooden frame. They are then partly dried and bent in the usual hollow semi-cylindrical form, after that they are fully dried in the sun, and then collected, arranged and burnt in the kiln. The instruments required are made then and there and cost only about Re. 1-8-0.

Mud is ordinarily got from the fields of some malguzar or zamindar and that has to be paid at about Rs. 4 per year. About six persons work in a unit and they can produce about 1,500 tiles a day. Paying them at two annas a day the cost of 1,500 *kacha* tiles works out to twelve annas. At that rate they can manufacture about 90,000 tiles in two months. The cost of labour for it comes to about Rs. 45.

Wood for burning it costs about Re. 1. For drying and arranging the tiles in the kiln, the labour of 20 persons is required for eight days for Rs. 20. Thus the cost of production of 90,000 tiles works out to Rs. 66.

These are burnt in the kiln for about 15 days and then allowed to cool for another 15 days. They are then sold from the kiln itself, those who buy taking it over from there. They are sold at about Re. 1-4-0 per 1,000 allowing 10,000 for breakages, the remaining 80,000 tiles are sold for Rs. 100. Thus, there is not much profit in this industry but the coolie gets paid for his labour at about two to two and a half annas a day.

Brick-making is also carried on side by side with the other industry. The process is simple and the instruments are made locally which consist of only a wooden frame, costing about annas eight. For making one lakh of bricks, labour charges come to about Rs. 150, mud about Rs. 5, wood Rs. 100 and grasses and other fuel Rs. 12-8-0. Arranging bricks and wood will cost Rs. 75. Thus altogether the cost of production of a lakh comes to Rs. 342-8-0. About 10,000 bricks may be allowed for breakages and other damages.

The remaining 90,000 are sold for Rs. 450, i.e., at the rate of Rs. 5 per 1,000. This is done in two months and hence the profit may be taken to be about Rs. 100 for the whole.

These two industries are conducted throughout the year excepting in the rainy season, i.e., about eight months in the year. Their sale is mostly local, i.e., within a radius of eight to ten miles from the centre. These industries can be spoken of as thriving when compared to the other cottage industries but they are also to be protected from the competition of the factory produced goods.

8. Handloom weaving of mill yarn.—Handloom weaving is carried on in this district from old times, though cotton is not grown in this district. This industry was flourishing before the advent of mill yarn and mill cloth. Raw cotton used to be imported from other districts especially Nagpur and some districts of Berar by "Banjaras" carrying the goods on camels or bullocks. The ginning and carding were done by local "Pinjaras" and they used to sell their slivers to spinners. There were some families (Katayya) in the village who, after weaving, would sell the cloth to consumers. Mill yarn being cheaper weavers began to purchase that. Other factors also replaced the use of mill yarn. It is more even and is available in large quantities. Credit facilities provided by the village merchants also induced them to do so. These credit dealings caught the weavers in the clutches of the sahukar, and he now began both to dictate prices of the mill yarn, and to buy up cloth in payment of old dues.

The demand for hand-woven clothes has gone down, since large quantities of mill-cloth are imported every year. Mill cloth caters to the tastes of townspeople and the villagers also have copied the use of fancy, fine and flimsy mill cloth. The women folk who have to do hard agricultural work still purchase the old fashioned "saris" woven by local weavers. There is a small demand for plain cloth, generally for village shirts and "turbans" but that too is decreasing as the mills are weaving cloth of 12 to 16 counts of yarn to suit village tastes. We have received complaints that mill cloth is not even half as durable as hand-woven cloth. So from the point of view of durability of cloth, people say that hand-woven yarn is much better.

There has not been much improvement in the process of weaving. The same old loom with a hand-shuttle is used mostly, though in some villages, the fly-shuttle has been introduced and this has increased production 50 per cent. It does not require much capital to adjust a fly-shuttle to the old loom, but the orthodox weavers are against using the fly-shuttle on the ground that they had to suffer from keen competition with the weavers using it. Of course, this improved loom is not useful when silk borders with designs are to be woven into saris, since the shuttle has to pass through the yarn by a special method.

The communities engaged in this profession are called Gadwalis, Kostars and Mohars. They are all Harijans. In the

family one person (the man) is skilled and there will be two or three women or children to help him in the process of warping, sizing, reeling, etc. The industry is slowly becoming uneconomical, as the demand for such cloth is going down. Even if the whole family works for two days, to prepare one "than", it will not yield a profit of more than four annas. Most of the weavers subsist upon this industry only, as they do not possess lands to cultivate. Even though the margin of profit is very low, they have to stick to this industry, or starve.

The raw material yarn is generally bought on credit from the local sahuakar, and the dyeing of the yarn is done by "Khatris". Old designs and borders are generally woven without much improvement in them. Looking at the texture, however, we have to admit that art and craftsmanship are both there, and that if weaving is discontinued, the art is sure to die with it.

The capital required for equipment is about Rs. 20. The looms are generally imported from Nagpur, but repairs are done locally. The art of weaving is complicated and it will require more than three years to learn it.

This industry needs special attention. In every village we found a number of houses of weavers. The great problem is the competition of mill cloth. The competition of mill yarn with hand-spun yarn has taught a lesson that the latter will yield to the onslaught of the former. In the same way the mill cloth is taking the place of hand-woven cloth. So long as the weavers use mill yarn, the price of the cloth produced will depend upon the raw material purchased. It has been found that the Marwari and the sahuakar dictate prices and the weavers are working as slaves without any sufficient remuneration. The income of the weaver is never more than three annas a day for a family of three to five members and one can imagine how these people keep their body and soul together. Unless the whole fabric of present day economics is changed, there is no hope for this class of artisans to get better wages. The weavers should be made self-supporting as regards raw material and finance. Ways and means should be adopted to stop mill yarn coming in to the village.

At present the mills generally weave yarn above 20 counts for their own use, and yarn below 20 counts is produced to be sold to weavers. Leaving aside the question of town and city people, the villagers need rough and coarse cloth when they are carrying on agriculture and other subsidiary industries. The fancy, fashionable and flimsy mill cloths may be confined to the cities. The question is to bring the whole industry of hand-weaving (from the process of ginning) outside the range of the competition of the mills. Even today, hand-woven cloth from mill yarn has withstood the competition of mill cloth. It only requires some assistance from the Government and some check on the free entry of lower counts of mill yarn into the villages. If some such relief is given to the weavers hand-weaving can again thrive. Even at present there are plenty of

weavers who can supply the demand of the whole district for clothes. Fifty years before it was so, and even now about 50 per cent of the clothes worn by the villagers are hand-woven. The question of finance assumes only a secondary position to the competition of mill cloth. If the goods produced by the weavers are disposed of quickly by better methods of marketing, the financing of the industry is not so difficult. Today because they have not been able to dispose off the clothes they have to borrow money from the sahuakar to buy yarn and the necessities of life at the high rate of 25 to 50 per cent interest.

Some years before the financing of the weaving industry was tried by the local authorities but the experiment was rather unsuccessful. It is reported that weavers did not pay their dues in time and so the enterprise had to be discontinued. Even if marketing is organized some financing will be needed by the weavers. If the sahuakars lend money at lower rates of interest, say at about 6 per cent to 12 per cent, it will help greatly. In the absence of such an agency, the co-operative bank may extend its activities to the field of industry and help in both financing and marketing.

9. Niwar-making (Cot Tape Weaving).— In villages near about Kirnapur in Balaghat tahsil, this industry has been carried on since old times. Formerly they used to weave hand-spun yarn, but due to the import of cheap mill yarn and the facilities provided by the sahuakars for purchase on credit, hand-spinning disappeared. As a matter of fact this industry requires yarn of the lower counts about 3 or 4, and hand-spinning can serve the purpose equally well. Niwar-making is now a dying industry, the reason being that there is no market for the produce. In the competition of the mill niwar is not there. The real cause is that as the purchasing power of the people has gone down and as niwar is an article of luxury, the malguzar and well-to-do people have substituted strings of fibrous materials for cots instead of niwar. Formerly all the niwar produced was sold in the local markets, but the local demand having disappeared, niwar-makers have to go to Nagpur, Hyderabad, and other distant places to dispose of their goods.

There has been no improvement in the process of production but the present craftsmanship is sufficient proof of the skill of the worker. The art of weaving of borders, are so complicated and attractive, that we have to appreciate the workmanship. When once the warp is arranged, the process of weaving is quite easy. The worker has to take care in moving the lower paddle at the proper time when pulling the weft. Speed in the industry is also required to a great extent, otherwise the output will be very low. Even women and small boys can weave this niwar, as generally, there will not be any breakage of yarn. The method of weaving is the same as in jails; some method of increasing speed may help the weavers.

It is difficult to give the earnings of skilled and unskilled labour. A bundle of yarn costing about Rs. 3 will produce 80 to 90 yards of niwar in a week. This will be sold

at Rs. 4-8-0 at the most. So the family barely earns Re. 1-8-0 per week. But as previously mentioned, they have to go to distant places to sell their goods and they have also to pay high interest charges to sahu-kars for the yarn borrowed, hence the margin of profit will be little.

When they take niwars to be sold in the bazar they have to pay a stall fee. Much of the marketing is done outside the district. At Narayantolla, we heard that some of the people have gone to Nagpur and other places, since three months and have not returned yet. Generally each man takes goods worth Rs. 100 to Rs. 150 with him and when he comes back much of the amount will have been spent in travelling and other expenses. They have also to pay an octroi duty of Re. 1-4-0 per maund as municipal tax in the town where they go to sell their goods.

There is great possibility of increasing production if the demand increases. Though at present, they are not fully engaged in the trade, improved marketing facilities may help them to employ their time fully.

It will take fifteen days to learn the art.

One of the reasons for the decrease in the demand for niwar is that the jails produce them in large quantities and sell cheap, with Government assistance.

The prospects of this industry are not great unless the standard of living of the masses is raised. Towns and cities afford markets which can be organized by co-operative buying and selling. Some competent salesmen should buy up the niwar produced by these people at reasonable rates and open Bhandars in towns and cities. These persons should either advance money to the weavers for purchasing yarn or should provide the yarn themselves. In cities people use spring cots these days and these have replaced niwar to some extent. Even the Public Works Department in the district have supplied the rest-houses with spring cots. It will be better and cheaper if the Government sees to it that, as far as possible, village-made articles are purchased for their use.

Carpentry and Blacksmithy.—These two industries are allied to agriculture in that the carpenters and blacksmiths supply the tools and implements of agriculture. The agriculturist pays them in kind for services rendered. They prepare other articles of household equipment also which they generally sell in the bazar, e.g., boxes, doors, carts, cots, spades, pans, etc. The articles produced by them are very cheap and if marketing is organized, they would fetch better prices. In the case of carpentry, there is not much competition as wooden goods are difficult to be transferred from one place to another, though in many cases wooden boxes have been substituted by steel trunks. It has been difficult now-a-days to get wood cut cheap but at the same time the carpenters have had to reduce the prices of the articles as the purchasing power of the people has fallen. A carpenter is now able to earn hardly eight annas a day. The blacksmith's plight is much worse, as people are now buying ready made tools.

Both the carpenter and blacksmith have now formed the habit of purchasing foreign-made tools for their own use.

These two industries need an organised market. They also need to introduce greater variety in production in order to cater to the needs of towns and cities.

10. Silk-weaving.—Silk-weaving is carried on mainly at Mahendiwade in Waraseoni tahsil. There are about 10 families who are engaged in this occupation. They generally make silk borders of saris or use silk thread as well. There are about three families who weave silk only. The demand for silk saris is not great now-a-days. As a matter of fact, silk saris are not for daily use, and once purchased they last for about 10 to 15 years. Generally at the time of marriages, silk saris are purchased. When the malguzars were economically sound, they used to purchase them in large numbers. Besides, silk saris are now imported from Nagpur and this also has decreased the demand for hand-woven saris to some extent.

The raw material, silk thread, is supplied by the local merchants. They purchase the saris from the weavers at about Rs. 25 each, of which the cost of the silk alone comes to about Rs. 20. It takes about three weeks to weave a sari so the wages which a weaver earns is not more than four annas a day. The artistic design, and the minute details to be carefully attended to, should fetch higher wages, but the decrease in demand has greatly reduced the profit of the weavers. The same sari is sold by the merchants at Rs. 27 or so and the profit will be Rs. 2 per sari. Of course he has to take the responsibility of finding a market and sometimes he has to keep the stock unsold for months together.

The raw material, silk yarn, is imported from Japan and other countries. The yarn is dyed at Nagpur and then sold to weavers in different places.

"Kosa", an inferior variety of silk, was woven by a particular individual some 30 years before, but that man is now dead and his son does not know the art. He used to buy "kosa" at Rs. 2 or Rs. 3 per thousand, and prepare "Kosa", silk thread, locally with a special charkha. A week's time was required to spin yarn out of 1,000 kosa. The cost of the equipment is about Rs. 10. The process of thread-making is very delicate and special care is to be taken that no knots remain in the thread. The kosa silk was generally used in preparing the borders of saris, but now-a-days the demand for such thread has gone down because of the competition of foreign silk, hence the poor man was not able to make an income out of it to meet his family expenses. He had to incur a debt to carry on this trade but he had no means to repay and, in utter dejection, he had decided to give up this industry altogether. It is a pity that even in brighter days, this industry was carried on only by one family.

Silk-weaving suggests that in olden times sericulture was practised. Due to the advent of ready-made foreign silk, however, local production has ceased. The industry can only thrive if silk is locally produced. The financing and the marketing problems are

difficult because the demand for such cloth is limited and as such the weavers are helpless in the hands of local merchants. In any case, if the beautiful art is to be preserved, the Government will have to find out ways and means to market their goods.

11. Mat-weaving and Broom-making.—Mats are ordinarily made from sann hemp, "sind" grass, and "sunn" grass. These two grasses they get in the neighbouring forests and sann hemp is cultivated in fields for its fibres. An acre of land will produce 40 to 160 seers sann hemp according to the nature of the soil. The raw fibre is sold at two and half annas a seer, from which ropes, threads and mats are made. The sann hemp grown in one acre will yield Rs. 7 to Rs. 25.

Big and small mats are made in many places in the district. We noticed it at Murri, Pathri, Dharapuri and several villages. They are used for spreading underneath beds, in bullock carts, and as carpets on floors. A mat of 8 yards in length and 1½ yards in breadth and costing Rs. 4 requires the labour of three men for eight days and fibre worth 10 or 12 annas. Hence the labourers get about two annas a day as wages.

Though this industry is struggling for existence, it is not getting the importance it deserves. By coloured printing and designs, it can be made much more attractive and can be used as carpets on floors.

Palm trees are very few in the district and hence mats from those leaves are not made but grass mats are made. A mat 5' x 4' costs only one and a half annas. The grass of course he gets for nothing. Ordinarily women are engaged in it and they seem quite satisfied with those wages.

Brooms and small ropes are also made from the "sunn" and "sind" grass. These ropes are very thin. Since they are not strong, big ropes are not made and these thin ropes are used only for cots and tying cattle, etc. They cost only one pice per ½ lb. Brooms are sold at two per pice and those who make them get about an anna and a half per day. These are all made only for local consumption.

12. Rope-making.—This is an industry which has great potentialities in the district. It is at present carried on in almost all the villages and especially in the villages of the Bahar tahsil since it is more jungly. Ropes, big and small, are made from the barks of some trees, some creepers and some grasses. "Bokkary", "Aloe", "Khajoor", and "Bager", "Mohur", "Sunn" and "Kusum" are some of the examples of trees, creepers and grasses used for the purpose.

Ropes made from the barks of some trees especially the Mohur, is extraordinarily strong even stronger than coir. They are also made and sold very cheap. The forests contain these trees, creepers and grasses in abundance. A strong rope which is 30 feet long and ½ inch thick, which can very well be used for drawing water, costs only two annas. Those who are employed in this get one and half to two annas a day for their labour. Women generally follow the trade.

At present the ropes are made only for local use and are sold then and there, but

it is an article worth exporting for it is available in abundance. There should be some factory near the forests where these barks could be brought and ropes made by villagers in large quantities. This can be run on the model of coir factories in Travancore and other coastal regions and will be very paying. It will then be a great boon to the villagers.

13. Tanning and Shoe-making.—The history of this industry can be traced from the origin of human society. As that society developed it has undergone many improvements but now progress is at a standstill. The cut-throat competition of foreign tanned leather is responsible for this and now the advent of shoes and other goods of rubber is dealing a death blow to the industry. The artisans are now on the verge of extinction.

This industry is exclusively in the hands of the "Chamar" community for years and now within these two decades some "Mochis" have come over here from the United Provinces and settled at Balaghat. The credit for keeping this industry alive goes to the former community whereas the latter depend upon the tanned leather imported from Calcutta, Cawnpore and other places even though they know the theory of tanning. There are about ten families of this community in Balaghat town whereas the Chamars are scattered, all over the district. Men and women alike are skilled in the industry, boys under 15 being the only unskilled labourers.

We were told that some ten years back, the "Mahar" community was responsible for flaying carcasses but that now the community has boycotted that work which has been taken over by the Chamars. The skin they get thus used to be shared by the kotwars of the village, and the owners of cattle, but now the owner's claims are nearly lost. In certain villages, even the kotwars are not claiming their right because of social reform, within the community. As a matter of fact under the law, the kotwar has no right over the skin of the carcass but because they happened to be flayers as well, they exerted and of some places still exert a customary right. Now that that work is done by the Chamars, they claim the skin and the customary right of the village kotwar is gone. This change has caused disruption in society because the Chamars by dictating their own terms place the owners of dead cattle at their mercy.

The Chamars as shown above, get raw hides and skins but dealers have spread a net work of organization and the Chamar is forced to sell his goods at the rate of Re. 1 per hide or skin. Thus the major portion of the tanned material is carried away to other places and what little is left for their own use is tanned by the country method. The other products flesh, bones, etc., are wasted and this wastage has helped the westerners to carry on a trade in bone whereas, if used, it could have fertilised their own fields. This year as a result of Government propaganda, people have begun collecting bones for their own use. Sjt. G. R. Valunjker of Nalwadi, Wardha, has laid down a scheme in this connection which the Provincial Government has

taken up. The scheme is to put the carcasses to their best use. It is expected that the industry will be able to hold its own and that the right of the owner will be restored.

Except for lime all the material required for tanning is in abundance in this district. The skin is first dried and then soaked in a solution of lime in a big earthen pot for eight to ten days. During this period they stir it, so that the chemical action on the skin may be uniform. The skin is then wrung dry of the water. The hair and flesh are then shaved off and then it is again dipped into a solution of "Avla" or "Dhawada" leaves to give it a yellow colour. To obtain a red colour they stitch the leather into a bag and put in a solution made of water and the powder of the bark of the yen tree and then the bag is hung up to let the water ooze out. This takes 48 hours at the most. The leather then taken out is tanned. The tanning material is found in the jungles of the district and the tanner has to pay only a nominal charge.

Shoe manufacture.—Ordinary shoe-makers do not require any costly establishment for their industry and the implements can be made locally. The total cost will amount to about Rs. 5 at the most. The establishment of the "Mochis" is more costly. They have [sewing machines, lasts and some improved tools.] With growing fashions Chamars too are feeling the necessity of improved tools and moulds which are not locally made but have to be brought from Gondia. They are also changing with the times and are improving their art of shoe-making and stitching. One old man at Balaghat told us that previously instead of these present-day iron nails, bamboo nails were used and that they were better than the present-day iron nails. But these days, they are not used nor does the present generation know how to use them. So also regarding thread, he said that these days they get mill yarn which they are using but that previously they were using hand-spun yarn or leather strips. These, especially the latter, were said to be more durable than mill yarn. So too, previously the lasts were made by local carpenters. [Shoes, slippers, chappals, saddles, mott and leather ropes are made for sale in the neighbouring market.] They prepare a pair of slippers within four hours' time, while some make even five or six pairs of chappals in a day. This requires the hide of a full grown animal. The slippers cost about ten annas a pair, and chappals about three annas a pair. Slippers being costlier few of them are manufactured though they fetch more. They have no marketing facilities. Besides they find that the attractive rubber shoes compete with their goods which consequently remain unsold at times. Needless to say that hardship follows. Flex and Batas and the chrome leather shoes prepared by the Mochis also compete with the Chamars' goods.

In spite of it all, these artisans earn a living wage and are not heavily indebted. Whatever debts they have are due to social functions, such as marriages and deaths, etc. They sometimes take to intoxicants.

14. Quarries and Fisheries.—There is not much scope for fisheries in the district. The Wainganga which is the largest river of the district, flows through the lowlands and even that dries up in the summer. There are a few rivers and streams and also some tanks but there is no lake in the district. Hence the fishes got are small in size and that too in small quantities for a few months in the year.

There is a kind of rod got from the jungles called "karka" which can be utilized in fishing. It is not much used at present. Fine fishing rods can be made out of it and exported to places where there is fishing to a great extent. The Forest Assistant Officer was telling us that good walking sticks can also be made of the same rod and so a promising industry may be started there from this forest production.

15. Poultry Farming.—This is an occupation which requires the minimum capital and attention but from which comparatively large profits can be derived. Though we found fowls being reared in some villages, generally speaking it is not common throughout the district.

For a rupee one can buy four hens and two or three cocks and by merely having a shed he can keep these. He need only see that they are in in the evenings and out in the mornings. Only occasionally need he do anything more for them. Ordinary country hen lays only about 40 to 50 eggs a year while poultry experts claim that the White Leghorn will lay about 300 eggs in a year. Even if it lays only 150 eggs a year which may be quite possible even in the most difficult circumstances, it is far more profitable to rear them than the country ones but they require much more attention and nurture than the villagers can give. Their feeding is also expensive.

Among the three or four good varieties of fowls the White Leghorn is the best suited for our climate and soil. By giving eggs or cocks to the villagers and inducing them to give up the local cocks the well-to-do villagers can rear this variety of fowls.

There are extensive fields surrounding all the villages and it is quite easy for the fowls to find food. So if the villagers can produce large quantities of eggs and find markets through co-operative societies or other means, it is well and good. The Deputy Commissioner of the district narrated to us his experience of how he asked one of his dependents to take to poultry farming and sell the eggs to the Deputy Commissioner himself. He even gave him a good variety of fowl. That man did it for a time but later due to some reason or other he abandoned it even though seemingly all went well.

Even if he does not find a market for his eggs it does not matter very much, because for one thing it costs him practically nothing to produce them. Besides 90 per cent of the villagers whom we have seen are living on polished rice and "dal" with perhaps two pice worth of oil a week. This means they only consume carbo-hydrates and hence their general health is poor. It is quite easy to speak of a balanced diet and ask them to take ghee, curds, milk and fruits but under

his present financial circumstances it is practically impossible for the villager to get a pie more from the budget for food. If, however, he keeps poultry he can have eggs and fowl for food both of which are very rich from the point of view of nutrition and inexpensive from the point of view of finance. It is stated that one ounce of egg emulsion is nutritively equal to six ounces of milk. Hence it is quite necessary and perhaps paying in cash for the villagers if they take to poultry.

16. Dairy Farming.—We have not been able to collect much information on this industry which is subsidiary to agriculture. One thing is clear, that in this district the number of buffaloes is very limited. So also the number of cows. The yield of cow's milk is very low; about one seer per day. Whatever ghee is produced is consumed in the villages by the well-to-do people of the villages, Balaghat town generally imports ghee from outside districts. In the villages the artisans and the poor villagers do not take ghee at all, except perhaps on festive occasions.

A breeding farm has been started by the Government at Garhi, in Baihar tahsil, and a good many stud bulls are sent out to the various parts of the district. Here the yield of the milk is about 2½ seers per day, but the main dairy produce is ghee which is sold at Re. 1 per seer. There are about 32 cows, 39 stud bulls and 212 calves.

17. Dyeing and Calico Printing.—This is also one of the industries in the throes of death. When handloom weaving itself is being strangled how can another industry which is only subsidiary to it get sufficient air to breathe?

We found this industry being carried on only at Langhi, Menhdiwada, Bakora and Lalberra. At Langhi, one Sudarshan owns a dyeing centre where about 15 to 20 people are employed per day. In the other places it is done in separate houses, a dozen houses being engaged in it at Menhdiwada and about half a dozen at Lalberra. It is mill yarn that is dyed and the dyes used are all German or Japanese. At Menhdiwada and Lalberra they use only red and black dyes, while at Langhi indigo and yellow dyes are also used. Kathories, Guaras, Charias and Kostas are the communities generally employed in it and they produce solely for handloom weavers.

At Langhi dyeing is on a big scale but all the processes are done by hand. The factory annually imports Rs. 12,000 to Rs. 15,000 worth of foreign dyes and deals with yarn worth rupees one lakh. They dye about Rs. 300 worth of yarn and on an average Rs. 4 worth of yarn can be dyed with dye costing rupee one.

The following is some of the data collected for black and red dyes at Menhdiwada in Waraseoni tahsil.

Black dye.—There are six houses engaged in this work at Menhdiwada and their industry cannot be said to be decadent. They import black German dye and mix it with chuni, powdered grain "chirota" and water. Three buckets of water, one pound of black dye, ½ lb. of chauna, and ¼ of a lb. of flour

of chirota are mixed well in an earthen pot. Six or seven pots like these are arranged and the yarn is put for about four hours into each pot in succession. One set can be dyed in one day.

A bundle of yarn 5 lb. in weight and costing about Rs. 3-14-0 is sold for about Rs. 5-8-0 after dyeing.

He gets the yarn from the sahuakar and gives its back, for which he is paid Re. 1-5-0 per bundle. Six workers are employed in one house, two paid servants, two women and two male members of the house. They raise an output of six bundles per day, but the amount of work done in a month or week depends on the orders of the Sahuakar. In the amount of one rupee five annas obtained per bundle, one rupee one anna goes for the dye and other raw material and only four annas they get for their labour. Thus for six bundles a day, six people get 24 annas or four annas per head as wages which is really considerable in a village area.

Red dyeing.—The process is different for the red dye. First the yarn is washed well, then dipped in castor oil for a day so as to absorb and fix the colour permanently. It is then trampled in water for six days and then put into the boiling solution of dye for eight days and afterwards dried. The margin of profit in the dye is almost the same as in the other case but the persons employed in it are actually getting more since they sell the yarn themselves to weavers or use it themselves. The dyers of black borrow money from the Sahuakar and hence they borrow yarn also from him to be returned after dyeing.

Trees.—Some 10 or 12 years ago local dyes were used to give colour to yarn. Sjt. Sudarshan, who is running a dyeing centre at Langhi, says he can make and dye most colours from local colours as he had been used to in the past since they were not shiny and attractive as foreign dyes so he had to abandon it in order to get better sales for his produce. The following information is collected from the museum as to the dyes got from the local trees and plants.

Name of tree or plant and botanical name with dye got.

Bark of Babul tree, *Acacia Arabica*—Black dye and brown dye.

Fruit of Mallot which is a red powder "Kemela", *Phillippinesis*—Red dye.

Root bark of Paribal, *Ventilago Madras*, Patna—Chocolate dye.

Bark of Hewar and stems, *Acacia Lencophone*—Red and black dye.

Sal bark, *Shorea Robusta*—Brown dye.

Neel Bark, *Indigofera Polchela*—Indigo dye (washerman).

Bark of Pipal, *Ficus Religiosa*—Pink dye.

Saj Bark, *Terminalia Tomentosa*—Brown dye.

Fruit Ghot Ber, *Zizyphus Xylopyra*—Black dye.

Besides these the flowers of dhawai, leaves of *Lawsonia alba* (Mahendi) for red dye, the bark of Palas and root of "Al" trees were commonly used for getting dyes, but now all these have died out and only exist as exhibits

in museums. It should be the work of the Research Department in University Laboratories to find ways and means of extracting all sorts of colours from our different local products and it should also be their endeavour to discover methods to keep them shiny attractive and durable.

18. Brass and Bell-metal wares.—This industry is carried on in Waraseoni proper. It is the ancestral profession of the Tamera community but now-a-days other communities such as Panchal and Sonar also have taken to it. There are about five families of Tameras who do the work of metal casting.

The alloy for the bell-metal and brass is imported by local merchants and they supply it to the Tameras. Copper is imported from other provinces, and lead from Malaya and Penang. The melting work is done by the Tameras.

The melting of bell-metal—(Kansa).—The quantity of bell-metal which can be prepared at a time is 16 seers. The two alloys—copper and ranga (lead) are placed in an earthen utensil in the proportion of 100 : 27, and melted for four hours. When they have melted well the resultant is bell-metal. The hot liquid is poured into small pits containing a layer of sand to cool and then it is beaten into sheets.

Brass is also melted in the same way, only the alloys are different, i.e., copper 80 parts and zinc 45 parts.

Only thalis are manufactured from bell-metal while from brass, kadchi, ganj, gangal, thalis and katori are manufactured.

The present state of the industry is bad because factory-made goods imported from outside compete with the utensils prepared locally. The attraction of the factory utensils is that they are well polished and that many varieties are available. It is difficult to give as much polish to the hand-made utensils.

Generally in one shop, six to eight labourers will be employed who do the unskilled work. The skilled workman is generally the owner of the shop himself who is a Tamera by caste. With the help of such unskilled labourers 16 seers of metal costing about Rs. 19 can be turned into utensils costing about Rs. 25. They are paid between six and eight annas a day, so taking seven annas as the average labour charges will come to Rs. 3-8-0. Rupee one will have been spent on fuel and other miscellaneous items. The skilled man or the owner of the shop therefore makes Re. 1 or Re. 1-8-0 per day. The work is done only five days a week, as the labourers become too tired and require a day's rest, and one day has to be set apart for shopping. Hence the Tamera's margin of profit is eight annas to Re. 1 for goods worth Rs. 25. These dealers also sell factory-made utensils and as it is much more difficult to buy metal and then get the utensils prepared locally, they pay more attention to push the factory goods in the market. It is estimated that in Waraseoni utensils worth about one lakh of rupees are sold every year, out of which only worth Rs. 1,000 are manufactured locally.

There is great scope for the development of this industry, as the demand for metal utensils is on the increase. Educated people of the higher castes are afraid of the hard labour involved in its production and they search for sedentary occupations. The industry requires great skill in the melting of alloys and also in the actual manufacture of utensils.

Most of the instruments are locally made by blacksmiths and the capital required for equipment is Rs. 50. If the utensils manufactured are sold locally and if there is a great demand for them, the industry can progress. If the factory utensils are taxed to a certain extent and if the local Tameras manufactured a great many varieties of utensils to suit different tastes, a person can easily engage eight persons and earn about Rs. 300 per year.

19. Lac Culture.—People in many parts of the district say that lac culture was there about 50 years ago, though only to a small extent. Now it has so expanded that in almost all forests lac culture can be found.

Lac is mainly found on the "Palas", "Kusum". Ber and Banyan trees also favour its growth, but in this district it is mostly found on "Palas". It is such a gregarious tree that it not only spreads easily but it allows no other tree to grow near it. A kind of insect takes its abode on the small branches of these trees and excretes gum-like substance which is called lac. It spreads to surrounding trees very easily and if one has to cultivate lac in a selected area of "Palas" trees he has only to take some branches of a tree having lac before the insects have flown out of their abodes, and tie them to some of the branches of other trees in the area. The insects will come out when full-grown and occupy that and neighbouring trees. This is called innoculating.

Lac for commerce is ordinarily collected while the insects are still in it. It is the blood of the insects that gives the yellow and red colour to the lac. If they are not in it, i.e., if they have flown out the lac will be black in colour. Thus it is we have coloured and black lac. In a year you get the lac crop twice. Usually the growth of trees is not visibly affected by the work of the insects though after a few years some trees grow weak and the insects will no more rear on them, since they cannot get sufficient building material from the tree. Two years' rest will then have to be given to the trees for the breeding of the insects to commence again.

Lac after purification is generally used for bangles-making, sealing wax, paints and varnishes, by dissolving it in methylated spirit, and as a plastic for making unbreakable and coloured vessels, such as, cups, saucers, etc. It is used also for linking together frail pieces of mica, as an insulating material in electrical works and ammunition and in a number of other things.

During the war and postwar years the price of lac had risen very high even up to Rs. 100 and Rs. 125 per maund. It was then a highly profitable business to collect lac and send it to outside countries, but now many of the European countries prepare synthetic dyes,

paints and varnishes or they are able to get it from other sources. The price of the purified quality is only Rs. 16 to Rs. 17 per maund at present. At the collecting place where it is taken in the original form prices are even lower, i.e., only Rs. 4 or Rs. 5 per maund.

Government forests and malguzari forests are taken by some individuals on yearly contracts for lac production. Those monopolists employ labourers to collect lac from the trees and pay them at the rate of two pice per pyali. One man will not be able to collect much more than five pyalis a day and so his daily earnings will only be about two and a half annas. Lac is packed in bags in a raw state and transported in bullock carts to Gondia where they are purified in small factories and sent to Calcutta. Gondia is a business centre in the Bhandara district where there are six or seven factories that buy the raw lac, purify it and send it to Calcutta.

The process of cleaning is quite simple. The lac is first ground well either in special chakkies or in iron cylindrical devices and the yellow or red powder separated from the stick-like black lac. They are then washed and dried in the sun. The black one is made in the form of big and thick "chappathies", while the red one is made in the form of hollow cylinders about 4" in diameter and 20 to 25 feet long.

One unit requires three persons for purification. One man sits at one end and continuously turns in one direction the cloth that is filled with lac, while another man sits at the other end which is near the fire and turns the cloth in the opposite direction. Due to the heat of the fire and to the pressure brought about by the turning, the lac melts and filters through the cloth. He then takes the lac and pastes it on a porcelain jar (about 10" in diameter and 2½ feet in length) filled with boiling water. A third man attends to the jar and spreads the lac on its surface by a piece of palm leaf. When it gets cooled a bit he takes out the sheet of lac, which will be about 2½ feet in length and a foot in breadth, and exposes it to the radiant heat from the fire at the same time stretching it to a length of about 6 feet and a breadth of about 4 feet. The thickness of the sheet is thus reduced to half a millimeter or less. It is broken into pieces when properly cooled and sent to Calcutta in parcels. The wages earned by the labourers vary according to the quantity of their labour. The man who sits near the fire will get nine to eleven annas a day, the woman or boy who turns it at one end three or four annas a day, and the man who extends it five to six annas a day.

There are 100 to 150 units like this in a factory from where they turn out large quantities everyday and send to Calcutta. More than half of the lac exported from Gondia comes from Balaghat district.

There is a vast difference in the prices of the raw product and the purified one. The raw lac fetches only Rs. 4 to Rs. 5 per maund whereas the purified quality is sold for Rs. 16 or Rs. 17. It is a pity that the villagers who collect it do not purify it then and there but export it to Gondia and are contented with the four or five pice they get for a day's hard

labour. In the whole district of Balaghat there are only two or three centres for purifying lac, one of which is at Somuapur. Facilities and a little capital should be provided for the villagers who collect it to purify it in each village.

We consulted some responsible men who know about the amount of produce from the district and the manufacture of lac in foreign countries, and they are of opinion that it is quite possible to start a factory at Balaghat. This is a first class example to show that we export all our raw material and labour and get the finished product. Even the Forest Department which is instrumental in sending out all the lac is getting its sealing wax, varnishes and paints direct from Calcutta. Therefore, it is up to the Government to start a lac factory to purify lac and produce dyes, varnishes and other lac goods in the district itself.

20. Bamboo Work.—Jungles and forests are in abundance in the district and the characteristic of these is that they are replete with bamboos. These bamboos are now exported from the forests in large quantities though some of it is consumed locally also to some extent.

Since the district forests produce so many bamboos, one may imagine that they can be got very cheap there, but that is not the fact. Somebody who goes to get bamboos from the forests, whether they be Government or other forests, has to pay one rupee for a cart-load. It will take one day for him to get to the forest and cut down about 50 to 60 bamboos. He has then to clean and pack them which takes another day. In a third he brings them to the market and sells them. Therefore it takes three days' labour of a man, two bullocks and a cart for which we can consider the payment to be one rupee. Thus the cost of taking 50 bamboos to the market is Rs. 2 or eight pies per bamboo and he sells them at nine pies or one anna per bamboo. The ordinary bamboo worker, since he requires only four or five at a time, buys it from this man, instead of going to the forest himself.

Thus the price he has to pay for the bamboo is considerably high and goods made with that raw material do not bring him much return. The Government should reduce the tax of one rupee per cart-load of bamboo, and give some more facilities for the bamboo workmen to get their raw material cheap.

At present, they are making varieties of things with the bamboo such as baskets, thatties, hoods and other parts of carts, door-frames, winnowers, sieves, etc. The importation of foreign and factory-made articles have not left this industry also in tact.

The advent of corrugated iron sheets, and window curtains of cloth have almost replaced the bamboo-thatties and floor mats. Only a few people are now using bamboo curtains for their doors. Winnowers and sieves are made even now but the wire sieves have almost ousted them. In fact, they can make very good sieves with bamboo at a nominal cost of one anna which will last a year. Sieves made of wiregauze cost about three annas but they last for two or three years. Thus, though in price and in use

there is not much difference between the two, people seek after the foreign made things, mostly because it has a better appearance and because it is fashionable.

The bamboo workers have to be taught to move with the times and to make fashionable things such as tiffin-carriers and the attractive and handy baskets with covers and handles, etc., which are made by craftsmen in other parts. Industrial schools may have to be set up or touring teachers appointed for the purpose. "Basodas", "Baigas", and "Khandras" are the three communities engaged in the industry which is carried on in most villages throughout the district. They do it throughout the year and depend solely on it for their livelihood. The demand for their products is decreasing and some goods such as 'tattis' they make only after getting specific orders.

21. Bidi-Making.—Bidi manufacture is unfortunately one of the most flourishing small scale industries in India at present. At Gondia which is the chief centre for its production in Central Provinces they get their raw material, tobacco, from Bombay and tendu leaves from Bilaspur, Chanda, Bhandara and Raipur districts mainly. There are about 35 companies manufacturing it, the biggest of them having a business of 15 lakhs of rupees per year.

In the Balaghat district it is not greatly produced. We observed it at Kherlanchi, Rampally, Kinnie, Rajgaon and a few other villages. It requires only a small capital to start a factory. What is going on in Balaghat is only some subsidiary work to the big concerns at Gondia. Bidi is made by putting cut tobacco pieces into a finely cut tendu leaf and rolling it up and binding it with a piece of thread. Tendu leaves are found in abundance in the jungles of Balaghat. So the merchants at Gondia come to different places in Balaghat where they get these leaves easily, start small factories there and produce bidis by importing the necessary tobacco. Tobacco is only rarely cultivated in Balaghat and so enough is not raised for the purpose. These Gondia merchants employ only local labour. The labelling, packing and sending to different places are all done at Gondia. Bidi-making is quite easy and one can be a skilled worker within a month. Men, women and children are employed in it and they get approximately four, three and two annas, respectively, for a day's labour.

There are 10 or 12 varieties of bidis according to their size and the amount and kind of tobacco used. The implements used are of local make except the yarn for tying and the paper for labelling, covering and packing.

All the bidis made are consumed in India. In all the villages we went, the villagers were helplessly suffering from want of money for their primary necessities such as, food, clothing and shelter. According to all medical advice the bidi is very injurious to the human system with its three great poisons nicotine, narcotine and prussic acid, and the bidi is evidently an unnecessary luxury. Therefore it is impossible for anybody to aid the industry, but at the same time to restrict production or to leave it to take care of itself in one district alone will not be a wise

policy especially when that one district offers a good market for the commodity.

That bidis by introducing a new type of smoking have adversely affected the Kumbhar's production of "chilams" also needs mention.

Tobacco, though not grown at present, can be very easily cultivated in the district and independent factories started there. Though at present only "Mohars" are engaged in bidi-making, other communities will also take it up if it is found paying. The initial capital required is not great.

22. Minerals—(Manganese ore).—The district is rich in minerals. Manganese, aluminium, iron and copper are found in varying quantities. But now only manganese is being extracted on a large scale. For aluminium which exists there as bauxite ore, there were requests for leases in the Baihar tahsil but as yet no work has been done. Mica is found in large quantities on the surface of the soil and at a depth of a few feet in Baihar but nobody has systematically worked it out as yet. Lime is produced there from lime-stone popularly known as "chun-kankari".

There are a large number of manganese mines in the district, e.g., at Bharweli, Ukwa, Katangi, Baihar, Tirodi, Samanpur and Gudma, but it is from Bharweli and Ukwa mines that the greatest quantity is extracted. The whole business is conducted by the Central Provinces Manganese Corporation, Ltd., which has a lease of 20 years. One-third of the export of manganese from Central Provinces is from Balaghat district.

Manganese ore is grouped into three classes of which the first class has 15 per cent of phosphorus. Purchasers pay three pice for every unit of iron present after a certain percentage, that is to say, that the presence of iron makes the ore of a superior quality. Large quantities of moisture present in the ore is not good though it cannot be avoided in small quantities.

The result of the analysis of the average ore in the district is as follows:—

- Manganese—50 per cent to 55 per cent.
- Phosphorus—0.5 to 0.12 per cent.
- Iron—5 to 8 per cent.
- Silicon—5 to 9 per cent.
- Water—Below 1 per cent.

The rest of the substance is combined with oxygen since the manganese ore is got as manganese peroxide. The table indicates that the quality of manganese got is excellent which is also evidenced by the following quotation from the District Gazette by C. E. Low, I. C. S., page 230

"The Indian ores are practically free from sulphur and arsenic, and the better class ores now being shipped from Central Provinces are probably unsurpassed among the ores of the world for quality."

Manganese is generally used for making an alloy of iron, copper and other metals, as an oxidiser in bleaching powder and some other products, for decolourising glass when in small quantities, also green and violet paints in pottery. Steel is made by addition of manganese and carbon to iron, having about 27

per cent of manganese and 4 to 5 per cent of carbon. Manganese is one of the most essential requisites for the preparation of war material.

Extraction of manganese ore commenced in the year 1889 in the district and the first load of 4,000 tons of manganese left Central Provinces in the year 1900. The total output in that year was 35,356 tons but since then the digging of ore has expanded greatly so that the total export of manganese from Balaghat district in the year 1937 was 399,532 tons, i.e., an increase of more than ten times the annual original output. In the beginning only the surface ore was extracted but now they are dug from depth ranging between 15 to 260 feet. The underground mine at Bharweli is about a mile and a half in length and the rope-way which carries the ore from Ukwa through jungles, hills, forests and fields to the Bharweli sending station, is about 20 miles in length and is the second largest in the world. Branches of railways from Raipur to Vizagapatam, Balaghat to Katangi, Tumsur to Tirodi, etc., have been constructed for the transport of manganese.

The process of extraction is just like the breaking up of rocks for metalling roads. Labourers with pointed iron rods make holes of about $1\frac{1}{2}$ " in diameter and 16" or 18" in depth, in the manganese rocks, fill it up with gelatine or gunpowder and ignite it. The rocks break up and fall to pieces. These are collected in small trucks and sent by rail to the cleaning place, where it is washed and the silica and mud removed and again sent by rail to the ports. If there is a rope-way it is thus sent from the mine to the cleaning place.

There is not much machinery used in mining except for the rope-way, pipe and railway. The digging, transport within the mine and cleaning are all done by labourers. On an average there are altogether 11,852 persons working per day. Women and boys only help in cleaning and transport. All labour in the mine is strenuous, dangerous and dirty, but fatal accidents are very few, only about one in the year. The labourers employed in digging get about 12 annas a day, while the others get four or five annas a day. Payment is made on the contract system according to the amount of work done. The figures given above are the wages they are thus able to earn per day. The treatment of labourers is far from satisfactory. There is no trade union or other labour union among the workers. They are given neither a pension nor a gratuity, nor is there any provident fund arrangement. When after a few years they are weak and disabled they are left to their own fate.

The manganese sold is all of the first grade. Though at some places they get some lower grades also, that is mixed with the better quality manganese and sold as first grade. One ton of manganese fetches about Rs. 30 now-a-days and the company makes a profit of 30 to 40 lakhs of rupees a year. The Company pays absolutely no kind of tax either to the municipality or to the Provincial Government or to the Central Government. They are even exempt from the income-tax since they are a British Corporation.

Since the export of the crude stuff itself is sufficiently paying, they make no attempt to purify it or to make finished products out of it. They annually export about four lakhs of tons of manganese of the best quality in the world. There is ample scope for the starting of a factory to make finished goods, which will employ many workers and thereby increase national wealth and prestige whereas at present they are only a drain on the country giving nothing in return. Coal is produced at Chanda and iron in many parts of the country. The Manager of the mines at Ukwa and Bharweli told us that to start a factory it would require a capital of about one crore of rupees and that the want of that capital was the reason why no such business was started. However it will be desirable to have only a state controlled factory run for the benefit of the people of the country and not a private one controlled by external agencies that pay little heed to the needs of the people. Hence we think it to be the duty of the Government to start a factory either in this district or at any central place for the product raised in the Chhindwara, Balaghat, Bhandara and Nagpur districts at the earliest opportunity. It is from these districts that we get practically all the manganese produced in the Central Provinces. At the present rate of excavation, the manganese in the mines will last only for about 40 years and if the rate is increased the period will be less. Therefore, every moment lost by the exportation of the crude ore means nothing short of a loss of thousands of rupees and labour for hundreds of men.

23. "Harra" (Myrobalan).—The district contributes more than 50 per cent of the total quantity of myrobalan exported from this province. Most of the "Harra" produced in the district is sent out of the province before they are even shelled. This process is partially done at Bombay and at Kharagpur, Bengal. An outside firm, Purushotamdas Mohandas & Co., has a virtual monopoly of collection. It has its agent Sjt. Mohunji Bhai, a big businessman at Balaghat, and he, in his turn, has his sub-agents at the different places such as Lanhi, Lamta, Lalbera, Baihar, etc.

They have taken the Government forests on a lease for three years for Rs. 39,000 while the Malguzari forests fetch Rs. 20,000 per year. Though "Harra" is collected from the forests at many places, it is obtained chiefly from the Baihar tahsil.

Harra is picked up from the ground in the forests and transported by bullock carts to different centres where it is broken and the shell which is about a quarter of an inch sometimes even less in thickness is retained and the seed thrown away or used as fuel. The shell is exported to Bombay and Kharagpur in bags by goods train. Harra is sold at Rs. 2-8-0 per maund while the pickers in the forests get only two annas per day. In the interior of the forests also where it is dangerous to work even during the day because of wild animals, they are paid only about three annas per day. About 25,000 people are employed in the collection and transport of harra in the district and Mohunji Bhai has an average business of

2½ lakhs of maunds of harra per annum. The picking however lasts for only three months in a year, since it is only during this period that the fruits are found on the ground.

About 95 per cent of the harra produced in the district is exported, the rest being kept for local consumption as medicine and as tanning material. It is from harra that the tannin extract used in tanning leather is made. Tannic acid which may be obtained by further purification of the tannin extract is used as an important constituent in the making of blue-black inks, as a mordant in the dyeing industry and as a source of making fast black dye in conjunction with copperas (green vitriol or iron sulphate). There is scope for starting a factory in Balaghat itself where a large number of the people of the district may be employed and thus save much national wealth. In fact, about 20 years ago there was a proposal made by some prominent people of the district to start a factory in Balaghat and then even collected the necessary capital, but then there was an uproar created by some mischievous persons that the extraction of tannic acid would necessitate the establishment of a tannery there, which in its turn would mean the slaughter of cows and other animals. Besides, as this was just after the Great War when prices of machinery were very high, the company had to be dissolved.

Since then conditions have improved and there are greater facilities in picking and transporting the seed, expert advice and cheap machinery. There is, therefore, greater reason to believe that a factory can be started now for the extraction of tannin from myrobalans.

24. Other Forest Produce.—The forests of the district which cover more than half its area are considered to be one of the richest in India. The area of Government forests is 272 square miles and the area of those owned by malguzars and zamindars will not be much less. Yet the exploitation of forest resources and the income therefrom is paltry.

Teak and sal wood as sleepers for railways and bamboo, lac, harra, honey and wax are the only important forest products collected. The Government gets an annual income of only Rs. 60,000 net from its forests. Lac, harra, honey and teak wood are all given on lease for small amounts, while the Government itself makes the sleepers required.

Sleepers are made from "sal" trees which grow in plenty in the forests and are transported by bullock-carts to a convenient place where they are sawn. They are then taken to the headquarters of the tahsil, i.e., Baihar, and from there transported to the Lamta railway station, a distance of about 60 miles. This transportation used to be done by bullock-carts, but they failed once to transport the timber in scheduled time. Since then all that transportation is done by lorries. It is not that there are not sufficient carts or that they are not able to transport them in time, but that once some difficulty arose and hence the right has been given to a lorry owner on a contract.

Sleepers are sold at Rs. 5 per broad gauge sleeper, and to Rs. 2-8-0 per meter gauge one. There is an annual output of 50 to 60 thousand sleepers or a business of one to two lakhs of rupees. It all depends upon the demand of the railway authorities. About 1,000 labourers are employed in it and all the sawing, cutting, and loading are done by hand. The cutters earn about five to six annas a day, sawyers six to seven annas and cartmen 10 to 12 annas a day. Cutting, sawing and transport are, however, not on the daily wage system but on a contract basis. About 600 cartmen are employed even now in the business and if at least half the work done by lorries is also given to bullock-carts, a very much larger number of them will be employed.

Mango is the chief fruit. Most of the product is locally consumed and the rest wasted. Since the variety is not good there is no export to outside markets. By grafting or planting new and good varieties, a good income can be raised. There are many other edible and medicinal fruits grown in plenty in the forest. "Imly" (tamarind), "avla", and cheronji the fruits of which are called "achar". This last has a sweet kernal inside which can be used in making sweetmeats and is sold in the bazar at six or seven annas per seer. These are almost entirely wasted now in the forests. Sometimes the contractors of "harra" smuggle hundreds of bags of these fruits and sell them outside the district. These fruits can be given either on a contract or the Government themselves can sell them or at least allow villagers to take them from the forests and sell them in the bazar.

Wild growths in many parts of the forests can be controlled by man by cultivating some parts since the soil is quite fertile and the climate suitable. We noticed that at Garhi a private man from the town cultivated a quarter of an acre of land in the interior of the forests. He had a well dug and grew tomatoes, cabbages, halda and "ghozars" there. From that small area he earned Rs. 33 last year and he expects to earn at least Rs. 8 more this year. The fruits produced were extraordinarily big in size. Vegetables, sugarcane, and orange trees can be easily cultivated in those areas and will be highly paying. Some private individuals should be enterprising enough for that and the Government should afford them all the necessary facilities.

[Most of the dyes, colours and gums can be collected from the barks and trees in the forest.] For example the *Semicarpus Anacardium* trees from which the washerman extracts his colour for marking clothes and the gum of Palas commercially known as "Khamarkhas" are found in plenty. Some research into this will make possible the collection of dyes, gums and resin in abundance from the forest area.

[All sorts of medicinal herbs, trees, plants, fruits and roots] are found in the forest but all is being lost at present. The villagers in the Baihar tahsil have a wonderful knowledge of many of these herbs. The Tahsildar of the place, a man educated on Western lines, narrated to us his experience while

he used to go to hunt in the forests. He told us how deep wounds were healed by some herbs in a few hours and how he was able to travel in the thick forest without any food or water for ten days except a peculiar fruit given by an indigenous medical man for that purpose, and how a small branch of a tree burnt for about ten hours on its own oil. It would certainly be beneficial to the world to know these things.

Prominent men in the district had been telling us that our country requires only Ayurvedic treatment for ordinary diseases and only for operations and a few major diseases do we require the Allopathic treatment. Ayurvedic medicines both for men and animals can be got in large quantities from the forest.

Firewood trees in the forests are now uncared for since their transportation charges are very high. By converting the firewood into charcoal they can be exported more easily. In fact in Bombay, Ahmedabad and such places they are using charcoal for fuel. The Government themselves had experimented once and the process would have

been successful had there been a demand for it at Balaghat. They were able to sell it only at twelve annas per maund at Balaghat, while at Bombay and Ahmedabad the price was about Rs. 2-8-0 per maund. If charcoal is transported from Balaghat to Bombay the charges will be very high. If the Government enters into an agreement with the railways and if they get a concession rate, the charcoal can be sold at a good margin of profit and much income can be had from that item.

The climate of Baihat tahsil is generally very cold and in winter water sometimes freezes. Therefore, it is a fit place for mulberry and sagga. The latter grows in the forest and it requires only a little enterprise for expanding its growth. About ten thousand lakhs of animals naturally or otherwise die annually in the whole of the Central Provinces. The hides of these animals are at present wasted though some are dried and exported in a raw state. There is great scope for collecting all these and conducting tanning and also making manure out of bones which can either be consumed in the district itself or exported to other places.

BALAGHAT DISTRICT

The following is a list of some of the trees, grasses, and plants found in the Balaghat forests and of the uses they can be put to :—

Serial No.	Name of tree or plant and its part	Botanical name	Uses
1	Nasbel : Bark	.. <i>Milletia auriculata</i>	.. For making strong ropes.
2	Marorphal : Bark	.. <i>Helicteres isora</i>	.. Do.
3	Lasora : Bark	.. <i>Cordia myxa</i>	.. Do.
4	Dhaman : Bark	.. <i>Grewia Titiaefolia</i>	.. Do.
5	Keoti : Fibres	.. <i>Ventilago Calyculata</i>	.. Do.
6	Chhind : Leaves	.. ..	To make baskets, mats, brooms, etc.
7	Munj : Fibre	.. <i>Sachharum munja</i>	.. Grasses for baskets.
8	Khus : Root	.. <i>Vetiveria zizanioides</i> *	.. Do.
9	Kaveet : Fruit	.. <i>Feronia elephantum</i>	.. Used to eat.
10	Tikhur : Tuber	.. <i>Curcuma spp.</i>	.. Used in Indian sweet-meats.
11	Baichandi : Root	.. <i>Dioscorea daemona</i>	.. Edible.
12	Phetra : Fruit	.. <i>Gardenia turgida</i>	.. Eaten in Central India.
13	Ber : Fruit	.. <i>Zizyphus Jujuba</i>	.. Edible.
14	Kusum : Seeds	.. <i>Schleichera trijuga</i>	.. Used as hair oil.
15	Gongal : Pods	.. <i>Cochlospermum gossypium</i> ..	Floss from pods used to stuff pillows.
16	Semal : Pods	.. <i>Bombax malabaricum</i>	.. Do.
17	Kans : Grass	.. <i>Saccharum spontaneum</i>	.. Do.
18	Ak : Pods	.. <i>Calotropis gigantea</i>	.. Do.
19	Indajava : Pod	.. <i>Holarrhena antidysenterica</i>	.. Do.
20	Jamun : Bark	.. <i>Eugenia Jambolana</i>	.. For tanning.
21	Amaltas : Bark	.. <i>Cassia fistula</i>	.. Do.
22	Rohan : Bark	.. <i>Soymida febrifuga</i>	.. Do.
23	Mango : Leaf galls	.. <i>Mangifera indica</i>	.. Do.
24	Ber : Bark	.. <i>Zizyphus Jujuba</i>	.. Do.
25	Dhaora : Bark	.. <i>Anogeissus latifolia</i>	.. Do.
26	Semal : Wood	.. <i>Bombax malabaricum</i>	.. This is a soft wood which is in great demand in Indian Match factories and it is produced in plenty in the forest regions.

CHAPTER VI.—DEAD INDUSTRIES

Within living memory the following industries which are now extinct had been carried on in this district:—

- (1) Spinning.
- (2) Sericulture.
- (3) Khadi weaving.
- (4) Smelting of ores—iron and copper.
- (5) Gold washing.
- (6) Geru.
- (7) Bangle-making.

Spinning.—The death of this industry is explained on account of the cheap and easy availability of mill yarn for weaving. As the district is not a cotton growing tract, the competition of mill yarn grew on a quick and wide scale and with it spinning, ginning and carding disappeared. Of course there are some professional carders, but they generally card old cotton for the gaddis or for lamp wicks. If the competition of mill yarn is checked, the industry can be started again and as yarn is required by the weavers, the industry can provide work for thousands of people. It is hoped that with the introduction of the Vidya Mandir Education Scheme, this industry will be taught in schools and that people will take to the industry as they were doing in former days.

Sericulture.—The causes of the extinction of this industry are not known. It may be ascribed to the competition of foreign silk and the dearth of locally produced kosha silk.

Khadi weaving.—The reason for the extinction of this industry is explained in the chapter on "Mill yarn weaving". The industry can be revived if hand spun yarn is provided to the weavers. Of course, there will be a little difficulty at the beginning as the weavers are used to weaving strong and even mill yarn.

Smelting of ores—(Iron and Copper).—Iron ore used to be dug out by the Agharias in Baihar tahsil but due to the import of cheap iron and iron goods, the industry could not continue. The difficulties of the industry have been—

- (1) the poor yields about 25 per cent of iron in the ore.
- (2) the crudeness of the methods of smelting.

It can be revived with good prospects and with the provision of facilities to workers.

Gold Washing.—There is a particular community named Sonjhara whose occupation was to carry on this industry on a small scale. There are some rivers such as Son, Deo, Tanda, Kasturi, Nahra, Banjar, Jamuna and Taunaur, where gold dust is found. Up to the year 1936, the Sonjharas were doing this work, but now it is found uneconomical to pursue this industry and the people have taken up agriculture instead. I reproduce here the process of gold washing as described in the District Gazetteer of 1907.

"A spot in the dry river bed is selected at the outside of a bend, where the finer sediment is likely to be found; after removing the stones and pebbles from above,

the sand below is washed several times in wooden cradles called 'kalluti', till all the clay is removed and fine particles of sand mixed with gold are visible. A large-wooden spoon, called 'Wahi', in this process to stir up the sediment which washed and rubbed by hand to separate the gold more completely from the sand, and a blackish residue is left, containing particles of gold and pebbles coloured black with which it forms an amalgam. This is exported in a clay called jharia, by which the mercury is got rid of and the gold is left behind."

Geru (red ochre).—This is a kind of earth which was used for colouring purposes. At present it is not so much in use. The industry is capable of being revived, if the sources of supply of geru are known to people and if they are taught to refine and use it for household purposes.

Bangle-making.—This industry was carried on by a Muhammadan at Menhdiwada, some 30 to 40 years ago. The reasons for the extinction of the industry are—

- (1) the importation of foreign and mill bangles,
- (2) the greater attractiveness of such bangles,
- (3) the heavy cost of fuel on account of the Government taxes on wood coming from the forests.

In a day, he used to make about 200 bangles. The raw material glass was brought from outside the district but the colours were prepared locally from pigments, etc., by mixing them with other materials, such as myrobalan.

There is little possibility of reviving this industry, as the old man is unable to work and no one else knows this art. However, this industry is carried on in the adjoining district, Seoni, and if somebody is trained there or somewhere else, it can be reintroduced here. Further, a demand for hand-made bangles will have to be created.

CHAPTER VII.—POSSIBLE INDUSTRIES

The industries which are dead have to be revived and the present industries which are more or less languishing because of the competition of factory-made goods have also to be placed on a sound economic basis. There are possibilities of starting some new industries in which we think the district can be self-sufficing—

- (1) Match-making.
- (2) Paper-making.
- (3) Mica mining and refining.
- (4) Kattha (catechu) making.
- (5) Bone manure making.
- (6) Horn and bone work.

Match-making.—In the forest, there are many Semal trees (*Bombax malabaricum*). The wood is very soft and generally used in match factories for making splints. If the industry can be run on a cottage basis, it will provide work for hundreds of people and also the forest produce will be profitably utilized.

Paper making.—Bamboo is grown in the forest abundantly and if paper pulp can be made, paper-making can thrive in the district. True, bamboo is a very hard fibrous material to be turned into pulp. Some small machine will therefore have to be devised to suit the purpose. There are some kinds of grasses grown in the forests which are available free of charge and from which paper can be prepared.

Kattha (catechu).—Catechu trees are found in some part of the district and if they are utilized to prepare kattha, not only will it provide work to many people but it will also stop imports worth about Rs. 5,000. Kattha is generally used with betel-leaves.

Bone manure.—A large quantity of bones is exported and not utilized where they are collected. This industry also can be carried on in the district.

Horn and bone articles.—At present the horns and bones of dead cattle in the district remain unutilized for commercial purposes. If articles such as buttons and combs are prepared from them, the industry can employ hundreds of people.

CHAPTER VIII.—DIET

The staple diet of the people consists of rice, vegetables, pulses and meat. In Baihar tahsil, the Gonds and Baigas subsist on rice

and uncooked meat, though in the other two tahsils meat is not so commonly used. Rice is the staple food and an adult consumes about 1 to 1½ lb. of rice every day, but the use of unpolished rice is rare. In the interior, hand-pounded rice is generally used. Where rice mills are working, villages within a radius of about 10 miles use only mill rice. It is reported that the people are growing weaker and weaker every year and the use of highly polished rice seems to be one of the reasons for it. Another reason is that as the economic condition is going from bad to worse, the people cannot use milk and ghee. There are very few milch animals.

Chillies are locally produced, but condiments and salt have to be imported from other districts.

People are quite ignorant of the nutritive value of the various articles of food. All food is generally cooked, and there are no other methods of cooking except that over a direct fire.

There is no oil mill in the whole district but rice mills are scattered all over and people have now become accustomed to get their paddy husked in mills.

A reasonable standard of living will cost about Rs. 150 to Rs. 200 per family under the present conditions, while the average income per family is considered to be about Rs. 50 to Rs. 100 per annum at present.

ANNEXURE

Questionnaire for Preliminary Enquiry

INSTRUCTIONS TO LEADERS

I. A district or an area of that type will be allotted to each leader of the group, with about ten helpers, to be called surveyors selected as far as possible from colleges or educational institutions.

II. The Deputy Commissioner of the respective districts have been requested to suggest suitable villages for the survey. Therefore, the leaders should put themselves in touch with these officials on arrival and get their help during their stay under their jurisdiction. Where possible, some one of the district officials will be detailed off to be with the party.

III. The party will disperse in groups of two to villages allotted to them and devote not more than two days to a village.

IV. They will obtain what food and shelter the villagers can afford to offer. They should not allow themselves to be entertained, but should be content with sharing the ordinary fare of the people. This is an important part of the scheme and so should be carefully observed.

V. Where the chosen villages are in close proximity, the helpers may meet their group leader in the evenings; if not, they should get into touch with him whenever possible. They should all gather together on the 6th February at an appointed place and submit their work to the leader.

VI. The leaders should submit their written report to the Chairman by the 15th February.

VII. As at present arranged, the Committee will meet on the 3rd March 1939 to consider the preliminary report.

Group Leader..... Surveyor.....

Name Address

Date.....

Name of village..... District

Names of persons giving information—

- (1)
- (2)
- (3)
- (4)
- (5)

I.—GENERAL INFORMATION

Population of the village

Occupations..... Number of literate persons

Area under cultivation (in acres)—

- | | |
|-------------------------------|--------|
| (i) Nearest post office— | miles. |
| (ii) Nearest hospital— | miles. |
| (iii) Nearest school— | miles. |
| (iv) Nearest veterinary aid— | miles. |
| (v) Nearest trunk road— | miles. |
| (vi) Nearest railway station— | miles. |
| (vii) Nearest market town— | miles. |

What is being done with night-soil and farm-yard manure?

Is there a good water-supply all through the year?

Total revenue and taxes paid to Government/Local Body annually?

Information in regard to any other duties (octroi, excise, etc.), leviable in the village or at the market town.

Popular financial resource (bank, Government or moneylender) and rates of interest charged.

General indebtedness per head.

Where do the Harijans live?

Are there any drink or drug addicts in the village?

(Note down your general impression of the village and its homes in regard to sanitation, hygiene and economic condition. Go inside some of the houses and see the state of things for yourself. Visit the Harijan quarters.)

II.—AGRICULTURAL

(a) What are the food crops raised? Quantity in maunds; where sold?

(b) What are the money crops? Price? Where are these processed into consumable articles; and in what way? Why cannot these processes be carried out here?

(c) Has there been a change in the crops within the last fifteen years? If so, what are the causes?

(d) Are any payments in kind made to the artisans—carpenter, barber, chamar, blacksmith, etc., and, if so, how much?

(e) What crops are irrigated? Is sufficient water available? What is the source—(canal, river, well, tanks, etc.)? What are the dues payable for water?

(f) What is an average holding in the village?

(g) What fruit trees are grown?

(h) How many palm trees are there, and what uses are they put to?

(i) For what period during the year the people are not busy with agricultural operations?

III.—INDUSTRIAL

1. What are the industries and occupations commonly carried on in this area?

2. Name of industry?

(a) History: Conditions in the past and present situation. Is there any competition from foreign products by way of substitution? Is there a change in the demand of the people for the product? Have there been improvements in the processes of production in the past few years? What is the finished product used for?

(b) Community or caste engaged in it and number of persons. Skilled and unskilled. Annual earnings of skilled and unskilled.

(c) In what stage of manufacture does the article leave the village? Are there other processes of manufacture to be undergone before the article becomes consumable? If so,

why cannot these processes be carried out here?

(d) What is the raw material and where is it obtained from? Is it available for the collecting or has a price or royalty to be paid or is it supplied by merchants? Is there any tax or duty to be paid on the raw material?

(e) Labour: For one working unit how many persons are required, skilled, unskilled and family members?

(f) What is the capital required for equipment? Are the tools complicated or simple? Can these be made locally?

(g) What is the percentage difference between cost and selling price? Does it include commission to middlemen?

(h) Who carries the stock of produce?

(i) What are the finances available—Government loans, moneylenders and merchants?

(j) Is this article capable of being made on a mass scale by machinery? Do the villagers in this place use the product? If so, are the sales out of a surplus or do they sell them for financial considerations?

(k) Where is the market for these goods? Is it merely an exchange market for sending it to other countries or is it a market for consumers?

(l) If the cost of the finished article can be analysed, give the percentage cost going to raw materials, labour, middlemen, transport, etc.?

(m) Is there any tax levied on these articles at the market in the form of octroi duty or other municipal taxes or stall fees? If so, what percentage does this bear to the cost price?

(n) If the demand is increased by better marketing facilities and if the processes of production can be improved, can the prices keep up and can production be proportionately increased?

(o) Is the finished product made available to the consumer in a hygienic and attractive form? Or does the finish of the article leave much to be desired?

(p) Can the raw materials now used in this industry be used for any other purpose?

(q) Are there any subsidiary industries to this arising out of waste materials in the process and by-product?

(r) How long will it require for a person to acquire the art that is required in this industry?

If possible give a short description of the process of manufacture?

(s) Do you know of any one who has made a study of this industry and has carried on any experiments in it? If so, state name and address?

(t) What suggestions have you for increasing facilities in regard to finance, eliminating of middlemen and affording sales facilities?

IV.—DEAD AND DYING INDUSTRIES

1. Within living memory what industries have been carried on in this area which are either extinct or are languishing? Can you give the reasons for this change? Is there any shortage of raw materials or is the demand taken up by foreign substitutes or is

the skilled labour being attracted to other better paying industries? Or is it caused by the introduction of mass production? Or has there been any tax or freight rates which have made the industry not paying?

2. How many were occupied in these industries? What were their earnings?

3. Where have the displaced artisans gone? What are the possibilities of revival and improvement? Are you in a position to give further information in regard to raw materials, equipment, finances and other particulars in regard to this industry as required under section III (if so, these may be taken down)?

V.—TRANSPORT

What is the usual method of transport? Are good roads available to the market? Are there toll and other levies on the road? If the transport is now taken up by buses, railways, etc., what were the earnings of cart-owners in this business formerly? Is the article to be transported perishable? Or one in which quickness of transport is essential? Who are benefited by the present methods of transport—people within the locality or outside?

VI.—CONSUMPTION OR DEMAND

1. What articles are imported into the district from outside and from abroad?

2. Can these be produced locally and on a cottage basis? Or can satisfactory substitutes be made locally within the price? Can such competing articles from outside be prevented from coming in by means of Governmental measures? Are there greater sales facilities afforded for imported articles?

3. Prepare a list of articles in very day use in the village which are not produced within the village such as locks, lamps, hinges, bolts, pots and pans, cooking utensils, food products, mats, kambals, articles of apparel, knives, ploughs, shoes, ropes, pieces of iron for shoeing bullocks or horses and such like. If any of these are obtained from outside, from where and in what state?

4. During the last few years what new articles of daily use have the people got accustomed to? If possible give an estimate of the annual expenditure on such in the village?

VII.—DIET

1. What are the main articles of diet? (Grain, vegetables, fruit, milk products, etc.) Give their quantities (in their raw state) used for an average meal. Are all these articles obtained locally? If not, from where?

2. Do people know about the nutritive value of different methods of cooking?

3. Are there any oil mills and rice mills in the vicinity? What would you consider a reasonable standard of living should include by way of clothing, shelter, food, education, medical needs and incidentals?

4. Is it possible to have a rough idea of the annual income for an average family in this village?

APPENDIX

A list of likely Industries on which information may be obtained.

- (1) Paddy husking.
 - (2) Flour grinding.
 - (3) Oil pressing.
 - (4) Sugar and gur-making.
 - (5) Bee-keeping and honey production.
 - (6) Pottery and glazed earthen-ware and glass-ware.
 - (7) Soap-making.
 - (8) Brick- and tile-making.
 - (9) Spinning cotton.
 - (10) Weaving cotton—Khadi.
 - (11) Weaving woollen kambals and carpets
 - (12) Handloom weaving of mill yarn.
 - (13) Carpentry and timber-work, making of wheels and carts.
 - (14) Blacksmithy, cutlery and tools-making.
 - (15) Smelting ores and tempering steel.
 - (16) Sericulture.
 - (17) Silk weaving.
 - (18) Sheep-breeding.
 - (19) Mat weaving
 - (20) Rope-making and jute and sann-hemp articles.
 - (21) Tanning and shoe-making and leather working.
 - (22) Lac culture.
 - (23) Cane and bamboo-work.
 - (24) Match-making.
 - (25) Paper-making.
 - (26) Brass-wares and metal casting work.
 - (27) Tools and implements-making.
 - (28) Dyes-making and calico printing.
 - (29) Toy-making.
 - (30) Quarries—Marble, china clay, soda ash.
 - (31) Mines—Coal, manganese.
 - (32) Forests—Teak and other timber and other forest produce.
 - (33) Dairy products.
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SECTION II.—NOTES ON VILLAGE INDUSTRIES

CHAPTER I.—PADDY-HUSKING AND FLOUR-GRINDING

(See Part I, Volume I, Pages 12 and 13.)

(Submitted by the All-India Village Industries Association, Wardha.)

Paddy-husking.—Some of the obvious questions that occur in connection with these industries are—

- (a) whether the quantities exported constitute the real exportable surplus and the quantities imported the supply of a genuine deficiency?
- (b) whether these industries afford employment as well as opportunities of self-expression to considerable number of people?

In short, whether these industries add to human well being within the province?

The time-honoured methods of production are the *chakki*, the *dhenki* and the *ukhli* and *moosal* in the case of paddy-husking and the *chakki* in the case of flour-grinding.

The *chakki* employed for husking is made chiefly of clay, though sand and the husk of paddy are also mixed with it to give it the required roughness and cohesion. Before starting work, either cowdung, as in parts of Nagpur district, or the juice of *sam* (*canavalia ensiformis*) leaf, as in the Seoni district, is applied to the surfaces in contact in order to reduce their wear and tear. Other implements required are a bamboo sieve and a bamboo winnowing fan called *supa*. It is obvious, therefore, that the capital required is almost negligible, seldom exceeding four annas. True, the life of the *chakki* is very short but that is of little consequence inasmuch as it is made of materials which are available in plenty and with one's own labour. The *chakki* is most commonly used in Nagpur, Seoni, Jubbulpore, Balaghat and Narsinghpur districts for husking paddy.

This is not an industry which is confined to any particular caste or group and as such the field for the recruitment of labour is vast. Women who do this work are able to supplement the earnings of the family by working either at the employers' *chakki* or at their own for others. The wages paid to them are approximately two annas per person per day of eight hours. Where they husk their own paddy, besides giving them work during what might otherwise have been their idle hours, it saves them the milling charges, however small an item of payment that may be. The payment demanded by the mills is usually about three annas per khandi (109 seers 6 chhataks—Balaghat). A fortnight's practice is the maximum training required for acquiring the necessary skill to do the work satisfactorily.

The inefficiency of the *chakki* is its greatest handicap because as much as 50 per cent of the paddy fed in comes out "unshelled". About half a khandi of paddy is all that can be dehusked by four women in an eight-hour day. The argument that time is of no

great account with a villager cannot very well be bandied at a time when the machine is there like "a roaring lion seeking whom he may devour". Throughout history one finds that work of routine nature is gradually taken over by "labour-saving machines". The danger from this increasing tendency has been all the greater when the work done with hand is not as efficient as it could be, as no premium can be put on inefficiency.

In some parts stone *chakkis* are used. The type that is worked at Maganwadi, Wardha, is a considerably improved one. Made of *babul* wood and with grooves cut into the surface of both the upper and the lower parts, it works faster and with greater ease than the old model. The quantity unshelled during the first charge is as low as 10 per cent when the *chakki* is in good condition. About four maunds of paddy can be dehusked per day and a worker can earn about three annas per day. The one great drawback, however, is that the wear and tear is so great that it needs to be repaired after every three days of continuous working. Besides, the cost of the *chakki* is about Rs. 6. True, no *chakki* needs to be continuously worked in the home, but still it cannot be stated with any degree of certainty whether in spite of the drawbacks mentioned above it can be easily popularized in the villages.

The second method—that of the *dhenki*—is popular throughout the rice-growing tracts. It consists of a wooden lever six to eight feet long fixed to a pivot, and is worked on the see-saw principle. To one end of the lever is fixed a short pestle which drops into a mortar fixed in the ground. The mortar is filled with grain and the worker steps on the lever at the end opposite the one to which the pestle is fixed, thus lifting the pestle a few feet above the mortar and then suddenly releasing the pressure on the beam. It is worked by men since it involves hard work. It costs Re. 1-8-0 to Rs. 2, but it is more durable than the *chakki*. About one khandi of paddy can be dehusked in one day of eight hours.

Further, it can be used not only for "shelling" but for polishing as well, whereas a *chakki* cannot do the work of polishing. This is in some ways an advantage these days because though from the point of view of dietetics unpolished rice is superior to the polished rice (see Appendix A), there is at present a sense of false prestige which prevents many people from using unpolished rice. The dehusing and polishing processes are, however, not combined because of the great loss that would be caused by pulverisation (breakage). The dehusked grain is separated by means of a winnowing fan and is put through the *dhenki* a second time for polishing.

The *dhenki* is also capable of further improvement as the experiment at Maganwadi has shown. Each *dhenki* has been provided with a double pestle. Fifty pounds of unpolished rice can be turned out from paddy in an hour and the wages paid are four annas per day.

The third method—that of using the pestle and mortar—is followed by women in

practically the entire rice-growing area as in the case of the *chakki*. Like the *dhenki* the pestle and the mortar are durable and are more expensive than the *chakki*. About three-fourths of a *khandi* of paddy can be dehusked in a day. Both shelling and polishing can be done by this method as with the *dhenki*.

This indigenous industry is on its last legs because of the inroads of the machine. Rice-mills are to be found in most of the towns and larger villages of the rice-growing area, Narsinghpur sub-division being the only exception. In the Nagpur district, there is one mill within a radius of every twenty miles.

Judging from the capital required in setting up a mill and from its output per day, one infers that there are two types of mills—the bigger and the smaller—the bigger costing from Rs. 15,000 to Rs. 20,000 each and the smaller from Rs. 4,000 to Rs. 5,000 each. Both employ ten to thirty labourers most of whom are unskilled. The large mills have a capacity of dehusking 200 *khandis* per day while the smaller ones can dehusk only about 35 *khandis*. The rates charged for milling seem to vary from three annas in Drug and Balaghat to eight annas in Nagpur. Wages paid to the labourers also vary from five annas in Drug to two and a half annas in other parts of Chhattisgarh such as Raipur, etc. Women are always paid less.

Seemingly, these mills have far greater efficiency than any of the indigenous methods, in the following two respects:—

- (1) The quantity dehusked is much great.
- (2) The worker is paid a higher daily wage.

It has, however, to be borne in mind that in the first instance the mill has curbed the chances of supplementary earnings for a good many people, the capacity of the mill being at least twenty times that of the most efficient indigenous method. Even in the case of the fortunate few who are able to find work in the mills, the period of employment has been considerably curtailed. Rice milling being a seasonal industry, no mill works for more than five months in a year.

Except in the case of the few skilled workers, the mill hand has little opportunity for self-expression. One feels that there is something radically wrong with the system of production where the worker has to look outside his main occupation in life for opportunities of self-expression.

It may be that the mills are able to turn out unpolished or only slightly polished rice; but from the commercial point of view, "the game is not worth the candle", because the unpolished rice, being more nutritious, is susceptible to attack by weevils after a while thus involving the difficult problem of its proper storage. It may be argued that hand-pounded rice can also be polished. The answer is that such rice can never be so completely polished as the mill product.

The fact that some of the mills are located near railway stations as at Bilaspur, Champa and other places, reveals the very purpose of their existence. They are there to deprive

the local people of their food—one of the many instances in which "man's rude work defaces the paradise of God".

Whereas the indigenous methods provide employment not only for those who actually husk the paddy but also for other workers such as carpenters and blacksmiths in the making and repairing of the *dhenki* and the mortar and the pestle. The mill, on the other hand, provides no such scope for employment. The machine, the labour for repairs and often the source of power are all imported.

Parboiled rice is produced only in Bilaspur, Champa and a few other places. In parboiling the paddy is first steamed in an iron pan for a few minutes after which it is soaked in hot water for not less than twenty-four hours. It is then exposed to the sun and is later steamed again and dried. It is then taken to the mill for dehusking. Experiments have shown that parboiled rice retains its nutritive constituents to a greater extent than untreated rice. It may, therefore, be concluded that polishing parboiled rice is not as detrimental as polishing raw rice.

Besides, from the business point of view mills find it a paying proposition to dehusk parboiled rice as the breakage in its milling is considerably less—being about 3 per cent only. The quantity of rice obtained is proportionately more than in the case of raw rice. This greater yield more than compensates for the additional expense and trouble involved in the parboiling process. There being no home demand for it, the parboiled rice milled in the province is exported to Madras and Bengal.

The by-products of the industry are:—

Husk, bran and mill broken rice.

The husk is used as fuel for the steam engines working the mills. Its use in the making of activated charcoal has also been reported. The bran which is rich in proteins, fat, etc., is often sold away as a feeding material for livestock by the mill owners. It may sometimes be used for human consumption as a cure for beri-beri. The broken rice is generally disposed of for what it will fetch and is consumed by the poorer classes. It could also be used in the manufacture of spirits, starch, etc.

So far as the proper utilization of these by-products is concerned, the odds are in favour of the domestic industry. In this case the husk need not be wasted but may be used as manure. Since the mills are not located near fields and since cartage is expensive, the husk turned out by the mills is seldom put to any such use. Husk can also be used by some of the village artisans such as the potter and the blacksmith. Further, in some of the smaller mills the husk and the bran come out together in rather a powdered condition and unless the former is separated from the latter the mixture cannot be given as fodder for livestock. It does not even have the same value as fuel, as husk alone. In the domestic process, there need be none of this wastage.

Though the greater part of the paddy is converted into rice, some of it is used for making *poha* or (beaten rice), especially in

the Chanda district. Up to now, this industry has been spared the concomitant evils of the machine though now that danger is staring it in the face.

The indigenous method of producing *poha* is by means of the pestle and mortar. The paddy is first soaked and fried and then beaten in the mortar with the pestle. The work is generally done by women during the early hours of the morning. It is thus essentially a subsidiary industry.

Flour-grinding.—Flour-grinding is another industry where the traditional method is being completely ousted by its formidable new rival—the machine—even though the hand ground flour is more nutritious.

Much of what has been said in connection with paddy-husking would be applicable to this industry also. In no district is the hand *chakki* used to earn a living and in some cases, especially in the Wardha district even for his own consumption the villager will take his grain to a mill nearby. One reason for this might be the dearth of good stones for the making of *chakki* in the Wardha district.

As in the case of paddy-husking, mills are to be found in all the towns. The cost of a small mill is about Rs. 500 only. In some places as in the Nagpur district, one finds that the same small mill is used for both dehusking rice and grinding flour.

As mentioned above, a stone *chakki* is used in the domestic method of production.

The stone is either black or white—the black being superior to the white. The common type of *chakki* found in most places is the flat one consisting of two circular pieces of stone varying from 14" to 18" in diameter and with the contact surfaces flat and parallel to each other. In some cases the upper stone is given a slope with clay to help in the grinding. In other cases, an annular space is formed by making a thin low wall of clay round the *chakki* in order to collect the flour that comes out from it.

This industry is confined to women who get up in the early hours of the morning to grind their own corn. When they work for others, it is a means of enabling them to earn about two annas per day. The output is generally 2½ lb. per hour, whereas the capacity of the mill is stated to be half a khandi per hour.

The improved type of *chakki* that has been set up at Maganwadi is adjustable, thus making possible the grinding of fine or coarse according to requirements. Further the *chakki* is not fixed on the ground level but is raised a few inches above it and this not only makes for cleanliness but also for adjustability. Like the Narsinghpur type, it has also an annular space made of wood instead of clay.

The products of the industry are—*Ata* or whole wheat flour, *maida* and *suji* or semolina.

Of these the first is the most nutritious.

APPENDIX

Rice is chiefly grown in Chanda, Bhandara, Balaghat, Raipur and Bilaspur districts.

Wheat is chiefly grown in Saugor, Hoshangabad and Narsinghpur districts.

Area under cultivation for the years ending March 1936 and 1938.

[From Season and Crop Reports of Central Provinces and Berar.]

Name of article	In acres	
	1936	1938
Paddy ..	5,589,220	5,763,529
Wheat ..	2,774,830	2,778,467
Wheat and gram ..	596,617	845,872

Rail and River-borne trade of Central Provinces and Berar.

[Figures in maunds of 82 2/7 lbs.]

	Imports		Exports	
	1936-37	1937-38	1936-37	1937-38
Rice in the husk ..	447	9,945	1,023,402	443,649
Rice not in the husk ..	127,277	131,382	5,226,764	4,699,654
Wheat ..	1,464,081	566,777	1,670,805	2,227,446
Wheat flour ..	166,479	136,995	9,801	74,959

TABLE OF FOOD VALUES

Name of food stuff	<i>Cereals.</i>					
	Moisture	Protein	Fat, (ether extrac- tives)	Mineral matter	Fibre	Carbo- hydrate
	Percent.	Percent.	Percent.	Percent.	Percent.	Percent.
1. Rice, raw, home pounded ..	12.2	8.5	0.6	0.7	..	78.0
2. Rice, raw, milled	13.0	6.9	0.4	0.5	..	79.2
3. Rice, parboiled, home-pounded.	12.6	8.5	0.6	0.9	..	77.4
4. Rice, parboiled, milled.. ..	13.3	6.4	0.4	0.8	..	79.1
5. Rice, beaten	12.2	6.6	1.2	1.8	..	78.2
6. Rice, puffed	14.7	7.5	0.1	3.4	..	74.3
7. Wheat whole	12.8	11.8	1.5	1.5	0.2	71.2
8. Refined wheat flour	13.3	11.0	0.9	0.4	0.3	74.1
9. Rice unmilled (prepared <i>Oryza Saliva</i> in wooden grinder).	14.1	7.2	2.3	1.3	..	75.1
10. Rice home pounded*	14.5	6.8	1.4	1.1	..	76.2
11. Rice milled*	14.4	6.7	0.7	0.8	..	77.4

(Figures taken from Health Bulletin No. 23 of 1938.)

*These were prepared from the same sample of paddy.

CHAPTER II.—OIL-PRESSING

(See Part I, Volume I, Page 13.)

(Submitted by the All-India Village Industries Association Wardha.)

Introduction.—Today in India all the roads from the villages leading to towns and cities serve to drain them of their wealth and prosperity. The villages which are the producers of wealth are squeezed like a sponge to yield all they have. It is usual to find that materials produced in villages are not only sold cheaper in cities than in their places of production but often enough you cannot even get them in the villages out of season. This is especially the case with oil-seeds. Being short of capital, the farmers are obliged to sell away their seeds as soon after the harvesting as they can. Only a very few of them can afford to wait for better prices for their produce, and still fewer people can stock seeds sufficient even for their own use. Neither are the seeds bought by the village merchants to be sold again to the villagers or the oilman, but they generally act merely as middlemen for some large-scale oil mills situated in a central place to which seeds flow from all directions like water towards a low level. It is due to this reason that *ghanis* are still seen plying in towns and

cities and other market places where the oilman can obtain seeds throughout the year, though at higher rates, while the *ghanis* are lying idle in villages where no seeds are available except during the harvesting time. In fact villages should be the more logical and convenient places for *ghanis* to work where mill oil is now being sold dearer and in a worse form than in cities in view of the cumulative increase in the middlemen's commissions and in the degree of adulteration practised at each successive stage respectively.

Thus the ill-fated country *ghani* is given a bad name and hanged. It is not supplied with the seeds and is decried as inefficient. The average farmer and the oilman cannot stock the seeds for want of capital; the *ghanis* do not get enough work and so cannot keep on plying for the sake of the few rich people in the village who can afford to stock their seeds but who have given up the habit of doing so. Thus it is a vicious circle around the *ghani*, which, though technically inefficient as compared with the power-driven machinery, has several other advantages which will enable it to hold its own provided the seeds are available as and when required.

History.—Reports from all the districts are unanimous in saying that this industry which, till very recently was in a flourishing

condition and which was carried on, on an extensive scale in almost all the villages of the province, big and small, is now fast dying out owing to the introduction of power driven oil mills. Oilmen who followed this occupation were not only prosperous but also enjoyed a certain status in society. Not only did they finance their own industry but the richer amongst them were also engaged in the business of moneylending. Their standard of living was high and they spent extravagantly on social functions.

The oilmen (*i.e.*, *telis*), who were contented and happy during their period of prosperity, little realized that their age-old primitive and highly inefficient instrument of production, *viz.*, the *ghani*, left to itself without being improved from time to time, could hardly keep up with the march of progress. The organization of the community on the basis of caste functioned only in matters strictly social, leaving the economic side of the industry entirely to individuals. Being, therefore, unorganized, the *telis* were completely ousted from the field by the highly organized large scale oil-mills equipped with the latest labour-saving devices. These mills changed the entire fabric of the industry.

— How very much the *ghani* has been affected by the introduction of mills can be seen by the fact that in the smaller villages there are no *ghanis* at work and in the bigger villages their number has been reduced to about one-fourth during the last twenty years. Those *Telis* who work the *ghanis* at present do so only half-heartedly and even they deal largely in mill oil. For some it has become an occupation during months when there is no work on the fields. Thus from a whole-time and continuous occupation oil-pressing has been reduced to a side industry contributing little benefit to the *Telis*. If they ply their trade at all, it is just because they have a sentimental attachment to their hereditary occupation and because there is still a demand for *ghani* oil even at a higher rate, as it is believed that from the dietetic point of view the *ghani* oil is superior to mill oil. The *Telis* having been ousted from their position as independent oil pressers, have lost all patience and confidence, and have gone to the length of allowing themselves to be converted into retail dealers in mill oil. In spite of all this, their decay would not have been so rapid, had they more faith in their customers whose sentiment for *ghani* oil they could have exploited for holding their own against all odds. In order to seek immediate gain, the *Telis* adulterated *ghani* oil with mill oil. Eventually when the customers found that even after paying a higher price, they got only adulterated oil, they preferred the cheaper mill oil. Thus the short-sightedness of the oilman is also responsible for his own ruin.

Side by side with the change in the demand for edible oil, the oil of castor and other seeds that was formerly used for lighting purposes has been almost wholly substituted by kerosene oil. As for illumination, none uses vegetable oil except during *diwali* for two or

three days in the year or in the temples or before idols in the home. On other days of the year, kerosene oil is used even in the remote villages. The rich use it in foreign lanterns and the poor in earthen pots. Thus kerosene oil has hit very hard the production of castor oil which was formerly used for illumination. The use of castor oil as lubricant for bullock cart wheels, however, continues. Its use as purgative has been almost discontinued because of the refined imported castor oil and other medicines. The figures of import of kerosene oil are significant. They show how completely the production of castor oil which was pursued by a sub-caste (called *yerendes*) has been smothered by the imported substitute.

The Workers.—The community following this industry is called *Telis*. *Telis* are both Hindus and Muslims. The occupation is hereditary, handed down from father to son. *Telis* are found in most villages of the province, although the majority of them have given up oil-pressing in preference to cultivation or field labour or both. There are one or two sub-divisions of this caste. Those who press castor seeds are called *yerendes*. There is a further social division of *Telis* into—

- (1) *ek baille*, *i.e.*, employing only one bullock at a time in the *ghani*, and
- (2) *do baille*, *i.e.*, employing two bullocks at a time in the *ghani*.

The profession requires two persons, one man and one woman, the man to work the *ghani* and the woman to clean the seeds and the surroundings and sometimes even to attend to the *ghani*. The man is a whole-time worker, while the woman works when she is free from household duties. Both these processes, the pressing as well as the cleaning of seeds, involve skilled labour. Neither can be done by those not trained in them.

There are three main types of *ghanis* in Central Provinces and Berar—

- (1) The Marwadi *ghani*.
- (2) The Varhadi *ghani*.
- (3) What may be called the Hindi Central Provinces *ghani*.

Of these, the most efficient, but the least prevalent, is the Marwadi *ghani*, while the least efficient is the Hindi Central Provinces *ghani*. But as Hindi Central Provinces forms a major part of the province this is the most prevalent. The second type seems to be midway between the two, both in number as well as in efficiency. It is significant to note that the efficiency of the instruments of production bears a direct relation to the prosperity of a place. If the Hindi Central Provinces *ghani* is the least efficient, that part of the province is also the poorest and the most backward.

At Maganwadi, the headquarters of the All-India Village Industries Association, Wardha, the *ghani* department has evolved an improved *ghani* after studying and experimenting with the various provincial *ghanis* and different patterns of construction.

The respective efficiency of the three *ghanis*—the Varhadi, the Hindi Central Provinces and the Maganvadi—are compared

here. In the Varhadi *ghani* linseed is usually pressed, while in the Hindi Central Province *sesamum* and *jagni* are commonly pressed.

Income and expenses per day.

Type of <i>ghani</i>	Time per charge in hours	Number of charges per day	Seeds pressed			Percentage of oil extracted	Bullock upkeep
			Kind	Quantity	Price		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Pailies	Rs. a.	Per cent	As.
Varadi ..	3½	3	Linseed ..	21	2 10	33	3
Hindi Central Provinces.	2½	3	Sesamum ..	15	1 14	33	3
Hindi Central Provinces..	2½	4	Jagni ..	16	1 4	25	3
Maganvadi ..	1½	5	Sesamum ..	42½	5 5 1	45	3
Maganvadi ..	1½	5	Linseed ..	32½	4 1	33	3

Depreciations cost and repairs	Total	Oil		Oil-cake		Total realised	Profit
		Quantity	Price	Quantity	Price		
(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
A.	Rs. a.	Pailies	Rs. a. p.	Seers.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1	2 14	7	2 6 6	14	1 1 0	3 7 6	0 9 6
1	2 2	5	1 14 0	10	0 8 0	2 6 0	0 4 0
1	1 8	4	1 4 0	12	0 8 0	1 12 0	0 4 0
1	5 9	19 2	7 2 9	24	1 6 3	8 9 0	3 0 0
1	4 5	10 14	3 12 0	22	1 11 0	5 7 0	1 2 0

As the Marwadi *ghani* follows the hot process in the sense that hot oil is mixed during the process of pressing, it is not possible to compare it exactly with the Maganvadi *ghani*. Although the Marwadi *ghani* is nearer to the Maganvadi *ghani* than all other *ghanis*, even that lacks many of the special features of the Maganvadi *ghani*. Firstly, it is not suited so much to the cold process as to the hot one, secondly, in its construction, especially relating to that of the stirrer and the pipe, it is difficult for one man to work two *ghanis* simultaneously, thirdly, it is not suited for pressing linseed. Lastly, it has no trench arrangement for the bullock which lightens the bullock's burden and ensures hygienic conditions around the place of production.

It must be noted that the working unit for the Maganvadi *ghani* consists of two *ghanis* looked after by one man at the same time.

The figures show that when linseed is pressed the earnings per day for one man for the whole day and one woman for half the day amount to Re. 0-9-6 in the Varadi and Rs. 2-4-0 in the Maganvadi *ghani*. As two bullocks are yoked in some Varadi *ghani*, the earnings will be reduced by annas three for the upkeep of the bullock and they would then come to only Re. 0-6-6. Again, the earnings per day come to four annas in the Hindi Central Provinces *ghani* for pressing *sesamum* or *jagni*, while they are Rs. 6 in the Maganvadi *ghani*.

Thus the inefficiency of the local *ghanis* largely explains why the majority of them have stopped work and why the rest of them carry it on perfunctorily. It is clear that if the improved Maganvadi *ghani* is introduced in these villages, there are good chances for the revival of this industry.

The Maganvadi *ghani* is very simple; in its outward appearance it looks like the *ghanis* ordinarily found in villages; but there are slight modifications in the internal constructions which involve no new complicated principle or mechanism. It is best suited to village conditions, as it can be made or repaired by local carpenters and worked easily by local Telis with a little initial training in construction and pressing.

The balance of income over expense is thus nine and a half annas only for the Varadi *ghani* and four annas only for the Hindi Central Provinces *ghani*. It will be wrong, however, to estimate the monthly or annual income from this. External competition and trade depression have considerably reduced the demand for oil, especially for that pressed in indigenous *ghanis*. It cannot, therefore, be assumed that the *ghani* is at work all the year round or even during all the days of the month. As a rule, the Teli who maintains himself and his family solely by the *ghani* runs it for about 20 days in a month. The monthly income may therefore be taken to be about Rs. 12 on the Varadi *ghani* and Rs. 5 to Rs. 7 on the Hindi Central Provinces *ghani*. Similarly the annual income will not be twelve times the monthly income as the trade is slack during some months. Those months in which festivals such as *Diwali* occur are good from the business point of view. The annual income may, therefore, be located in the neighbourhood of Rs. 100 on the Varadi *ghani* and Rs. 50 to Rs. 60 on the Hindi Central Provinces *ghani*. This income is, however, not net as wages and other items have to be paid out of it. Besides, it is the joint income of a man and a woman. There is thus no balance on the Varadi *ghani* and often a deficit on the Hindi Central Provinces *ghani*. Why then does the Teli carry on his trade? Because of—

- (1) his caste,
- (2) the pride he takes in carrying on his ancestral trade, and
- (3) the lack of an alternative occupation.

Undoubtedly, this may sound fantastic to one who has not been in touch with Indian villages. To the Teli, however, it is a reality and it is only abject poverty which at times drives him from his village to seek some other occupation. It is chiefly this which keeps the trade going even under dire circumstances. Moreover, were he even to make up his mind to take to some other trade, he will not find anything more profitable. He knows that other industries too are in the same bad way as his own and the change will not profit him in any way.

Another equally important reason for Telis continuing to work the *ghani* is the fact that this affords them a screen to exploit the sentiment of the customers for *ghani* oil. In reality, as we have already seen, they largely deal in mill oil, because they find it more profitable to do retail selling of mill oil as *ghani* oil than to press their own seeds and then sell the genuine *ghani* oil. It is necessary to remember this fact while computing the annual income of the Telis which will accordingly be more than what is shown above as possible from the industry itself.

Besides these, the following considerations have also helped in the continued use of the *ghani*:—

- (1) The preference shown by consumers to *ghani* pressed oil over mill oil because of its superiority in nutritive value and flavour.
- (2) The custom of stocking the oil seeds by the consumers and of getting them pressed, whenever required, on payment of mutually agreed charges.
- (3) The *ghanis* being worked as a secondary occupation during leisure from agricultural operations or any other main industry.

Whatever oil is produced in the village *ghanis* is used mostly for edible purposes and not for commercial ones. Similarly, it is produced for local consumption and not for export. The oil cake is also locally consumed either as food for cattle or as fertiliser for land. Oil seeds, however, which are produced in large quantities in Central Provinces are exported outside the province and even to foreign countries. Possibly, the oil seeds produced in the province are in excess of its requirements in which case such surplus may be exported. All the export at present, however, is not limited to this natural position, but is made against the import of a considerable amount of oil from outside the province. This exchange of seeds for oil is carried on, not with a view to interchange different varieties of oils, as the province grows almost all the common oil seeds except cocoanut, but to have the oil seeds crushed in large scale oil-mills and to be returned in the form of oil. The reasons for not crushing the seeds locally in bullock *ghanis* are—

- (1) inefficiency of the local *ghanis*, and
- (2) lack of organization of the industry as reviewed in the first two sections.

If people are persuaded to use only *ghani* pressed oil not only for edible purposes but also for industrial (especially for soaps, paints, and varnishes) or for medicinal uses and to prefer vegetable oil in place of kerosene oil for lighting purposes and if efficient *ghanis* are introduced in the province, there is no reason why this industry cannot be revived and the villages made self-sufficient in regard to their requirements of oil.

Oil seeds.—The following oil seeds are produced in the province:—

- (1) Groundnut.
- (2) Sesamum.
- (3) Linseed.
- (4) *Jagni* (niger).
- (5) Mustard.
- (6) *Guli* ('Mahua seed').
- (7) Castor.
- (8) *Karanji*.
- (9) *Margosa* or *Neem* (*Azadirachta indica*).
- (10) Cotton seed. (The present *ghani* is not suitable for pressing this seed.)

Of these, mahua seed which grows in abundance, and *karanji* and *margosa* which are available in smaller quantities are forest produce while the others are cultivated. For the collection of mahua flowers and

seeds, a royalty has to be paid to zamindars in some parts, while in others they can be collected free. The *karanji* and *margosa* seeds can be had free throughout the Province.

As for the agricultural oil seeds, the cultivators sell them away soon after harvesting on account of financial stringency. For the same reason, the oilmen are also unable to stock them for their requirements for the whole year. They may buy a little stock direct from the cultivators at harvest time, but for the rest of the year they buy sometimes for cash and sometimes on credit from the village merchants according to their requirements. Some well-to-do cultivators and many zamindars stock their own seeds and get them pressed on contract, when necessary. The pressing is not supervised, as the quantity of oil to be returned by the oilmen is fixed by custom.

For a working unit one Teli and a woman member of the family are required. Both are skilled workers. In the case of the Hindi Central Provinces *ghani*, the woman works more at it than the man, who sells the oil at the different fairs held in the neighbourhood.

Capital.—The capital required for equipment is as follows:—

	Rs.
(a) Cost of Hindi Central Provinces <i>ghani</i> each.	15
(b) Cost of Varadi <i>ghani</i> each ...	25
(c) Cost of Maganvadi <i>ghani</i> each ...	30
(d) Cost of the bullock ...	30

Thus apart from the stock of seeds, the equipment including the bullock costs about Rs. 45 for the Hindi Central Provinces *ghani* and about Rs. 55 for the Varadi *ghani*. Where two bullocks are yoked, the Varadi *ghani* will require a capital of about Rs. 80.

Equipment and Plant.—The construction of the *ghani* is simple and it is made locally. The wood for making the *ghani* is locally obtained for about Rs. 2 and the carpenter's charges for construction come to about Rs. 10 or more. The *ghani* is made or repaired by a special class of carpenters, who are from amongst the Telis themselves. Some of the oilmen, who work the *ghani* themselves, also know how to make or repair the *ghani*. To that extent, they are free from the difficulty of obtaining the services of specialised carpenters.

The *ghani* consists principally of the mortar, the pestle and the weight beam. A load is put on the weight-beam the pressure of which is transmitted through the pestle and applied to the seeds. In the cavity of the mortar, the pestle is moved by bullock power and the seeds are pressed. This cavity of the mortar wears out and gets enlarged in course of time as a result of the friction with the pestle. To remedy this and to make the mortar last longer, the replaceable wooden parts of a particular shape are fitted into the cavity. This arrangement, however, is not to be found in all the *ghanis*

of the province. In such cases, the worn out mortars have to be thrown away at the end of about five years when their cavities get out of proportion.

In the Hindi Central Provinces *ghani*, there is a pipe to allow oil to run down through it into a receptacle below, while in the Varadi *ghani* there is no such pipe and the oil is soaked up with a piece of cloth tied on to a stick and the rag is squeezed of its oil contents into a pot. This is very unhygienic in that the Teli who smokes, goes the bullock and removes the dung, with his hand during the course of the work also squeezes the cloth with the same hand which he 'cleans' occasionally by wiping against the wall or something else. These Telis, however, claim that their method of taking out oil from above is hygienic, inasmuch as the bullock's urine and other dirt and dust do not contaminate the oil. They also claim that the oil in their *ghanis*, being stored up in the pit till the charge is finished, gets *pacca* and is free from powder or water, and as such keeps for a longer time.

It may be mentioned here that the Maganvadi *ghani*, while providing a pipe for the oil to run down into a vessel, secures the above two advantages claimed by the Varadi *ghani*. The trench arrangements for the bullock ensures the hygienic condition, while a change in the process of extraction makes the oil *pacca*, i.e., free from powder and moisture. The pipe is not opened as soon as the oil begins to appear, as is done in the Hindi Central Provinces *ghani*, but is opened only about an hour afterwards when almost all the oil pressed out remains stored in the pit and completely gets free from powder and moisture. It also becomes hot to an extent and hence can be said to be *pacca* in the parlance of the Telis.

The cost price of a seer of linseed oil on the Varadi *ghani*, as calculated in the table in section (c), is four and a half annas, while it is sold at five and a half annas a seer. Thus there is a difference of about 20 per cent between the cost and the selling prices. Similarly, the cost price of a seer of gingelly oil on the Hindi Central Provinces *ghani* is five annas and a third, while the selling price for the same is six annas. Thus the percentage of difference between the cost and selling prices is about 12.

As the oil is sold directly by the Teli to the consumer, there is no middleman's commission added to these prices.

As referred to in section (e) above, the stock of oil-seeds is kept by the village merchant and rarely by the Teli himself.

So far as the buying of oilseeds is concerned, the Telis generally buy them on credit from the merchants. But as indicated previously, the Telis are also farmers and as such, borrow from local money-lenders or from the Government as other farmers do.

Oil pressing is already being done on a large scale in oil mills where expellers, hydraulic presses and power driven *ghanis* are used. As stated above, whatever oil is produced in the village is consumed locally.

The village itself and the bazars in the neighbouring villages or towns are the market places for selling oil and cake. These markets are usually for consumers, where the exchange of local goods and other household necessities is effected.

An analysis of the cost of oil produced with the various *ghanis* is given below:—

- (a) With varadi ghani—Raw materials 91 per cent. and Labour, etc., 9 per cent.
- (b) With Hindi Central Provinces ghani—Raw materials 85 per cent. and Labour, etc., 15 per cent.
- (c) With Maganvadi ghani—Raw materials, 94 per cent and Labour, etc. 5.5 per cent.

For reference see table in section (c).

A stall fee of half an anna has to be paid at the market places. As the amount of oil sold is not definite, it is difficult to calculate percentages.

If production can be increased and if the competition of mills is regulated or abolished, prices can be kept steady in spite of increased production. Demand may also be extended, if other uses such as making soap and varnishes and burning vegetable oils in lamps are encouraged.

The *ghani* oil is far from satisfactory from the point of view of cleanliness. In addition to the seeds not being properly cleaned, the *ghani*, the method of extraction, the place of production, the utensils, the water that is added and the place and manner of sale—all these are dirty to a varying extent, often repulsive to fastidious customers. But unfortunately, both the *teli* and the customers are indifferent to it and even take this uncleanness as unavoidable. Oil containing many impurities does not keep for a long time but gets rancid soon. Also, as the seeds are not fully cleaned, their cake, which at present is used either as fodder or as manure; is unsuitable for human consumption. Of course, in this province, people are not accustomed to use oil-cakes as food and this is an added reason for their not being utilized as such. Considering, however, the very poor quality of the food consumed by the people and the high nutritive value of some oil-cakes, it seems to us that the inclusion of oil-cake in human diet should be encouraged. Various delicious preparations can be made out of these cakes. This, along with the insistence by consumers on cleanliness, will naturally ensure hygienic conditions being maintained.

Groundnut and cocoanut and to a smaller extent sesamum mixed with gur or sugar are taken as articles of food. None of the other oilseeds are utilized for any other purposes except that of extracting oil.

There are at present no subsidiary industries carried on either with oil or with its by-product, the cake. Oil can, however, be used in the making of soaps, boiled oils, paints, varnishes, hair oils, medicinal castor oil, whereas the oil-cake from certain seeds such as gingelly, groundnut, cocoanut, etc., could be used for making sweetmeats.

It may be possible to acquire the art of pressing any particular oilseed within a couple of months, but since the treatment

varies with the kind of oilseeds pressed, at least a year is necessary to acquire skill in pressing all the different oilseeds. During this period the learner will also gain sufficient experience to locate any defect in the *ghani*.

Process.—The processes of extraction of oil in the Hindi Central Provinces, the Varadi, the Marwadi and the Maganwadi *ghani* are as follows:—

Hindi Central Provinces ghani.—Four pailies = 5 seers of Sesamum or *Jagni* seeds are put in one charge. A small amount of cold water is added to the seeds a little after beginning the charge. A man or a woman sits on the weight-beam and drives the bullock which is blindfolded, as well as attends to the seeds in the mortar. A stick is kept inserted in the oil pipe but it does not completely block the pipe from which oil keeps dripping down into a vessel below. During the process water is added twice more to the seeds. After each addition of water, the cake is turned over with a *crow*-bar to accelerate its circulation which helps in the speedy extraction of oil. In about two hours and a half the charge is finished. The bullock is unyoked and given a little cake. The cake is taken out of the *ghani*-pit and a fresh charge introduced. Two charges are pressed in the morning and two in the afternoon.

The Varadi ghani.—A quantity of linseed sufficient for one charge is made a little wet with water and allowed to stand for about five minutes. It is then put into the *ghani*-pit and the bullock driven. Here also the man sits on the weight-beam where he sometimes goes to sleep. There is a rod, one end of which is tied to the pestle while the other rests over the pit thus helping to stir the seeds. Water is added twice more during the process. When the oil is completely pressed out, it collects over and the cake gets inside the pit. The oil is scooped with a small cup and what cannot be so taken out is removed with a piece of cloth which is dipped into it and squeezed into a vessel. Thus the charge is finished in about three or three and a half hours when the bullock is unyoked and fed with some cake. After taking out all the cake, a fresh charge is introduced.

The Marwadi ghani.—The difference in the process between the Hindi Central Provinces *ghani* and the Marwadi one is that in the latter the pipe is not left open from the very beginning but shut till a good deal of oil is collected in the pit when it is taken out, boiled on fire and again poured into the *ghani*. This is repeated four times during a charge. The oil thus gets very hot and its food value is impaired. The heat, however, helps the speedy and thorough extraction of the oil.

Maganwadi ghani.—One essential difference in the process of expressing oil with the Hindi Central Provinces *ghani* and the Maganwadi one is the fact that, as already stated, the pipe is not kept open from the beginning and all the oil is allowed to accumulate in the pit till it gets free from powder. Another difference is that hot water is added to the seeds not cold. A third difference is that instead of a person sitting on the weight-beam, the necessary load in the form of large stones or mud bags is placed on it, and the man is free to attend to two *ghanis* at a time.

Process of obtaining castor oil.—(i) The local process.—The local *ghanis* do not press these seeds. The seeds are first roasted, then crushed on a flat stone with the help of a wooden rod called *mushal* and these crushed seeds are boiled in water. The oil that gathers on the surface of the water is removed by means of rags of cloth.

(ii) The Maganvadi ghani process.—The seeds are dipped in hot water for a little while and put into the *ghani* after all the water has been strained. This makes the seeds soft. It is then pressed in the *ghani*. Oil begins to appear in 10 or 15 minutes, and then the cake is turned over twice or thrice, and the drain pipe opened. The charge is finished within an hour.

As referred to above, the Maganvadi *ghani* which has been designed after a study of the various provincial *ghanis* and further investigation, embodies the following special features :—

- (1) It is suitable for pressing all common oilseeds.
- (2) It extracts a higher percentage of oil.
- (3) Its daily output is high.
- (4) The time taken per charge is lessened.
- (5) Two *ghanis* can be simultaneously worked by one man.
- (6) The initial cost as well as the repair charges are low. The initial cost comes to about Rs. 30 depending upon the availability of wood.
- (7) It is light for the bullock.
- (8) It provides for the keeping away of the dust, urine and the dung of the bullock from the oil receptacle.

In addition to producing an efficient *ghani*, the All-India Village Industries Association has also published directions relating to the dimensional relationship of the various parts of the *ghani*, thus bringing it within the scope of the ordinary village carpenters to make or repair the *ghani*. At present, students from all over the country are being trained in the industry so that they may introduce the new *ghani* in their own parts. These students during their course of ten months, are taught how to get *ghanis* constructed and repaired and also how to work it for pressing various oilseeds.

Mill vs. Ghani.—Generally the prices of hand-made products are much higher than those of the mill-made ones. But the position is somewhat different in the case of oil. On the whole, there is a difference of about three to six pies (that is, 5 to 10 per cent) between the price of a pound of 'ghani oil' and the retail price of pound of mill oil. The mills can sell at a cheaper rate, partly because (1) they have the necessary capital to purchase and stock the oilseeds at the harvesting season at cheaper rates, (2) they produce on a large scale in a centralized form which enables them to make a large aggregate profit even though the margin of difference between cost and selling prices of oil and cake may not be great and (3) they adulterate the more expensive variety of oils with the cheaper ones. The first two points concern more the commercial rather than the technical aspect while the last point is an unfair competition with the

ghanis producing unadulterated oil and as such forms no basis for the claim to higher efficiency by the mills. Let the mills deal only in unadulterated oils and see how they compare with improved *ghanis*. It should be incumbent on the Government to guarantee pure products and to licence oilmills for the purpose.

It is true that to some extent by a lower crushing cost and a little higher percentage of oil extraction, the mills produce a little cheaper than the *ghanis*. This should be admitted as the real efficiency of the mills. But this alone does not make much difference in the rates of oils which is about six pies per pound or ten per cent on linseed oil and about three pies per pound or five per cent on other oils. This advantage, however, is lost in the commission charged by the retail sellers of oil; so what is saved by the mill efficiency in this way goes to middlemen and is no gain to the customers or even to the producers. As the mills produce on a large scale, they will have to sell wholesale and there will always be the commission to the retailers to be reckoned with. In other words, for purposes of comparison this commission should be added up to the cost of the mill oil. And so what we have to compare with the price of *ghani* oil is the retail price of the mill oil which includes this commission and not the wholesale prices.

Suggestions.—Thus, if the unfair competition carried on by the oil mills with the *ghanis* by adulterating oils is stopped by the Government and at the same time if it helps the oilmen to stock oilseeds at cheaper rates, there seems to be every chance of the *ghani* successfully competing with the mill.

1. As regards the inability of the *tehi* to stock seeds, the easiest course, to our mind, would be to encourage the consumers of oil to store their own seeds and whenever required, get them pressed on contract under supervision. This is not a new custom to be introduced into the villages, but is even now prevalent in many parts of the country. However, the poverty stricken condition of the people comes in the way. This method will also ensure the purity and freshness of the oil and therefore deserves further encouragement. Farmers who produce oilseeds can stock their own seeds and get them pressed instead of buying oil, which at present is very difficult to get in an unadulterated form. To the extent to which this is not possible co-operative stores, helped by Government, should take up the responsibility of sparing the *tehi* from having to buy seeds at high retail prices, which are as a rule higher during the rest of the year than at the harvest season. Thus the *tehi* will be greatly relieved of the burden of financing his industry, and he will be better off by pressing seeds largely on contract.

2. The utter inefficiency of the local *ghanis*, both Hindi Central Provinces and Varadi, is proved in section (c) when it is compared to that of the Maganvadi *ghani*, which seems to be about sixteen times more efficient than the Hindi Central Provinces *ghani* and about three times more efficient than the Varadi one. Thus the introduction of the Maganvadi *ghani* would go a long way

to withstand the competition from mills with this important but fast dying village industry.

3-4. After making all efforts to sell the oil and the cake as cheap as possible, by improvement both in technique and the business side of the industry, the *telis* should be trained to win the confidence of their customers by dealing only in pure unadulterated oil. Thus, being sure about the quality of the oil, the customers will not grudge paying a little more for *ghani* oil than for mill oil. They will be able to appreciate it both from the social as well as from the dietetic point of view.

5. It seems as though the competition faced by the *ghanis* is not so much from the mills as from the cheap groundnut oil produced by the mills. Groundnut oil is the cheapest of all edible oils and therefore it attracts the consumer who wishes to save even a pie whenever possible. At present *ghanis* usually press other oilseeds, the oils of which are more costly and therefore their consumption is low. The *ghanis* should press groundnut also and sell the oil to those who ask for it. Of course, the only danger in this is that the *teli* will be tempted to adulterate the dearer oil with the cheaper one. But it can be checked by enlightened and organized public opinion. This will make it possible for people to choose between cheap and dear oils produced by *ghanis* and will stop them from turning away from *ghani* oil. This will also give fulltime work to the *telis* the lack of which has contributed to their distress at present.

6. The *telis* should be able to press not only edible oils but also commercial oils. And whenever possible, they should know how to convert it into some other industrially useful forms such as soaps, varnishes and paints and food preparations from oilcakes. These side industries will greatly improve their economic condition. Efforts should be made to devise lamps for burning vegetable oils in place of kerosene oil.

We would like to repeat briefly the suggestions regarding how the *telis* and the public can combine for resuscitating this cottage industry.

1. They should ban the entry of mill oil into the village.

2. Consumers should stock their own seeds and get them pressed on contract. This will ensure both cheapness and purity of oil.

3. The public should insist on using *ghani* oil for edible, commercial and lighting purposes.

4. Common meetings of *telis* and the public should be held and resolutions should be passed asking the *telis* to deal only in pure oil. Defaulters should be punished.

5. The *telis* should introduce efficient *ghanis* and try to reduce the rates of oil and cake. They should press cheap oils like groundnut also for such customers as ask for it.

6. The *telis* should also follow some other industries in their spare time such as agriculture, spinning, dairy, soap making, manu-

facture of varnishes and paint, and sweetmeats out of oil-cake.

Finally, we may enumerate the lines along which the Government may help the *telis* to revive the use of *ghani*.

1. Licensing of oil mills.

2. Storing of oilseeds.

3. Introducing the Maganvadi *ghani* by sending out trained carpenters to remodel local *ghanis* and by starting demonstration centres through district boards.

4. Research in design to see how *ghanis* can be further improved.

5. Research in oilseeds.

6. Research in methods of burning vegetable oils for lighting purposes.

7. Purchase of goods produced by the *teli*.

8. Expert technical and business advice to be made available for *telis*.

CHAPTER III.—GUR INDUSTRY

(See Part I, Volume I, Page 15.)

(Submitted by the All-India Village Industries Association, Wardha.)

There are principally two sources, viz., sugar-cane and palm from which 'gur' and sugar are or can be made in this province. The palm resources, however, are not yet exploited. As will be seen from the Appendix, the province does not produce enough 'gur' and sugar to meet the internal demand.

Large Imports.—In 1937-38, the production of sugar-cane-'gur' in the province was 44,218 tons, while the consumption during the same period amounted to 86,432 tons, which necessitated an import of 42,124 tons. Moreover, all the sugar required in the province has to be imported. The sugar consumed in 1937-38 was 38,300 tons. Even though 'gur' is a village product, its large import must be deprecated, when resources for producing the requisite quantity are locally available. The economic drain caused by the imports amounts to about rupees One crore and thirty-five lakhs.

Potentialities of Sugar Production in this province.—It will be seen from the Appendix that 15,257 tons of 'gur' can be obtained from the existing palm trees in the province every year. 26,867 tons of gur shall still have to be imported to meet the demand unless the local production is augmented to the required extent. According to the present estimates, one and a half tons of gur is produced from sugar-cane grown in one acre of land. Hence, nearly 18,000 acres of agricultural land will have to be brought under cane-cultivation in order to make up the deficiency in 'gur' supply to dispense with the imports. As the sugar-cane crop has the effect of 'exhausting' the soil, it cannot be raised in the same fields year after year.

It is, therefore, necessary to have recourse to rotation of crops and as a rule, leguminous crops are raised in sugar-cane fields to recoup the soil. It will thus be seen that it is necessary to bring 36,000 acres of good land under sugar-cane cultivation in order to ensure a regular annual supply of cane for the making of 'gur' and to make the province self-sufficient. On the other hand, if 26,867 tons of 'gur' are to be obtained from new palmyra plantations, only 1,343 acres of land, which need not be necessarily agricultural land, will suffice. The palmyras grow even on waste land. 25 palmyra trees will yield a ton of 'gur'. In an acre of land, 500 trees can be planted, and these will yield 20 tons of 'gur' annually.

A profitable remedy to release 28,273 acres of land for vital food crops.—At present 30,483 acres of fertile agricultural land are utilized for cane-growing in the province, in order to produce 44,218 tons of 'gur'. Only 2,210 acres of land will be enough to produce an equal quantity of 'gur' from palmyra trees. Thus 28,273 acres agricultural land can be available for raising vital food crops like wheat, juar, rice, etc. If a regular scheme for palmyra plantation to be undertaken by the villagers is encouraged, within 20 years all the fields used at present for cane-growing can be utilized for raising food crops. The palmyra begins to yield the sugary sap when it is 15 years old.

Scope for increasing Horticulture by encouraging palm 'gur'.—Out of the 30,483 acres under cane, 27,358 acres are irrigated at present. Therefore 27,358 acres will be available for extensive horticulture, when palm 'gur' is substituted for sugar-cane 'gur'.

Annual Saving of rupees thirty-three lakhs through palmyras.—The present cost of cane cultivation per acre in Central Provinces is Rs. 110. Thus, for growing cane in 33,483 acres, Rs. 33,53,130 are spent annually. The palmyras, when once planted, yield sap for sugar-making for at least 50 years continuously and involve no annual cultivation or irrigation cost.

Interests of the Farmer, the Labourer, and the Consumer.—Cane-growers are at present at the mercy of the fluctuating market. Moreover, cane is an intensive crop, depending on irrigation. So it is confined to limited areas abounding in irrigation facilities. In view of the intensive production of 'gur', the agriculturist who is also the 'gur' manufacturer, has to dispose of his 'gur' at cheap prices to the middlemen, who are the moneyed merchants. There is a fairly long chain of these middlemen, big and small, who flourish on the profits of the 'gur' industry. Out of nineteen districts in Central Provinces and Berar, cane 'gur' is produced only in nine. In order to transport the 'gur' produced in these to other districts, the agency of merchants and railways is very essential. The consumer pays the highest price for his 'gur' requirements and the actual producer realises the least or is sometimes even underpaid, the moneyed class and the foreign Railway Companies being the real gainers.

As palmyras can be grown without the aid of irrigation, it is not necessary to have plantations of them. They can thrive on field

boundaries very well. Therefore almost every village can raise enough palmyras to obtain the requisite quantity of 'gur' and sugar for local consumption without taxing the capacity of the land already under cultivation. The cultivation of palmyra will eventually draw the producer nearer to the consumer and thus help to reduce the number of middle men and avoid the expenditure in railway freight. This proposed method of satisfying the 'gur' needs of a village through extensive palmyra planting can be well compared with that of providing the village with a well for its water supply, which makes it self-sufficient in this respect and it enjoys the fruit of local effort, encourages local skill and combines purity with freshness. On the other hand, a system of supplying cane-'gur' to the whole province by encouraging intensive cane-cultivation in selected areas is comparable with that of maintaining a large tank with costly water-works to provide water to an extensive area, even though this involves the imposition of a water cess and the not improbable risk of spreading deadly diseases through the contaminated water.

The Farm Labourer and Village Artisans.—Usually the farm labourer is thrown out of employment in the hot season when the agricultural operations are at their ebb. This, however, coincides with the season—March to June—when palmyra 'gur' is made. Hence it will be a boon to the farm labourer. The abandonment of cane-cultivation will not throw the farm labourer out of employment during the other seasons. They will continue to work in the fields released from cane cultivation, which will be put to other uses like horticulture or for raising cereal crops. The labourers themselves can conduct the palm 'gur' industry, as the initial investment required is very small. The labourers can easily learn the method of climbing and tapping the palmyras for the purpose of drawing out the sugary sap. In the case of cane-'gur' the villagers have to depend on the big factories for supplying cane crushers, but for making palm 'gur' the village smith will supply all the tools needed.

Earthen pots are used for collecting the sap from the palmyras. Therefore, the village pottery will be amply encouraged.

Sugar supply.—The sugar needed by the province can also be obtained from fresh palmyra plantations without jeopardising agricultural land which is under food crops at present. Of course, it will take 20 years to attain the goal but the scheme must be launched from now.

No Floating of Large Factories involving Investment in Foreign Machinery.—The technique of manufacturing sugar is quite simple, which can be broadcast in the villages where the palmyras are available. This does not involve the establishment of big sugar factories, requiring heavy capital investments in foreign machinery in order to produce sugar. The production of sugar in factories entails no fewer or lesser evils than unemployment, capitalism, exploitation of labour, raw material-producer and consumer which are the concomitants of other large scale concerns also, e.g., the

textile mills. Fortunately, no sugar factory has yet been started in the province. In the enthusiasm of opening new industries and avenues of employment every attempt should be earnestly made to avoid the starting of any sugar factory either as a state or private enterprise. As regards nutrition, 'gur' is far superior to refined sugar, which is produced on the farm or in the factory. Vigorous attempts have to be made to displace the consumption of refined sugar with that of 'gur'. If sugar is needed at all, only that produced in villages should be made available.

Necessity of introducing hand-driven centrifugals.—In the manufacture of sugar, all the apparatus required can be procured locally in the villages, except the centrifugal machine which need not be driven by power. Small hand-driven centrifugal machines can be very useful. The machine must not be very costly. An attempt in this direction has been made by the All-India Village Industries Association. A small hand-driven centrifuge costing Rs. 50 has been devised. In an eight hour-day, 164 lb. of sugar can be made from 'rab' by two workers working with one centrifugal machine. Further investigation is urgently needed on this subject. Such centrifugals can be manufactured in the province. This by itself will be a lucrative source of employment to the smiths and the carpenters. Instead of starting a central factory, small factories for manufacturing the machines can be opened even in central villages with state aid. An embargo should be placed on the import of such machines from outside the province.

The Twenty year limit.—No doubt, the lucrative and fascinating prospects of establishing the palmyra-'gur' industry in this province demand patience for twenty years. In the meantime, however, a popular campaign for planting the palmyras has to be conducted assiduously. The exploitation of the existing palms, of course, can be taken up immediately. The experience that will

be gained during these twenty years, while manufacturing thousands of tons of palm gur, will be of much avail when the new plantations of palmyras will be mature enough to yield the sugary sap.

APPENDIX

Potentialities of palm-gur-making

Work for 50,000 villagers.

Distribution of wealth in villages—Rs. 27 lakhs.

According to the information supplied by the Deputy Commissioners of the districts in Central Provinces and Berar, there are 10,20,103 Date-palms and 39,742 Palmyra palms in the province. The following figures indicate that 4,27,222 maunds (a maund of 40 seers, of 80 tolas each) of 'gur' can be made from these palms annually. The industry will enable the villagers to earn 26,70,137 rupees every year. In making date-palm 'gur' 40,804 workers will earn rupees 15,30,150 in about 5 months and in making palmyra 'gur' 7,948 workers will earn rupees 1,98,700 in 3½ months. Besides these, a number of village potters, smiths and fuel collectors will be benefitted.

(A) Date-palm gur.

- (1) Number of date-palms available—10,20,103.
- (2) 'Gur' that can be obtained annually at 15 seers per tree—3,82,538 maunds.
- (3) Total price of 'gur' at Rs. 6-4-0 per maund—23,90,862 rupees.

Employment and Distribution of wealth.

NOTE.—The season for the making of date-palm 'gur' lasts for 5 months, i.e., from November to March.

A tapper taps on an average twenty five date palms daily. He would, however, require 50 trees, as the trees have to be rested alternately.

Serial No.	Items of cost	Number	Cost Rs.
1	Tappers	20,402 at Rs. 50 per head for 5 months.	10,20,100-
2	Helpers	20,402 at Rs. 25 per head for 5 months.	5,10,050
3	Fuel, at 8 annas per tree per season		5,10,051
4	Tree rent		2,55,025
5	Pots (earthen)		30,603
6	Other accessories		64,879
Total			23,90,706

B.—PALMYRA GUR

Kind of labour	Number	Earnings
1 Palmyras available ..	39,747	..
2 Gur that can be obtained annually at 8 or 9 maunds per tree per season = 44,909 maunds.	44,909	..
3 Price of gur at Rs. 6-4-0 per maund—2,79,431 rupees ..	..	Rs. 2,79,431

Employment and distribution of wealth.

NOTE.—The season for palmyra-gur manufacture is 3½ months from March to the middle of June. A tapper taps ten trees daily.

		Rs.
1 Tappers ..	3,974 at Rs. 35 per head for 3½ months.	1,39,090
2 Helpers ..	3,974 at Rs. 15 per head for 3 months.	59,610
3 Tree rent at annas 8 each ..	..	19,671
4 Fuel at annas 8 per tree per season ..	..	19,871
5 Other expense for pots, pans, etc. ..	..	40,989
Total ..	..	2,79,431

Distribution of palms in the Central Provinces and Berar.

Serial No.	District	Number of palmyras	Number of date-palms
1 Akola	600	60,000
2 Amraoti	673	19,500
3 Bhandara	78	8,500
4 Bilaspur	201	1,488
5 Betul	990	1,500
6 Buldana	127	6,225
7 Chanda	36,500	15,700
8 Drug	1,000
9 Hoshangabad	1,000
10 Jubbulpore	100	3,000
11 Mandla	1,500
12 Nagpur	1,223	2,38,678
13 Nimar	1,000
14 Raipur	100	4,400
15 Saugor	550	15,400
16 Wardha	6,26,612
17 Yeotmal	14,600
Total	39,742	10,20,103

Statement showing the Imports and Exports of Gur and Sugar in the Central Provinces and Berar (for 12 months from the 1st April to 31st March)—Maund=82½ lb.

	1935—36		1936—37		1937—38	
	Import	Export	Import	Export	Import	Export
Sugar, refined and unrefined.	1,084,894	6,214	1,116,027	4,692	1,055,415	9,163
Saugar (gur, rab, molasses, jag-gery, etc.)	1,262,053	5,601	1,288,908	6,062	1,154,820	4,106

Figures taken from the "Accounts relating to the Inland (Rail and River-borne) Trade of India".

CHAPTER IV.—BEE-KEEPING AND HONEY PRODUCTION

(See Part I, Volume I, Page 15.)

(Submitted by the All India Village Industries Association, Wardha.)

With its plentiful forest and other resources, the province seems to hold out great prospects for the development of this industry, though at present they are not being utilized at all or only in a haphazard manner. The Yeotmal district and the Melghat taluq in Berar, Alipore and Jalgaon in the Wardha district, Sihora tahsil in the Jubbulpore district, the forest regions of the Betul, Balaghat and Bilaspur districts, are only a few of the many places in which this industry is, and may be, carried on.

Of the trees and plants grown in this province those on which the bees can thrive are abundant and varied, viz., garden plants and creepers, such as the rose, the zinnia and the antigonon; vegetables; garden plants, such as the plantain, cucumber, brinjals, peas, beans, bhindi, and munga; field-crops such as juar, bajra, maize, gram, cotton, sesamum, mustard, lucerne, coriander, and onion; fruit trees, such as guava, citrus mango, tamarind; and other trees such as neem, babul, sindhi, etc. Of these, the honey of bees visiting tamarind trees has the best flavour. At present, what is collected is mostly from the honey-combs found on the sindhi, semal, the tamarind and the babul trees.

With the exception of Balaghat where the right of honey collection is leased to a joint stock company, the industry is carried on by individuals or small groups of individuals on a small scale. Barring the A. I. V. I. A. at Maganwadi, Wardha, where it is done more for purposes of demonstration and training than for a market, nowhere is the industry carried on in a scientific manner.

Generally speaking, there is no particular community that has specialized itself in this trade. The people living near forest areas try to supplement their earnings by these means, though the Baiga community in the Balaghat district and the Gonds in the Jubbulpore district seem to have made this their peculiar preserve.

The bees, the honey-combs of which are usually raided by the honey-collectors are the Indian Bee or *Apis indica* which can easily be tamed, the little Bee or *Apis florea* or even the Rock Bee or *Apis dorsata*. The two latter love the open air and are untamable. The Rock Bee is very ferocious also.

The present method of production, though crude, is simple enough. The bees are scared away, the hive captured and honey squeezed with hands, after which it is strained through a piece of cloth which is not always clean. If the bee is ferocious, it is smoked away for capturing the hive—a highly wasteful process. The major portion of the honey that is marketed at present is what is collected from the combs of the untamable bees an indication perhaps of the enterprising nature of the honey-producer.

The honey so obtained varies in quantity from a quarter or half a seer per comb of the ordinary bee to six or seven seers per comb of the Rock Bee. Its price ranges from six or

seven annas per seer in the Balaghat district to twelve annas per seer in the Wardha district.

The honey produced thus cannot rank very high in purity since the grub, the larvae, the pupa, and dead bees if any, will also have been squeezed into the honey. Such impurities may range from 2 to 4 per cent.

That being so, it is not as desirable as absolutely pure honey. It may even be some times positively harmful.

The low price at which the commodity is marketed may be accounted for in various ways. Sometimes, honey is adulterated with gur which makes the consumer naturally suspicious and unwilling to offer a fair price. Sometimes, particles of impurities remain even after straining. More generally, low prices are perhaps due to the fact that the producer's cost of collection, his staying power and his knowledge of market conditions are virtually nil. Or it may be that even though its food value is great, the use of honey as an article of food is not on any considerable scale. This will also explain why the industry is not carried on, on a commercial scale.

The principal constituents of honey are—

	Per cent.
Water	17.7
Dextrose (grape sugar)	34.0
Laevulose (fruit sugar)	40.5
Sucrose (cane sugar)	1.9
Dextrins and gums	1.5
Ash	0.18
Acids, proteins, pigments, bees wax pollen grains, etc.	4.1
Total	99.88

Today, the chief use to which honey is put is medicinal. Obviously then, the market for it cannot be a wide one. This will also account for the fact that quite often the by-product, bees' wax, is also sold for the same price as honey, e.g., in the Wardha district both the products are sold at 12 annas per seer.

The producer consumes a part of the commodity himself but the bulk of it he sells immediately after production, either direct to consumers or to local dealers and merchants who in their turn sell it in the neighbouring market or export it. This last seems to be a very common practice. From the Balaghat district alone 200 tins of it are annually exported by the firm, Messrs. Purshottamdas Mathuradas and Co., Bombay.

The by-product, bees' wax, is used by various groups of people, such as chamars, polish and candle-makers. Since the introduction of paraffin wax which is sold very cheap, the use of bees' wax in the candle-making industry has declined. There is, however, still a good demand for wax candles for certain special purposes, e.g., for burning in churches, etc.

Even though the demand for honey has not been well-developed, a worker engaged in the industry can earn about Rs. 2 per week which compares very favourably with the earnings in other industries, but lest this figure should mislead one, it must also be

mentioned that this is not an occupation which brings in a steady income throughout the year.

Incidentally, it must be mentioned that this is one of the very few cottage industries in which there is no impediment of any sort placed, whether in the form of licence or of octroi. Is it because the market being very limited, a levy on it will violate all the canons of taxation?

Under existing circumstances, the case for introducing apiculture as an entirely new industry is strong. Not only does it make it possible for an agriculturist or horticulturist to supplement his meagre earnings with the proceeds of this subsidiary industry, but it may even enhance his earnings from his main occupation, because the bees, by assisting in cross pollination, may improve the quality and the yield of his crop.

New methods of production can be introduced as well as improvements made in the old method. One improvement will be the introduction of the sun process where instead of hand-squeezing, the honey-comb is kept in the sun on a basin covered with cloth and the honey made to trickle into the basin. The honey thus collected is purified by pouring it into an earthen vessel with a corked hole at the bottom and keeping it in a hot-water bath, and is then cooled. In this process, the wax collects on the surface and the pure honey is obtained by removing the cork and receiving the honey that runs out into a clean vessel.

Thus, by this sun process, all the impurities resulting from the use of the present crude method can be eliminated without at the same time doing away with its one great advantage, the need of any capital outlay.

Another much needed improvement is the keeping alive of the untamable bees. In the case of the little bee, this need can easily be met, if the honey-comb is taken down after sunset when the bee will not sting. It can then be scared away and the upper part of the honey-comb where the greater part of the honey is concentrated removed and honey collected from it by the sun process. In the case of the rock-bee, however, this is not very easy because it is never very gentle in its ways.

The newer and more scientific method of production, as has been successfully demonstrated at Maganwadi, Wardha, is by capturing a natural colony of bees into a specially constructed wooden hive with brood and super-chambers and with frames in each which makes it possible for the bee to live its natural life. This work of capture is done either in the mornings or in the evenings. Sometimes it may be necessary to use a 'smoker' to gather the honey-comb and the bees into the hive. The honey-combs are placed in the super-chamber so that the honey collects in that chamber. The advantage of this is that the lower or brood chamber need not be disturbed, thus preventing the chances of the bees deserting the hive. Capturing a natural colony is an art in itself and needs training. Sometimes, artificial feeding on syrup may be necessary during the first few days.

The hive is kept in the shade on a stool, the legs of which are kept in water to prevent any ants from getting access to the hive. It is imperative that the hive should be kept clean, as otherwise enemies of bees such as wax moths might find their way in, which will drive away the bees from the hive. Inspection is further required to see that the colony is never without its queen.

When the honey collected is ripe, it is extracted with the help of a small centrifugal machine. The combs from the super-chamber are taken out after the bees are carefully brushed away, their cappings removed with a double-edged knife and then put into the extractor. The honey so extracted is collected into another vessel. The advantages of this method are firstly that the purity of the honey is guaranteed and secondly that the comb is not destroyed.

This method involves a capital of Rs. 15 for the hive, the knife, the 'smoker' and the extractor. Besides, the labour required to look after the colony has also to be paid. One need not have an extractor all to oneself unless one has a large establishment, nor need one always own a 'smoker'. These can be collectively owned. Even so, this method of honey production is costlier than the old predatory method. If, however, the industry becomes a paying one, as it may well be, this need be no problem. Until then, some means will have to be devised whereby the intending producer may be able to get the required amount of money.

An equally great, if not greater, problem is that of marketing. As has already been stated, this is a commodity with a limited market at present. In Maganwadi, this problem does not exist because of its intensive market which has grown not entirely out of purely economic considerations. To popularise the use of honey is an essential requisite which might be beyond the capacity of the small producer. Can anything be done in the way of setting up a sales bureau or a co-operative sales society which will widen the market for honey by bringing the producer and consumer into contact with each other and at the same time preventing any possible exploitation?

The case for Government intervention in this industry is strong. It fulfils some of the major conditions laid down by the Indian Fiscal Commission, viz., an abundance of raw materials and cheap labour. Cannot demonstration centres be started in the various tahsils and direct financial assistance on favourable terms be given?

CHAPTER V (a).—POTTERY

(See Part I, Volume I, Page 15.)

(Submitted by Dr. Sarin, Lahore.)

I.—Pottery in retrospect and prospect.—The word 'ceramic' has been derived from the Greek word 'Keramos' meaning pottery, but the Greek word itself originated from an older Sanskrit root meaning 'to burn'. Pottery or ceramic ware is defined as a product, in the manufacture of which a high temperature treatment is involved and which is manufactured chiefly or entirely from raw

materials of an earthy nature, as distinguished from those of an organic or metallic nature. The entire ceramic industry depends directly or indirectly upon the nature of minerals called clays which have the remarkable property of becoming plastic when mixed with water and hard when heated to a sufficiently high temperature.

Although clay working is one of the oldest industries of man and has progressed as time has advanced, yet its technical development has been slow when compared with younger industries, the children of modern engineering and chemical research. This is probably due to the inadequacy of contemporary general research when applied to the ceramic problems of suspensions, plastic working conditions and silicate fusions. The older industries which started before the days of modern chemistry and physics have had the handicap of medieval methods, superstitions, trade secrets and prejudices not known to the younger industries. Ceramics has been particularly unfortunate in this respect. The artistic side of pottery ceramics was, however, highly developed centuries ago. Pottery is a handicraft built up only by experience. It was nursed in its first beginnings in the hoary antiquity by untrained hands. The original potter's wheel, a flat stone pivoted on to another stone and turned by hand to shape round vases and bowls is thought by some to have been man's first machine, from which have developed the rotating and circular movements of all the present machinery. But now ceramic products supply the most diverse needs of man and enter as important factors into the construction and decoration of buildings; they supply varied domestic requirements and are indispensable for building all kinds of furnaces and for manufacturing chemical products; they render important services to agriculture and sanitation, *i.e.*, in the drainage of water and sewage; horticulture makes considerable use of them; and finally they lend themselves to the creation of decorative pieces whose artistic beauty is admired by the whole world. Thus clay products are an essential element of what makes civilization—they are of the same value as wood or metal but more important than glass or natural stones. These have become a criterion with which to measure the development of civilization of nations. In our modern times these support millions of people.

Egyptians were the first to make bricks of rough-earth. These were dried by exposure to sun-light and later fired in a primitive type of kiln. In some excavations, fired bricks were found at a depth of 25 to 30 feet below the level of the valley of the Nile. This depth, with the progressive elevation of the soil, suggests that the beds containing those bricks were deposited 10,000 years or more ago. According to Marietta Bey, vases of terra-cotta which were intended to contain provisions for the deceased have been found in the tombs of the Memphite period (5000—3000 B. C.). Whether the Chaldeans and Assyrians borrowed their processes from the Egyptians or whether they discovered the processes themselves, is not certain, but it is known that after having for a long time used crude bricks in their buildings they erected the palaces of Croesus

at Sardis, of Mausolus at Halicarrassus, and of Attalus at Tralles in beautiful, red, fired bricks, which evince the skill of Chaldean and Assyrian potters at that remote period. The Persians who succeeded the Assyrians carried the manufacture of monumental wares to a high degree of perfection. The body employed by the ancient Persians was extremely siliceous, having the appearance of a piece of soft stone. At a later period, the Persians used more plastic bodies for making dishes and vases.

The art of faience was introduced into Europe from Persia by the Arabs and the Moors in the eleventh century. When the Arabs were superseded by the Moors, a new kind of ware appeared in Spain, which was distinguished from the Persian wares chiefly by the metallic lustre of the glaze.

The aborigines of Mexico and Central America made some remarkable terra-cotta, the origin of which dates, probably, from before 1000 B. C. The first pieces of pottery in China were made during the reign of the Emperor Hoang-Ti (2698—2599 B. C.) but their great discovery, that of impermeable pottery (stone-ware and porcelain), is much more recent, the first mention of it being made in a work published in the reign of the Emperor Ulan-Ti (175—151 B. C.). The Japanese annals relegate the origin of Japanese porcelain to the first century B. C.

Some ancient buildings, forts and temples in India by their very existence bear testimony to the fact that this great art flourished in our own land at a high pitch of perfection. Pots and figures of Lord Buddha which have been excavated in Taxila, are made of such material, that, in durability these excel the hardest porcelain of today. In the Vedic hymns mention is made of pottery. It is possible that the Chinese learnt this art from the Indians.

The manufacture of terra-cotta was thus invented by four different peoples—the Egyptians, the Chinese, the Indians and the Mexicans (Astecs)—at periods too remote for accurate dates to be assigned to them.

The manufacture of porcelain, a pure white translucent ceramic, as hard as steel, was discovered in China and afterwards it spread throughout the world. Chinese porcelain was imitated successfully at the Royal Porcelain Factory, Berlin, and the French Factory at Sevres. The English, while trying to imitate Chinese porcelain, experimented with all possible kinds of materials except, kaolin, which is, the most essential ingredient and which is, as it were, the bone of porcelain. They used bone-ash in place of kaolin and while failing to produce porcelain they invented a new kind of pottery called bone-china.

The modern ceramic wares consist of earthen ware, stone-ware, soft-paste porcelain, hard paste porcelain, chemical porcelain, electric porcelain, bone-china, majolica and faience, refractory products, terra-cotta, porcelain buttons and studs, and artificial teeth.

Earthen-ware.—It is made of a body which is porous but hard enough so as not to be

scratched by steel. It is glazed with a lead or lead-less glaze. As the temperature of firing is not very high, it affords an opportunity of being decorated with under-glaze or over-glaze colours. Today Staffordshire in England is famous for its fine earthen-ware. The whole valley of Staffordshire is spotted with ceramic factories. Tiles, table-ware and tea-sets are usually made of earthen-ware.

Stone-ware.—The body is vitreous and resistant to heat and strong acids. If glazed, the glaze is impervious to chemicals. Stone-ware jars are well-known to factories manufacturing acids. Drain-pipes and sanitary-ware are made of stone-ware, making pottery an indispensable auxiliary to the science of hygiene. Another important branch is the manufacture of blue engineering bricks and decorative or paving tiles. Stone-ware was known to the Chinese many centuries before European civilization.

At the present time stone-ware manufactured in France, Belgium, Japan and India enjoys an extraordinary favour.

Soft-paste porcelain.—The body is vitreous, translucent, very white, being fired at a much higher temperature than earthen-ware. Table-ware, tea-sets and artistic figures are made of soft-paste porcelain. It is chiefly manufactured in France, China, Japan and Germany. The Japanese egg-shell porcelain is popular because of its artistic designs, high quality and low price.

Hard-paste porcelain.—It is fired at a still high temperature and table-ware, tea-sets and dinner-sets are made of this porcelain. It is chiefly manufactured in Germany and U. S. A.

Chemical porcelain.—It is also a kind of h.p. porcelain and is used for laboratory wares. It has the property of resisting sudden changes of temperature and the glaze on it is not affected by acids.

Electric porcelain.—This is another very useful kind of h.p. porcelain. It is used for electric insulation due to its non-conductivity. Insulators, switches and other electric appliances are made of it. Lately Steatite-porcelain has come in vogue, as it is capable of sustaining the highest electric pressures utilized today. It is extensively made in U. S. A., Germany and India.

Bone-China.—It is a kind of S. P. porcelain in which bone-ash is used. It was accidentally discovered during an attempt in England, of making porcelain similar to that of the Chinese origin. It is chiefly manufactured at Staffordshire in England.

Majolica and Faience.—It is a kind of pottery cheap in price, yet most artistically decorated with ceramic colours and is, therefore, used for decoration. Flower vases and chimney pieces are generally made of it. It is made in France and England.

Terra-cotta.—It includes lower-class pottery as red bricks, paving tiles, etc. It is porous and not very lasting. Attempts have been made in India and England to make articles of red clay which may pass for earthen-ware or even for porcelain.

Refractories.—Refractory ware is an invention of the nineteenth century, during which time scientific knowledge, suitability of raw materials and the accuracy attainable in the mixings, created an industry which has rendered possible great purposes in metallurgy and the manufacture of chemicals. Glass pots and refractory bricks are made of refractory materials. Chief manufacturing countries are Belgium, U.S.A., France, Germany, England and India.

The manufacture of porcelain studs and buttons and that of artificial teeth are the monopoly of a few works in England and U. S. A.

Photography too has now been pressed into the service of the ceramist. Perfect photographic pictures can be reproduced on porcelain. This method has surpassed all other methods in attaining durability.

Raw materials for ceramic industry are numerous and are to be found all over the earth.

Kaolins are chiefly found in the form of soft lumps in the midst of pegmatite, gneiss granites prophyry and other rocks. More rarely they are found in sedimentary deposits. They are used in the manufacture of earthen-ware porcelain and in several non-ceramics industries, such as the manufacture of paper, paint and soap.

Secondary clays, as distinguished from China-clay or Kaolins, are of three kinds—vitrifiable, refractory and fusible. Other aluminosilicates similar to clays are Allophane, Halloysite, Talc or Steatite and Asbestos.

Quartz occurs in quartzose rocks, granites, gneiss, mica-schist, etc., but it cannot be extracted from these economically. It is collected when these rocks have decomposed into their constituents. Flint is found in the form of pebbles in chalky ground. Sand is a product of the erosion of various rocks. It is highly siliceous and is composed of quartz with varying proportions of felspar, mica and calcium carbonate.

Felspars are obtained from feldspathic rocks, such as pegmatite, basalt and porphyry. Felspar is found as potash or soda-felspar. Carbonates of calcium and magnesium, calcium sulphate, bone-ash and phosphorite are also used in pottery manufacture. Alumina is introduced in ceramic bodies as bauxite, a crude aluminium hydrate of very variable composition. Coal of a high quality and of low sulphur content is always used for burning ceramic-ware.

In India all the raw materials for the pottery manufacture are to be found in abundance. China-clays are found in Bengal, Bihar, the Punjab, Central Provinces, Rajputana and Madras. Ball clays and other lower grades are found in Delhi, Central Provinces, Bihar and the Punjab. Quartz is found all over India. Felspars are found in Ajmere, Delhi, Jubbulpore, and Dholpur and Gwalior States. It is possible that some of the deposits in India have not been excavated so far.

In the Central Provinces kaolins or white clays are found in the Jubbulpore, Chhindwara, Narsinghpur and Drug districts and fire clay is found in Jubbulpore and at Warora in Chanda district. Representative analyses of fire clays found at Jubbulpore are given below :—

Silica	62.92	60.65
Alumina	25.29	26.60
Ferric oxide	1.08	.87
Lime	.57	.45
Magnesia	0.29	.30
Alkalis	.58	1.40
		Titanium oxide.
Loss on ignition	9.35	9.25
Total	100.08	99.52

Good qualities of sand are found in the Jubbulpore district and a very pure quartzite occurs in large masses near Kisanpur, ten miles from Narsinghpur railway station.

Today India is producing ceramic-ware out of Indian raw materials in all its phases though on a small scale, so small indeed that she cannot meet her present needs. There are the following four potteries in the Central Provinces :—

- (1) Messrs. Burn & Co., Ltd., Jubbulpore.
- (2) Messrs. Perfect Pottery, Ltd., Jubbulpore.
- (3) Messrs. Katni Pottery Works, Ltd., Katni. (It was reported some time ago that this factory was closed.)
- (4) Central Pottery Works, Ltd., Nagpur.

These factories use provincial raw materials for making their wares which find a demand in and outside the province. In India pottery of one kind or another is made at Delhi, Lahore, Gwalior, Calcutta, Benares, Bombay, Mysore and Thar Kathiwar. Red-clay industries are spread all over India. There is no experimental and teaching station in this province. There are only two such stations in India at Benares and Lahore while in foreign countries a large number of institutions give instruction in this important industry.

In spite of the progress already made, the final stage of development of ceramics has not yet been reached. In some of its applications it seems to have reached near perfection, but in others much remains to be done and the progress of metallurgy and numerous other industries will give rise to fresh development in ceramics. Finally there still are many branches of life in which pottery could with advantage replace the materials now employed, on account of its indestructibility or the brilliance of its decorations.

II. Processes involved in pottery manufacture.—The raw materials required for preparing the body-mixtures are china-clay, ball-clay, felspar, quartz and whiting, while those for preparing the glazes are china-clay, felspar, quartz, whiting, white lead, red lead, borax crystals, sodium carbonate and zinc oxide.

The following metallic oxides are used for imparting colour to the glazes or the bodies :—

Cobalt oxide, Uranium oxide, tin oxide, iron oxide, nickel oxide, antimony oxide, chromium oxide, manganese dioxide, zinc oxide, fluorspar and cryolite.

The ingredients for the body mixture are mixed together in definite proportions, ground fine in a ball mill to pass through a 100 mesh sieve. The mixture is filtered-pressed to remove excess of water and kneaded on a kneading machine to remove entrapped air bubbles inside the body-mixture. This kneading makes the body homogeneous and better adapted to slip casting as well as throwing on the wheel. The mixture is kept for aging for a few days for the preparation of clay bodies.

Pottery is a very comprehensive term as stated before and it will not be possible to discuss all the specialized processes for the preparation of various types of pottery ware, e.g., china-ware, stone-ware, porcelain, sanitary ware, etc. For the sake of illustration one example, i.e., of earthen-ware is taken. A typical body-mixture for an earthen-ware body would be—

China clay—45.
Quartz—36.
Felspar—14.
Whiting—5.

For the preparation of the body the materials are mixed, ground and kneaded as stated above and the articles are either cast in Plaster of Paris moulds or turned on the Potter's wheel. The 'green' ware so formed is dried in the open atmosphere and biscuit fired at a temperature of 1100°C in a round down-draught furnace.

Some of the foregoing processes cannot be easily and effectively carried out by hand specially for manufacturing on a commercial scale. The most difficult of them is the fine grinding of hard raw materials like quartz and felspar. The installation of a ball mill for grinding is most essential.

The glaze ingredients are mixed together in the following proportions, fritted (i.e., heated to fusion) to form transparent glassy bodies, ground fine in a ball mill and sieved through 150 mesh to form a glaze slip :—

China clay—5.
Quartz—20.
Felspar—25.
Whiting—5.
Borax—10.
White lead—30
Soda ash—5

The glaze is applied upon the biscuit ware by either of the following processes:—

- (a) dipping,
- (b) spraying,
- (c) sponging,
- (d) brushing, and
- (e) dusting.

The most common of these methods is the dipping.

The glazed articles are fired in a down draught kiln at about 1040°C.

The firing of pottery articles is the most difficult of all operations and requires very careful controlling by a skilled workman. There are a number of types of furnaces used for the purpose of biscuit and glaze firing. The country furnace used by the Indian potters varies in design and construction in different parts of the country. The modern type of furnace is the round down-draught furnace the construction of which is rather costly and cannot be easily introduced in Indian villages. The designing of a suitable furnace for Indian conditions is a problem which is to be tackled.

The glazes applied upon earthenware are either leadless or lead-glazes. In case lead has been utilized in the manufacture of a glaze, it is essential that the whole of lead should be present as calcium or sodium alumino-silicates, which form is harmless towards acidic foods.

III. Decoration.—In the ceramic industry there are a number of distinct methods for decorative work—

- (i) Underglaze decoration.
- (ii) On-glaze decoration.
- (iii) Over-glaze decoration.
- (iv) Majolica decoration.
- (v) Lustre decoration.
- (vi) Lithographic work.

Different ceramic colours are manufactured out of the metallic oxides already mentioned by calcining the metallic oxides in definite proportions at a temperature of 1250°C in oxidising, reducing or neutral atmosphere according to the particular shades required.

When the decoration is done on a biscuit ware prior to glazing and then the ware fired, the colour effect so produced is known as U. G. decoration.

When the colours are applied on the fired glaze, the decoration is termed as on-glaze. But when the colours are mixed in the glaze itself and the coloured glazes so formed are applied, the decoration obtained is in-glaze.

In the case of majolica glazes, the different coloured glazes are applied on the ware simultaneously side by side so that in glaze firing a very beautiful coloured ware is obtained.

Lustres are applied on the glazed articles to give them peculiar shades such as the mother of pearl shade.

Very beautiful multi-coloured designs are painted upon the finished ware by the use of lithographic papers.

IV. Advantage of earthenware over metals.—The earthenware articles can be kept absolutely neat and clean, and are not attacked by acid foods as is the case with metallic utensils.

If handsome decoration and graceful designs of the table-ware have any beneficial psychological effect upon the gastric glands of the human system in the form of increased appetite and improved digestion, the earthenware is certainly to be preferred.

CHAPTER V (b).—IMPROVEMENT OF VILLAGE POTTERY

(See Part I, Volume I, Page 15.)

(Submitted by Sjt. V. V. Subedar, M.L.A.)

On this subject we have to consider—

- (1) What articles are used in the villages.
- (2) Whether any improvement could be made in them and what the difference in cost will be on account of those improvements.
- (3) Whether any new articles could be introduced in the villages that will be within the means of the villagers.

(1) Generally we find that articles used in the villages are mostly those manufactured by the ordinary potters from ordinary mud found near the villages. Such articles are those as are used for cooking food, heating water, keeping food stuffs and storing provisions. The other articles generally used by the villagers are crude roofing tiles and bricks.

The general method of production is as follows:—

Some 'fat' plastic clay is mixed with some sandy non-plastic earth or spent ashes from the fuel burnt in the village households, and also with some proportion of hornedung or some such organic material. All this mixture is carefully sieved through their country sieves made of bamboo meshes, levigated with water and kept for a few days for aging with several kneadings with the feet at short intervals, say every three or four days. In about two weeks, this aging is complete and after a further charge of thorough kneading, the clay is ready for the manufacture of pots.

Almost all the pots are made on the Potter's wheel. First, a crude pot is made with only the mouth of the correct size on the potter's wheel which is removed from the main mass of clay on the wheel by cutting it off with a piece of thread or thin wire. When this pot is half dry it is given the right shape and size by beating it on a round polished stone with a slab of wood. After this is sufficiently dry it is ready for the potter's kiln.

The kilns that are used by these potters are only so in name. They are rather stacks in which first some fuel is piled and then the pots arranged one upon another with proper spacing. These spaces are closed with fuel and the upper surface of the stack is covered with a thin layer of clay to prevent the flames being wasted in the air. Small fire holes are kept at the

bottom to ignite the furnace. Once the furnace is ignited it is allowed to burn freely and nothing can be done to prevent over or under firing. There is no special device either for regulating the increase of heat or for cooling or for the measurement of temperature. It is all done empirically. Further, the whole thing is left to the mercy of the elements. Naturally, the fired goods as they come out of the furnaces contain all sorts of articles from the over-burnt ones to those still in the clay condition. Many have black surfaces on account of insufficient fire and so on. The firing also is anything but economical. This is true of all articles including roofing tiles and bricks.

(II) When new and scientific methods of production are introduced, we find that there is a very wide gap between the products of the old and the new methods. There is very little kinship between the crockery used by the middle classes and the pots and pans of the village potter. This is due to differences in raw material, workmanship and cost. Let us suppose that the household utensils that the villagers use at present are to be replaced by better quality glazed articles manufactured either in the same village or in the group of surrounding villages. The difficulty of obtaining proper raw material that will stand the temperature for glazing will at once be felt. Such clays are not available everywhere and if brought from a distant quarry, its cost will be prohibitive. The clay commonly found in villages cannot be used for making glazed ware because it will not stand the melting temperature of any glaze which does not contain lead. Besides, for medical reasons lead compounds are not to be recommended except only in certain special circumstances.

The preparation of the glaze is not a simple matter either unless some central organization arranges to prepare the same and distribute it to different groups of villages.

Further the cost of the articles thus manufactured will not bear any comparison with that made by the village potter. For example, The Central Potteries Ltd., Nagpur, manufactures stoneware jars which are articles of domestic use, whose cost cannot possibly be less than 10 or 10½ pies per lb. (Water capacity). A 20 lb. jar will thus be sold for Rs. 1-4-0 while a 'Ghada' of the same capacity made by a country potter is generally sold for annas 0-1-6 or 2. The difference between the two kinds of articles is at once apparent. Therefore, the only hope for the improvement of village pottery lies in the kiln and firing methods.

One very important article that needs mention is the Khuja or Surai for cooling water in the hot season. This article is used in very large numbers, practically every household requiring one or more. The poor people who cannot afford 6 or 8 annas for a Sohagpuri Khuja, purchase ordinary 'Ghadas' whose quality for cooling water varies greatly. If this article could be improved, it may also bring a better and reasonable return.

The following are some of the ways in which that may be brought about:—

- (a) The clays and mud that the village potter uses should be brought to a standard composition.

- (b) These clays should be prepared in a standard way to standard consistency.
- (c) The articles that he prepares on the wheel should be standardised in shape and capacity.
- (d) The potter should be taught to use new and improved types of kilns. He should also be taught to use modern firing instruments to regulate the temperature.

The product will thus be almost standardised in quality and capacity, consequently it will be possible to standardise the market also and thus ensure a living wage to the potter.

We may say here that even at present the industry of the village potter is very important. His produce is sold not only in the village itself but also in the city to a very great extent. Our experience is that in the weekly Bazars at Nagpur, the proportion of the sales of stoneware manufactured in the Central Potteries to the sales of country utensils is as low as 1:100, both in price and in bulk.

What has been said about improving the production of pots, applies to bricks and tiles also. If the instruments and ovens used for making them are improved, they will also be standardised, and sold at more favourable prices.

I shall now give a few concrete suggestions for effecting the above mentioned improvements.

Improvements.—(a) A central station where the preliminary general experiments could be made may be set up. For this purpose a small furnace and a little more equipment the initial cost of which will not be more than a few hundred rupees, will have to be kept for the preparation of the clay and the manufacture of the articles.

If the Central Potteries Ltd., is chosen as this Central Station, the services of an expert will be obtained free and only the cost of the material and labour will have to be paid. One or two potters from a group of about 50 villages could be trained here who will go back as teachers of the art in that particular group of villages. The expenses of this Central Station should be met by the Government.

(b) A small kiln and other devices costing not more than Rs. 1,000 will be kept at Government expense, at a central village in that group of 50 villages where the potter who has been trained at the central station will work. He will be allowed the free use of this plant on condition that he will teach the potters in the surrounding villages the working of the kiln and allow them also to make samples from their clays and help them to build their own furnaces.

It seems that this is the easiest way to start the rudiments of new methods among the village potters. Concurrently with this, cheap literature on pottery should be printed in the local languages and distributed free or at a nominal price. This will help them to think for themselves and add to their knowledge.

(III) We shall now deal briefly with the superior sort of pottery that is used by the upper classes of society namely stone jars, crockery etc. It is our duty not to allow

foreign articles in our province knowing that the raw material, and fuel required are available in large quantities.

For this purpose the industry could be developed on the Japanese model. An industrial village should be organized where certain processes of production which could not be undertaken by the potter individually should be carried out in a factory while the remaining processes may be undertaken individually.

For doing this work a limited liability company should be started under the partial control of the Government. A substantial part of the capital should also be subscribed by the Government.

A central place like Nagpur, Jubbulpore, or Katni where all the raw materials of the modern type, fuel, etc., can be had within reasonable distances and at a fair price should be chosen for the development of this industrial village. Potters from the vicinity should be encouraged to reside in this village. A separate cottage should be provided for each potter which should also form a part of that village factory. Every resident in that village should contribute to the industrial labour required. A separate factory should also be built there for those processes which cannot be carried out individually. All transactions from the factory to the individual and *vice versa*, should be on the sale and purchase system. The finished product should be disposed of in the market on business lines.

There is no chance of these better products coming into conflict with the cheaper country product as the difference in the prices will necessarily be great.

This is only a rough sketch of the scheme which I believe may be worked out more fully.

CHAPTER VI.—SOAP-MAKING OUT OF INDIGENOUS MATERIALS

(See Part I, Volume I, Page 17.)
(Submitted by the All-India Village Industries Association, Wardha.)

The information furnished by the members of the Industrial Survey parties clearly reveals the fact that the soap-making industry in this province is well nigh extinct. Though there are some factories in the province turning out soap *en masse* and on a small scale, still a large quantity of soap is being imported. The reasons given are various: lack of encouragement, successful dumping of the imported article, wide spread practice of adulteration, and the inferior quality of the soaps that are usually turned out by the existing units. At least one factory, that at Chhindwara, is stated to have functioned for six months and closed down later because of the "lack of technical knowledge and the bad finish of the soap turned out".

Alongside of these facts, it is known that a large quantity of oil seeds are being exported from the province, that the "Mahua" trees are wild and plentiful, and that the alkaline resources of the Lonar lake are almost inexhaustible. These facts show that

every material needed for the industry is available here but is not being tapped properly.

What would, therefore, seem to be lacking really is the organisation of the industry with special regard to the supply of the raw materials, especially indigenous soda ash or caustic soda, to the villagers and the imparting of the technical knowledge necessary for processing the same and turning out good soaps. Quality is the result of careful, diligent and studious application to work. But it seems to be generally assumed that the industry can just as well be entrusted to an ordinary workman. Such assumptions act as impediments to industrial progress.

Soap-making on a large scale is an industry which requires chemical processing and calls for sound technical and scientific methods which may not be possible to have without the services of experts and expensive equipment.

On a domestic scale where the products need only satisfy the local requirements and where quality, finish and the recovery or utilization of waste products is not such a pressing problem as the utility of the article turned out, the industry does not call for the services of chemists or technicians or even the use of elaborate equipment and much capital. On such a scale the most complex of the industries, though involving chemical operations, assume the status of an art. Such industries need properly trained men to run them and not anything more by way of technical knowledge.

In what follows, the industry will be dealt with under two aspects: (1) where it can be a household occupation, and (2) where it is to be run as a co-operative or cottage industry.

The industry of soap-making is not a new one. Some households prepare all the soap they need. Imported caustic soda has been invariably used. Any industry that depends on an imported raw material will not be satisfactory and cannot afford a stable occupation for the masses. In order to reusitate this important industry of the province, soap-making has to be organized on new lines, using caustics, prepared from materials like the "sajji matti", wood-ashes, "khars", etc.

With the exception of adulterants which have themselves little cleansing properties but tend to encourage fraud, the chief ingredients that go to make soap are the oils and fats, both vegetable and animal, and caustics. The preparation of caustics is practically unknown to many and needs some explanation.

The white efflorescence appearing on the surface of some lands immediately after the end of the rainy season is known as "sajji matti" or "reh" and contains soda ash, common salt and other mineral substances in varying proportions. Samples of "matti" collected from three villages near about Wardha indicate an average soda ash content of 12.5 per cent. This may be taken as the normal concentration of the "matti" that will work satisfactorily. It will not be profitable to work up materials that contain less soda ash.

The method of preparing caustic soda is simple. A weighed quantity, say eight seers,

of "mitti" is extracted with minimum quantities of hot water thrice, stirred vigorously every time before allowing the mass to settle and the clear upper liquid is drawn off as completely as possible. By this process more than 90 per cent of the soluble matter will be recovered. If properly extracted, the concentration of the collected liquid will be suitable for causticisation. This process consists in adding the necessary quantity of freshly burnt and unexposed lime—about half the weight of the soda ash contained in the "mitti", little by little to the boiling extract of the "mitti" previously collected. The mixture is well stirred, maintained hot for one to one and half hours and then allowed to cool and settle when again (the clear liquid from above) is drawn off as completely as possible. To this white sediment that is left behind is admitted a small quantity of water, well stirred, allowed to settle, the clear liquid again drawn off and added to the previous collection. This clear solution is the caustic lye, which can be directly used for making soap. Eight seers of "mitti" contain one seer of soda ash, which requires half a seer of freshly burnt lime and produces three-fourths of a seer of caustic soda. One part of caustic soda can ordinarily saponify five parts of cocoonut oil or seven parts of other oils and therefore the oil or mixture of oils that is to be used should approximately weigh four seers.

There are four principle methods of making soap, of which the one suitable in a household will be the semi-boiling process. The cold process soap cannot be made with the low concentration of the lye that is prepared. The boiling process does not work well with small quantities. The semi-boiling method consists in heating the oil (or mixture of oils) to which is added little by little the caustic lye and the contents kept constantly stirred. The caustic is added till the sample drops transparent from the stirrer and the tongue test indicates a distinct bite. Rosin to the extent of 5 per cent by weight of oil used may be incorporated at the outset in the body of the oils or added to the charge in the intermediate stage. This improves the lathering property of the soap. The transparent mass is ready for use after the contents have solidified.

The equipment needed is of the simplest description, only ordinary kitchen appliances, such as a frying or sauce pan, the capacity of which is to be three to four times the quantity of the oils to be treated, empty kerosene oil tins, iron spoons, a hearth, etc. With a little practice a man or a woman can do the job well as a part of the regular domestic duties.

Immediately the soap maker wishes to undertake making a large quantity of settled soap to recover the waste products and if possible, to recover the glycerine, he is faced with problems of complicated equipment, technical control, capital, etc.

It has been mentioned that on a domestic scale the adoption of the "semi-boiling" process is preferable. It will be noted that in this process no operation is involved which would separate the impurities in the oil and caustic soda lye, excess water and glycerine. These, therefore, are included in the body

of the soap and consequently the soap does not keep well, sometimes turns rancid soon and is of inferior quality. But a unit working five maunds of oil a week can well employ the grained or the settled process where the soap is separated as far as possible from the impurities by the addition of common salt to the extent of 10 per cent on the weight of the oil used. The object of using a blend of oils is to make a good soap, as each oil has its own good points.

The caustic soda has to be prepared as before. To saponify five to seven maunds of oil a week, one maund of solid caustic soda is needed which requires the extraction of 12 maunds of a ten per cent "mitti". The method of preparing the lye is the same, but because we are to deal with comparatively large quantities, we have to make such alterations in the extracting plant as would render the work smooth as well as effective. Extraction by the percolation method is defective in that an impermeable layer of mud is usually formed and prevents further extraction. The efficiency is from 45 to 50 per cent. Each extraction which consists in adding water, preferably hot, stirring, settling and drawing off the clear liquid, though suitable on a small scale and efficient in that more than 90 per cent soda ash is extracted, is bound to be very slow when applied to a larger scale treatment. Hence the method of extraction on a battery system is recommended. A battery of four vessels is sufficient to extract practically all the alkali. After the extraction, the causticisation is conducted as already explained, using thirty seers of freshly burnt and well preserved lime. In order to see if the causticisation is complete, a sample of clear liquid is taken and treated with sufficient hydrochloric acid. If there is no effervescence, the reaction is complete. If more lime is added and the process repeated until a fresh sample gives practically no effervescence.

The saponification is conducted just as before and when it is complete the soap is salted out (or grained) by the addition of common salt in small quantities to the charge with simultaneous stirring. After the graining, the charge may be allowed to boil once and then the boiling kettle or drum closed with a lid and wrapped with gunny bags or other non-conducting packing in order to conserve the heat for a long time. After about 24 hours the packing is loosened. It would then be observed that the contents of the kettle have settled as follows:—

- (1) Upper frothy soap;
- (2) good transparent soap just below;
- (3) nigre or waste soap still lower; and
- (4) brine water containing various other impurities and glycerine at the bottom.

For this reason the soap-boiling kettle is usually provided with outlets at different heights through which various portions can be drawn off. The good soap is cooled in a frame and separately finished after allowing a day or more for drying. The niger and the frothy soap can be shaped into balls or with the hand.

The finishing of the soap may be dealt with under the following items :—

1. Scraping the froth.
2. Slabbing.
3. Barring.
4. Cake-cutting.
5. Stamping into tablets or cakes of desired shape.

In the case of unframed, grained and other soaps any one of the three alternatives given below may be adopted after kneading the soap :—

- (1) Moulding the soap to form cakes of the required weight and stamping the moulded soap to a neat shape in a soap press.
- (2) Making cakes of soap in earthenware moulds.
- (3) Working it into balls of the required weight.

The items of equipment needed are :—

- (1) General appliances such as caustic lye tank for extraction, causticisation, and storage; oil containers, buckets, scales and weights, wooden or iron ladles, "bhattis" for boiling soaps, hydrometers, tin pots, etc.
- (2) Soap-boiling appliances like the kettle with the three valves or an ordinary 40 gallon drum provided with a tap at the side near the bottom.
- (3) Appliances for settling and solidifying soap, i.e., soap frames.
- (4) Soap cutting instruments—long knives foam removing slabber, bar-cutter, cake-cutter, soap-cutting table, etc.
- (5) Shelves or racks for drying soap.
- (6) Soap finishing appliances like stamping dies of various sizes and shapes such as for cube soap, for twin-cakes, etc., and the stamping machine.

For a unit that has been described above as an example, the cost of the raw materials to run it for a month will be about Rs. 350 and the cost of equipment from Rs. 50 to Rs. 100 or a little more according to needs. It is not possible to give detailed estimates for obvious reasons.

The only items in which skilled labour is essential are the processes of causticising and soap-boiling. The unit can absorb at least five workmen one of whom should be a skilled one to boil the soap and to supervise generally. The ordinary equipment can be made in the village by the carpenters, blacksmiths and masons. The man in charge of the unit should have completed a course of training which may last for a month or two at a training centre, like that at the headquarters of the All-India Village Industries Association, Wardha.

There are two important by-products of the industry that have to be disposed of, namely, washed earth and precipitated chalk, both of which are thrown out in bulk. The former can be used for building and repairing purposes, whereas the proper utilization of the latter is a problem that has to be closely investigated. It would appear that it could be used, after the necessary treatment, for a number of purposes to which

chalk is generally put, e.g., as a paint material in water paints, washable distempers, base for cheap lakes, putty, an extender in paints or for making white or coloured crayons, as a filler in India rubber goods, as an ingredient in polishes, or lastly as a fertilizer, as is done in foreign countries.

It will be seen from the above that in soap-making from indigenous materials, the only troublesome and difficult process is the preparation of caustic soda from the indigenous alkaline sources. To those who are accustomed to use the handy imported caustic soda of commerce, this item may strike as expensive and unnecessary. Indeed, when the source is far away from a working unit, the transport charges of the bulky earth will be high enough. For a material that is but a free gift of nature, the transport cost may amount to, say, a rupee per bag of two maunds (one maund = 40 seers), this being the actual charge which the All-India Village Industries Association pays at present. If, however, the "sajji" is made available to the villagers in a more concentrated form from the immense deposits of the Lonar lake, the industry has vast potentialities. In the absence of such a scheme to supply the alkali, the method of preparing caustic soda as described above has to be followed. In any case, the use of imported caustic soda should be discouraged, for no cottage industry that depends for its raw materials on imported articles, can be widely and securely carried on.

As large quantities of oil are used in soap-making, a revival of this industry can set the idle and out-of-use *ghanis* running full-time. A single unit of the size described above can employ two efficient *ghanis* working whole time which means it can support two *Tell* families.

There is a good demand for soap in this province, and as pointed out at the very outset this demand is being largely met by imports. If, therefore, the industry is well organized on rational lines, it will mean employment to many an indigent and unemployed person. The present system of exporting money, material and employment is a threefold loss that has been responsible for the economic ruin in evidence in the villages. The soap industry alone can consume a major part of the 25 lakhs of maunds of oilseeds. Hence, if the Department of Industries can provide the necessary training for men to run the industry successfully, meet the little initial capital requirements and arrange to supply the villagers with impure but concentrated "sajji" at reasonable rates, it would mean that an avoidable outflow of wealth and employment could be checked and conserved in the province.

CHAPTER VII.—COTTON HAND-SPINNING AND HAND-WEAVING

(See Part I, Volume I, Pages 17—20.)

Submitted by Sjt.

(Shrikrishnadas Jaju, Maharashtra Charkha Sangh.)

1. Before stating my views on the industry of hand-spinning and hand-weaving, I consider it desirable to draw attention to

a consideration which applies to most of the cottage industries in general and to the industry of hand-spinning in particular.

2. An urgent need for the introduction of manifold cottage industries to serve as subsidiary occupations to the rural populace is recognised by almost all. But when we begin to examine the particular industries which would serve the purpose and could be easily carried on on a wide scale giving occupation to millions that are to be provided for, we can hardly point out any, except those that are connected with food and clothing. But these have already been or are being ruthlessly annihilated by competition with large-scale and small scale industrial concerns. If we proceed on the basis that we should strive for such cottage industries only as can survive the competition of power-driven machinery, we might as well spare ourselves the trouble of investigating the problem of cottage industries as the tragic tale of their ruin is writ large on the emaciated bodies of the villagers. Unless we are prepared to get out of the rut of commonplace theories of economics such as buy cheap, competition, survival of the fittest, etc., there is no hope for cottage industries of wide scope, which could give part time or whole time occupation to the teeming millions of India, whose problem of unemployment or under-employment can never be solved by any amount of use of power-driven machinery. It is, therefore, necessary to reserve industries connected with the primary needs of the villagers for cottages only and to strive our utmost to remove the obstacles in the way of their existence, progress and development. The alternative to this is to leave the semi-starving millions to their fate which is the order of things now obtaining but which no Government should allow to continue.

3. Our Provincial Government should, therefore, decide and declare in clear terms their policy on the question of cottage industries. This policy should in my opinion be—

- (a) that all the industries connected with the primary needs of the rural populace such as food, cloth etc., will be ensured to the villagers as cottage industries,
- (b) that obstacles in their way such as competition with power-driven machine goods and others will be removed by all means in the power of the government,
- (c) that if the provincial government do not, under the present constitution possess adequate powers to effect this, determined effort will be made to acquire them from the authorities that be, and
- (d) that there will be collaboration with other provincial governments in encouraging cottage industries.

4. Arguments for and against hand-spinning and hand-weaving, i.e., khadi, have been discussed at length during the past 20 years and a great deal of literature has come into existence on this subject. Sjt. Balubhai Mehta has recently published a book entitled "Khadi Mimamsa" in Marathi. It gives

in brief valuable up-to-date information regarding khadi. It contains also a list of important books bearing on this subject. Since I do not know which particular points regarding hand-spinning and hand-weaving the survey committee would deem it relevant for its enquiry, I would not here attempt the task of summing up all the points concerning this industry and thus increase the volume of this note. I would only suggest that those who want to study the question of khadi should refer to those books. I would, however, like to mention only one thing here. The cloth requirements of the whole of India, if met by mill cloth, will not be able to give employment to more than one million of workers at the utmost, but if met by khadi, i.e., by cloth woven by hand out of handspun yarn, will give full time employment to four crores of persons, and as spinning is essentially a subsidiary part-time occupation, double or even treble that number will be benefited by it.

5. Cotton is grown in abundance in the province and is exported in large quantities. In places where it is not grown it can be easily imported from other districts and can even be grown to meet the demand. Weather conditions might go against its being raised as a money crop but not against its being grown in small quantities. Tree cotton *Deokapas* can also be grown all over the province. Strange as it is, almost all the Charkha Sangh Khadi Production Centres in the province are going on at places where there is little cotton grown locally.

6. The annual cotton crop of the province is ordinarily estimated at about 15 lakhs of khandis of kapas, the lint of 15 per cent. of which is consumed in local spinning and weaving mills and that of the rest is exported. One khandi of kapas, if ginned by power-driven machinery, gives employment to one labourer for a day, but if ginned by a hand gin, can give employment to 30 (labourers). The cost of ginning one khandi of kapas in a ginning factory is about Rs. 2-8-0 if the factory gets its full feed of the kapas required. It is more in lean years. An old country hand-gin costing about a rupee gins 3 lb. of kapas in an hour, but an improved one costing about Rs. 5 can gin 4 to 4½ lb. If the village woman's daily wage be taken to be annas two, the expense of hand-ginning one khandi of kapas would be about Rs. 3-8-0. As a matter of fact, many a time a village woman labourer gets much less than annas two per day. A small tax somewhere on the machine-ginned cotton can revive this industry of hand-ginning. Cotton seed obtained by hand ginning has superior value as seed.

7. It is said in some quarters that the number of men engaged in the handloom industry in India is increasing. I wonder if it is correct. In our province at least it appears to be decidedly decreasing. At some places encouragement is being given to work the handloom by electric power, which means the engagement of less number of workmen and the establishment of small factories with the middlemen controlling them. So the application of electric power to this

industry does not mean encouragement of cottage industries, giving employment to a larger number of weavers. To my mind, the question of handloom weavers can be solved only by giving them the occupation of hand-spinning also.

8. In the years 1937 and 1938, the Central Provinces and Maharashtra Charkha Sangh has been able to do the following khadi work in the province:—

Manufacture of khadi	Sq. yards	Production cost Rs.
Year 1937 ..	2,64,822	1,18,824
Year 1938 ..	3,85,169	2,13,180

The marked difference in the comparative production cost in the year 1938 is due to the increase of wage on the principle of a living wage!

Khadi sold—1937, Rs. 2,26,262 ;
1938, Rs. 2,27,317.

In the year 1937 khadi sold in excess over the production was imported from other provinces.

Money distributed amongst the workmen as wages—

	Rs.
Year 1937 ..	80,784
Year 1938 ..	167,041

Workmen getting employment including those that worked part-time and also those that took to spinning irregularly:—

	Workmen	Number of villages
Year 1937 ..	5,520 (547 being weavers).	284
Year 1938 ..	6,220 (637 being weavers).	459

Establishment to run this work in the year 1938 consisted of 154 workers.

As khadi became dearer owing to increase in wage on the principle of 'living wage', its production and sale have recently gone down.

9. Analysis of the cost of khadi manufactured by the Maharashtra Charkha Sangh at the current rates of wages, is as follows:—

	Rs.	a.	p.
Cotton ..	0	2	0
Carding and spinning ..	0	9	0
Weaving ..	0	2	0
Bleaching, establishment and transport.	0	3	0
Total ..	1	0	0

The present rates of wage paid by the Maharashtra Charkha Sangh are based on a scale by which a skilled workman can earn about 9 pies per hour of efficient work. A two spindle charkha, called the Magan

Charkha, has now been devised which, besides giving a spinner a wage of one anna per hour, will also enable us to make khadi a little cheaper. There has recently been much progress in the art of spinning by Takli, which costs only an anna and a half. Its regular plying by a skilled hand three-fourths of an hour per day can produce in a year yarn sufficient to make about 25 sq. yards of cloth which is 50 per cent. more than the present average per capita cloth consumption of our countrymen.

10. Petty khadi production centres are springing up throughout the province through the government scheme of Village Uplift Centres. Their number is about 50. When the Basic schools under the new Vidya Mandir Education Scheme will have been established, they will also produce hand-spun yarn.

11. Competition by mill cloth stands in the way of the progress of the industry of hand-spinning and hand-weaving. It should be removed by the Government.

12. The Government should recognise in full the sovereign status of the khadi industry amongst the village industries, with all its implications. Lately there has been an atmosphere somewhat favourable to khadi, but part of the public, especially the government servants, have their own misgivings. Government should issue communiques stressing the importance of and advantages accruing from khadi and making clear the Government attitude towards its wear by those that are in Government service. In all the Government Departments where cloth is needed, only khadi should be used in place of mill cloth. The same should be recommended to the local bodies also. The Government Textile Department should use and deal in hand-spun yarn only.

CHAPTER VIII.—SHEEP-BREEDING

(See Part I, Volume I, Page 21.)

(Submitted by the Extra-Assistant Director, Animal husbandry, through the Director of Agriculture, Central Provinces and Berar.)

In this province sheep-breeding industry is neither followed on any intensive scale nor on any systematic improved or business lines. A few poorer classes of cultivators and some professional class of shepherds carry on this industry by keeping a small flock of ewes with the object of increasing the strength of their flock for selling to butchers and for wool for blankets, etc. They graze them along the road-side or in the village waste land or in privately owned scrub jungle for the last of which they pay some grazing dues. During the hot weather, when the crops from the fields have been harvested, the flocks of sheep are grazed during the day and for the night they are folded for getting the fields manured. In return, the shepherds are paid for their maintenance some grain, the quantity of which depends on the number of sheep in the flock and the days they were folded in the fields. These shepherds move with their

flocks from village to village in search of grazing and manuring the fields of the cultivators. No attention is ever paid to the improvement of the quality and quantity of fleece. Any attempt to induce these shepherds or other owners of the flocks to settle in one place and carry out their profession by breeding with improved rams to improve the fleece of local sheep will not, I am afraid, meet with success unless some satisfactory arrangement is made to provide grazing land and food for the flocks, and marketing facilities for their produce.

In this province, large stretches of scrub jungle are lying unutilized except during the rainy season when the village cattle graze on them; if these stretches are reserved for grazing sheep and facilities are given to the owners of flocks to graze on them, this will certainly give great stimulus to this industry and, I am sure, improvements in local sheep could be effected in a very short time.

In the year 1911-12, a flock of local sheep containing about 700 young ewes, was purchased by the Agricultural Department and kept at the Government Farm, Sindewahi, in Chanda district, as a nucleus flock to start with, to manure the land of the farm and to make observations regarding the suitability of the land, climatic and other environmental conditions, feed, etc., to help further breeding work. It was observed that during the rainy seasons, the sheep suffered most on heavy land, but when transferred to hilly tracts where the soil is light and dry, they thrive well.

Attention was next paid to the improvement of fleece. The fleece produced by local sheep was very poor both in quantity and quality and it was found necessary to improve it by introducing rams possessing the strain of producing better quality of fleece. For this, rams of the well-known Merino type were imported and introduced in the flock of ewes. Before that, the ewes from Sindewahi farm were transferred to Telenkhery Farm.

Breeding with imported Merino rams was carried on for sometime and within about 6 months time some of these Merino rams died and it was found that they were very susceptible to the diseases of the sheep in the province.

The second attempt was made by introducing cross-bred Merino rams; about 50 were crossed by these rams and the fleece produced by their progeny was decidedly superior both in quality and quantity and further breeding was continued till the year 1918. The fleece produced by various generations of this mating was sent to the Textile Expert to the Government of Central Provinces for valuation, who valued it at nearly double the price of the fleece of local sheep.

Further breeding work had to be discontinued as there was no demand for finer and longer staple of wool from local weavers.

The importance of improving the quality and quantity of wool produced by local sheep is evident from the fact that in the Central Provinces and Berar there are about three lakhs of sheep scattered throughout the province. Approximately one lakh of these are found in the Chhattisgarh division,

another lakh in the four districts of Berar and the rest in other districts. From the distribution it is clear that sheep thrive well in hilly tracts where soil is light and in plains where rainfall is not heavy or the soil well drained.

There is no particular breed or type of sheep in this province. Two distinct types, however, can be found every where—one having a long tail and the other having a short tail. There is some difference in the size of their ears too, some have got long and pendulous ears while others have short ones. There is not much difference in the quality or quantity of fleece produced by them. The colour is generally dark, a small number of white sheep are also found and a very few are of a mixture of white and black, while an insignificant few are brown in colour.

The sheep are shorn twice a year—once in cold weather and a second time in hot weather. The average weight of marketable fleece per sheep per year is not more than 2 lb. There are no organised centres for collecting and marketing fleece or wool. The local shepherds sell their fleece in local markets or card, spin and weave it locally into blankets. The fleece is not graded according to quality but in several cases black and white fleece are kept separate, as white fleece fetches a higher price in the market. The fleece from young lambs i.e., the first clip is kept separately for weaving into smooth blankets which are valued at higher prices.

If we review the history of sheep breeding industry in other wool producing countries, we find that the conditions in those countries about 26 years back were nearly the same as they are in our province. Take for example Peru. The indigenous sheep of Peru were poorer in every way than our present sheep. The yield of wool per sheep was $1\frac{1}{2}$ to $1\frac{1}{4}$ lb. per annum. The quality was also poor. The method of utilizing wool was similar to our village methods of today. In a short period of about six years, the yield gradually increased to 4 or 5 lb. per sheep per year and the quality of wool produced greatly improved. In Australia also, the same state of affairs existed. She built her trade in wool from a nucleus flock of Indian sheep.

The Royal Commission on Agriculture stressed the improvement of sheep for the production of better quality of wool and remarked that the lack of organization with consequent lack of continuity in the work was certainly responsible for past failures.

Out of three lakhs of sheep in Central Provinces and Berar, if we could succeed in increasing the yield by 1 lb. per shearing which means the increasing of six lakhs lb. of fleece per year when valued at the present rate of Re. 0-4-0 per lb., this would give an increased income of $1\frac{1}{2}$ lakhs of rupees per year to the shepherds.

The next attempt made by Government to improve the quality of local sheep is the opening of a new sheep breeding farm in Betul district as an experimental measure very recently i.e., in the year 1938-39. Here a flock of 300 selected local ewes has been

kept and a regular programme of breeding has been drawn up which has been approved by Government.

Last summer this farm was stocked with the required number of local ewes and the results of its working are keenly watched. Arrangements to issue improved rams, the product of this farm, for breeding purposes will be made by extensive and intensive propaganda work by the departmental staff.

The first drawback in keeping sheep as far as it is known is that they suffer from various diseases which could be prevented by administering preventive and curative doses of certain cheap and locally available medicines periodically and by inoculations.

The other drawback is the want of a suitable and convenient marketing organization, which, if established at various centres, will no doubt give a stimulus to the development of this industry, especially the assistance of the Textile Expert of the Industries Department, will be of great use in organizing and establishing such centres.

CHAPTER IX.—CARPENTRY

(See Part I, Volume I, Page 21.)

(Submitted by one of the Schools of Handicrafts, Central Provinces and Berar).

Carpentry is one of the oldest occupations in the world, and is practised in every country today. In ancient times, iron or steel was not thought of, but there was a copious supply of timber available in the forests, and it was with this timber that people built their houses. The log cabin, for instance, was built entirely of timber. As time went on, iron ore was found and, in the form of iron and steel industries, has since been developed into a formidable competitor. Notwithstanding this, carpentry as a vocation will continue for ever.

Carpentry, apart from its being a light industry, is also a very fascinating one. This occupation in the past was confined to the 'sutars' or 'badhais' but for various reasons, it has now come to be practised by all castes and creeds. At one time the higher castes, the Brahmins for instance, would not take to it; but in recent years they have begun to respect the dignity of labour and are taking to this occupation more and more.

Carpentry is divided into four principal sections:—

- (1) furniture and cabinet-making.
- (2) house-building requirements.
- (3) cart and cart-wheel-making and,
- (4) wood turning.

1. Furniture and cabinet making.—This section of the industry is confined only to large towns. Formerly in India, every body lived in small houses, and it was then customary to sit on a covered floor for all purposes but to-day with modern progress, palatial mansions are being built and furnished with the most up-to-date and expensive furniture. The advantage accruing from the use of furniture is that it offers greater comfort besides being more sanitary. It is to meet these demands that the industry of cabinet-making is on the increase.

Cabinet and furniture-making is a fine art and skilled artisans can command high wages say, from Rs. 1-8-0 to Rs. 2-0-0 per day.

In this province, various kinds of timber suitable for this section of the industry are available in large quantities. Teak wood is generally preferred because it is easily worked, and can be stained to any desired colour.

In recent years, expensive and improved tools of foreign manufacture have been introduced in large quantities.

There should be no difficulty for carpenters specializing in cabinet-making in earning their living. Apart from their being able to find employment in cabinet and furniture-manufacturing firms, of which there are at least three or four in every town, they can get the work of repairing furniture by visiting all homes, where furniture is used. Failing this, saleable articles such as tables, chairs, and cots can be prepared and sold at fairs and in markets, where there is always a demand for well made furniture.

2. House-building requirements.—As the nature of this work does not call for great skill, carpenters employed in it are paid less. It consists of making doors, windows, with their frames known as 'chowkhats', trusses, and roof work. This kind of work is obtainable in towns and villages but in the former, the work is of a superior order and made to specification. This is not so in villages where the work is crude. This accounts for the village artisan's lack of training.

There is no difficulty in obtaining raw material which is cut in standard dimensions and stocked by all firms dealing in timber. Carpenters employed in this section usually earn from Re. 0-12-0 to Rs. 1-8-0 per day.

3. Cart and cart-wheel-making.—Cart-making does not call for much skill and can be made by any carpenter. On the other hand, cart-wheel making calls for skill. Besides, babul timber used for cart wheels being extremely hard, it makes the work laborious. Cart-wheel-making differs from province to province. Very little attention is paid to the scientific details of its construction. Faulty construction involves recurring expenditure. In India, it is invariably found that cart-wheels are made of a straight type which is not the best kind. In all foreign countries, the 'dished' cart-wheels are used and it must be admitted that this type has several advantages over the straight one. By dished is meant that the wheel is concave on the outside. The advantages are:—(1) smaller wheel base; (2) greater body space which means greater carrying capacity and pay-load; (3) the wheels work against the collar of the axle, whereas with the straight type, the wheel tends to run off the axle; and finally, the dish has a tendency to keep the tyre tight on to the felloes. Invariably, with country-made wheels, much space is left between each spoke, the object being that the felloes will be made to meet on account of the contraction of the tyre after it has been put on and cooled. But carpenters fail to realise the excessive strain that is put on the

tenons in the hub of the wheel, as a result of which in a very short time the whole wheel falls to pieces, and the unfortunate cart-owners are put to much expense, and loss of income while the wheels are being repaired. Cart wheels are made from 'babul' wood owing to its close grain and hardness. This timber is unfortunately not grown in forest areas under the control of the Forest Department. Nor is it available in large quantities and of sufficient girth in all parts of the province and very soon wheel-wrights will have to look for other suitable timber. Only at Akola, 'babul' is obtainable in fairly large quantities whereas in the northern districts it is very scarce; consequently it has to be imported, thereby raising the price of cart-wheels considerably.

With the introduction of motor lorries, the cart and wheel-making industry is suffering. Pneumatic tyres are being fitted to bullock carts in towns and this has affected the carpenter adversely. In spite of all this, however, it can be said that carts and cart-wheels will always be in demand.

4. Wood turning.—There are not many rural industries left now-a-days. It is one of the tragedies of what we call progress that so many crafts, to the perfecting of which have gone centuries of tradition, have been left high and dry, as it were, not from any inherent fault, but owing to competition with the machine. Here and there the struggle for existence continues and in a very few cases the handworker is able to hold his own against the machine. As a rule the latter has a tremendous output, but it is expensive to buy and this means a great deal of money locked up without yielding any interest. It costs money to run it and requires accommodation which in turn involves capital costs. On the other hand, the rural craftsmen themselves work at their trade so that there is no wage bill to pay. Their overhead charges are small. Since they generally work in the villages or in forest areas from where they obtain their timber, they have very small rents and rates to pay. Their worksheds are their humble homes and there is no bill for power to run the machinery. In this way, some are still able to turn out their wares as cheaply as, or even cheaper than, the machine. One of the items in this class of work is that of making turned legs, for tables chairs and cots.

In foreign countries there is a division of labour. Thus, the felling of trees is done in the forest by one set of workers, while a different set does the cleaning up and reducing to size. After further treatment such as seasoning, etc., different kinds and qualities of wood are available to the carpenters for the various purposes for which they require them. In our villages, however, this is not so. The carpenter has himself to do all the operations from the felling of the tree in the forest to the making of finished goods from it in his cottage. As he is not an expert in all the above operations, he works at a considerable loss of time which is money. After the trees have been felled and cut up into lengths, the village carpenter removes the bark, etc., with what is called an adze (*basula*). Although most of

them can use this instrument, with a high degree of skill, this work can be done more efficiently, with less effort and in less time with what is known as a draw-knife which is very seldom seen in India. It is a very simple tool and can be produced in this country at the low cost of 6 to 8 annas each. Again, for the next operation, i.e., cutting the timber up into pieces of the required size, very little thought is given to the strength of the timber. Carpenters saw the timber along the grain whenever the grain is cut thus reducing its strength. To reduce to size for turning purposes, the lengths must be cleaved. This method has the advantage of being much quicker than sawing, and above all, producing straight grained timber, since the split follows the natural line of the grains. The timber is then trimmed down with a draw-knife and made ready for turning.

The tools used in wood turning are very simple and inexpensive. The country or village lathe consists of two wooden pegs sunk into the ground, about 3 feet apart. Through the pegs pass two iron spikes (centres) on which the timber to be turned is revolved by a piece of cord which is operated by a boy. The wood revolves backwards and forwards and it is during the latter motion that the turner does his work. Although there is a considerable loss of time compared with the machine, some very fine work can be turned out in this way.

Excepting in the large towns and railway workshops in this country, the work bench is very little used. It is within the means of all carpenters belonging to any town or village to construct a simple structure like an ordinary work bench, which will enable them to do their work in a standing position; but having got accustomed to doing the work while sitting on the floor they continue to do so. The only way to overcome this practice is to accustom the beginner to work in the standing position, whereby not only is the work turned out of superior quality but also the health of the workman is not injured. In the sitting position, the internal organs of the body are pressed one against the other, and that is why we see so many hunch backed people among the working classes.

The village lathe can be made just as simple, at a little additional cost, on the treadle fashion so as to do away with the need for a second man to operate the rope.

Outturn.—In the villages where there is ample supply of timber, great scope exists for the wood turning industry. One has only to visit a weekly bazar in towns and villages where cots of various shapes and sizes are sold. The workmanship is of the crudest type. The legs are straight pieces of timber badly shaped with mortices twice the size of the tenon they have to hold, and the result of this is that in a very short time the legs fall away from the rails.

Everybody, particularly in the villages, sleep on 'khatias' (*charpoys*) to protect themselves from snakes, etc. These 'khatias' at present are sold for Rs. 1-4-0, to Rs. 1-8-0 each, which amount villagers are very reluctant to pay because of the crude workmanship. If the village carpenter could be

taught to improve his outturn, not only would he benefit himself but also the public who purchase his wares.

As a rule, a village carpenter is not entirely dependent on his calling for a living. To supplement his income, he has also to do some cultivation. As an artisan, he ought to be engaged only in his craft. Invariably, he is not paid in money for his customary services, but in kind after the harvest. This merely helps to keep body and soul together, but provides no money to purchase clothing and other simple requirements for himself and his family. The lot of the carpenter at present is indeed a very poor one. This is not at all surprising because of the poor quality of the work turned out by him. If he were taught to do good work, his value as a craftsman would increase and it would not be necessary for him to depend also on agriculture for a living.

Village industrial schools should be opened, which will cater for the village boys. In the off season, when there is no ploughing to be done, cultivators could be taught to repair or even make their own ploughs, doors and *chowkhats* and small articles such as wooden toys, *peedhas*, rolling pins, etc. This will not only keep the villager occupied but will also give him a little additional income by selling his spare time work on market-days.

CHAPTER X.—BLACKSMITHY

(See Part I, Volume I, Page 22.)

(Submitted by one of the Schools of Handicrafts, Central Provinces and Berar.)

Blacksmithy is one of the most important cottage or village industries. It is a basic industry, as without the implements produced by a blacksmith, it would be very difficult to carry on other cottage industries. From the point of view of usefulness and importance to the cultivators, blacksmithy stands first among cottage industries, as agricultural progress depends on the improvement of agricultural implements.

There are many difficulties in the way of following this industry remuneratively. At some places technical improvements are desirable, whereas at others cheaper and better raw materials are needed. This industry can be revived if it has an assured home market. There is no reason why various articles which are imported should not be made here. In almost every village there is a *Lohar* who attends to the sharpening, repairing and upkeep of the implements of the cultivator. In big towns, there are skilled blacksmiths who carry on their business of manufacturing domestic articles, agricultural implements, etc. The existence of smithy in a village depends on the amount of work available there. The more skilled among the blacksmiths have settled in big towns like Nagpur, Jubbulpore, Katni, Wardha, Akola, etc. Every district is known to contain one or more such centres where iron articles of agricultural and domestic use are made and sold in shops or in villages by pedlars.

All the persons engaged in smithy, with perhaps rare exceptions, belong to the *Lohar* caste. Other castes have not taken much to blacksmithy with the result that the industry has always remained in the hands of hereditary workers. Generally speaking, almost every village has a blacksmith with his forge.

From the information collected, it is found that in this province this industry has adapted itself to the family organization except in a few places where workshops engaging 4 to 5 persons are run by well-to-do smiths. A blacksmith generally finances his business himself, although the capital at his command is small.

A blacksmith obtains his raw materials from the nearest town where it is imported from foreign countries or Jamshedpur. He does not work up iron ore, though it is found at many places in this province. Medegaon, Balod in *Lohara zamindari* in *Drug district* and *Narsinghpur sub-division* have large deposits of iron ores which are not being worked at all. Efforts are required in the direction of smelting iron ore which is abundant in the province.

In addition to the repairing work which an ordinary blacksmith does in a village, he makes during the off season articles like axes, (*kulharies*), sickles (*hansias*), *khurpis*, *karbi-cutters*, knives, door chains, latches, *sarotas* (nut crackers) and cooking utensils such as (*tawas*) pans, *sigries*, etc., for which he finds a local market. At some places in the province iron safes are manufactured, but this industry deserves further development. *Newari* (district *Nagpur*) blacksmiths are noted for making good razors. At some places scissors, knives, *sarotas* are also made. These days on account of outside competition the work of a smith has been reduced to that of repairing, although only a few years ago cutlery was made in almost every village. The process and the method of work are almost the same in almost all districts. The method of hammering iron on an anvil with hands instead of using any mechanical device is in vogue in every centre. No machinery of any kind to save hard labour has been noticed. The forge is made of clay. Goat-skin bellows are used for producing a blast. In some towns trained artisans have been noticed using a hand made fan to replace the bellows and using improved labour saving tools and devices. Cowdung cakes and charcoal are used as fuel for the smith's fire.

A smith in a village is paid in kind by people belonging to the same village in which he resides, but those who come to him from outside the village pay him in cash. To get a plough spike and for repairing his carts, etc., a villager pays about 40 pailies (50 seers of corn). An untrained blacksmith in a village earns, with the help of his wife, about annas eight per day. A skilled and trained smith earns annas twelve per day. What with outside competition and what with the bad financial conditions of the cultivators upon whom the village smith is solely dependent for his earnings, the condition of a blacksmith at present is rather deplorable.

The tools and implements employed in this industry are simple and are mostly made by the blacksmith himself at a little cost.

Tools which are generally used, consist of a pair of tongs, hammers, chisels, anvil, etc. etc. Files, etc., are purchased by him from the town. Many of the tools which a smith used to purchase before, he has endeavoured to make them with success. The fan-wheel used by some skilled blacksmiths in Bela in Nagpur tahsil, is decidedly an improvement on the goatskin bellows in as much as it is cheaper and more efficient in the long run.

The problem of blacksmithy in the villages is difficult to solve so long as foreign competition prevails. The blacksmith's one drawback is his small capital. The retail purchases of raw materials adds to the cost of production and makes the finished products dearer. Again, a definite improvement in the tools of a blacksmith is necessary, besides the necessary training in village workmanship and the use of labour saving devices. To achieve this, the establishment of more industrial institutions for the training of artisans in the use of the improved tools and labour saving devices is necessary in the province. These should be located in villages and shifted after every two or three years. Another direction in which industrial education can be promoted is to endeavour to provide, in the lower and higher elementary schools, courses of study in such subjects as will have practical bearing on the local industry. These suggestions are calculated to benefit the future generation. That something should be done to improve the condition of the present workers cannot be gainsaid. The artisans have already inherited the skill of their craft and they require proper guidance and better facilities for getting tools and appliances that will help them to earn better wages and such facilities should certainly be made available to them.

CHAPTER XI.—PRODUCTION OF KHERI

(See Part I, Volume I, Page 22.)

(Submitted by Sjt. Walter Dutt.)

This note is not meant to be exhaustive or to be a scientific monograph on the smelting of iron ores in the province; it refers only to the production of what is locally known as 'kheri' by direct smelting from special types of manganiferous iron ore.

Kheri is a crude form of steel technically called 'wootz' which has been manufactured or probably as long as two thousand years and exported to the West: Damascus blades and Sheffield cutlery were both made from this product which found its way to the West through Persia. (See monograph on Iron and Steel Industries of Central Provinces by Begbie—1908.)

But during the last quarter of a century the industry has rapidly declined and foreign iron and steel though it is of an inferior quality, have driven out the small scale melter as a direct consequence of which here are hardly any blast furnaces in operation. The Jubbulpore district was one of the places most famous for the production of Kheri. (See Jubbulpore District Gazetteer Volume A, pages 259, 260 and 261.)

Nearly all modern smelting of iron is done in large blast furnaces having a capacity of

20,000 or 30,000 cubic feet and the fuel used in these is always coke, whereas the capacity of charcoal furnaces is never larger than 2,000 to 3,000 cubic feet. This new process has a history of not more than 75 years. Before that time, all the iron smelted in Europe or Asia was made in small blast furnaces using charcoal as fuel. Even now in those localities where plenty of wood is available, charcoal blast furnaces are still used to make pig iron of special purity, e.g., in Sweden.

Giving an account of the Styrian iron works, Professor T. Turner states:—

"The material is of very special purity, being low in phosphorus, copper and sulphur and relatively high in manganese. It is smelted in small blast furnaces, the fuel used being entirely charcoal. Of such furnaces there is a number in the vicinity of the Erzberg and these vary somewhat in shape and dimensions. A representative furnace is about 11.4 metres (36.4 feet) high, with a capacity of 35 cubic metres (1,240 cubic feet). The blast is produced by a water-wheel, and requires 25 horse power, an additional 5 horse power being required for other purposes connected with the furnace. The blast pressure is 45 to 50 millimetres of mercury (about 1 lb. to the square inch); it is heated in pipe stoves by the waste-gases to a temperature of 200 to 300 C., and enters the furnace by 5 bronze tuyeres. The charge consists of 12 hectolitres (33 bushels) of charcoal, 438 kilos (8.6 cwt.) of calcined ore, and 9 kilos (20 lbs.) of quartz, which is required to act as flux. The time required for the ore to pass from the furnace top to the hearth is about four and a half hours. About 118 charges are employed per day, the furnaces being tapped about sixteen or seventeen times during the same period, each tapping consisting of about 1,600 kilos (3½ tons), or a weekly production of about 180 tons." (Metallurgy of Iron by Turner, page 108, 1895.) Professor Turner states that with good working about 65 to 70 lbs. of charcoal are required to produce 100 lbs. of pig iron.

Up till the end of the nineteenth century, charcoal furnaces were still working in Great Britain. Turner writing in 1894 describes them as follows:—

"The working of the two charcoal furnaces still remaining in Great Britain was described by W. K. Macadam in 1887. They belong to Messrs. Ainslie and are situated at Newlands and Blackbarrow, near Ulverston, in Lancashire. One dates from before 1711, having been rebuilt in 1870, while the other was built in 1747. The height is about 30 feet and the make does not exceed 30 tons per week. Cold blast is used and the slags are glasses variously tinged with colour, and quite unlike any other blast furnace slag. The charges used to produce 1 ton of pig iron in 1738, and 1887, respectively, were as follows:—

	1738	1887
	Cwts.	Cwts.
Charcoal	35	40
Red haematite	40	32½
Iron stone	½	1
	(Irish aluminous ore)	
Limestone		2

"Each furnace is blown out once in three years for repairs and is allowed to remain out of blast for a year, so as to allow an accumulation of charcoal. The wood takes sixteen years to grow and about 2½ tons of wood are required to produce 1 ton of charcoal, so that 5 tons of wood are needed per ton of pig iron. The iron is of the best quality, and fetches a very high price." (Metallurgy of Iron by Turner, page 161.)

There is thus no technical difficulty in the manufacture of pig iron or wootz on a small scale with charcoal as a fuel. Modern methods may have made great strides in the metallurgy of iron, but that is no reason for rejecting the older methods if they suit local conditions.

Examining the problem from a provincial point of view and keeping in mind the needs of the agriculturists in Central Provinces, I have not the slightest hesitation in saying that it would be of enormous service to them if the production of 'kheri' could be revived.

The manufacture of kheri may be considered under four heads:—(1) raw material, (2) suitable plant, (3) costs, and (4) demand.

Raw materials—(a) Fuel.—Charcoal is made in very large quantities in Jubbulpore and Narsingpur district, for export as fuel for domestic use. It has been estimated that Indian forests yield 325 tons of wood per square mile every year. Enquiries made during the survey of typical villages show that the yield of charcoal from partially-dried wood is about 30 per cent. But allowing 5 per cent. margin we may take the yield at 25 per cent. If Government were to grant concessions to work forest areas for charcoal, cutting and storing can be done at the rate of Rs. 2-8-0 per 100 maunds, and the preparation of charcoal would not cost more than Rs. 1-8-0 per 100 maunds of wood converted. On this basis the cost of charcoal at the forest would not exceed Rs. 16 per 100 maunds exclusive of Government royalty. Allowing Re. 1 per 100 maunds as royalty and Rs. 3 for carting to the furnaces, the cost of charcoal would be Rs. 20 per 100 maunds or roughly Rs. 6-8-0 per ton. The cost given in the Central Provinces forest pocket book is Rs. 13-4-0 for 45 maunds or roughly Rs. 30 per 100 maunds, but Government figures are always apt to be too high. I am quite certain that charcoal can be had for a maximum of 4 annas per maund or Rs. 6-12-0 per ton at any site within a radius of 10 miles from the forest area where it is made.

(b) Iron ore.—The best iron ore deposit for the production of kheri is situated in the Sihora tahsil between the villages of Gogra and Bhanwai. (See records of Geological Survey of India, Volume 21, Part III, page 75.)

The ore has the following analysis:—

Ferric oxide	66.33
Manganese (with traces of Cobalt)	12.26
Oxygen	6.85
Phosphoric acid	.27
Sulphuric acid	.03
Sulphur	trace
Ignited soluble residue	9.55
Lime, alumina, water and undetermined	4.76
Total	100.03

(Records Geological Survey, Volume XVI, page 101.)

This may be compared with the analysis of the Erzberg ore used in Styria (Turner, page 108):—

	Per cent
Ferric oxide (Fe ₂ O ₃)	67.78
Ferric oxide (FeO)	2.00
Manganous oxide (MnO)	3.86
Lime (CaO)	7.15
Magnesia (MgO)	2.90
Alumina (Al ₂ O ₃)	1.79
Silica (SiO ₂)	7.05
Copper oxide (CuO)	trace
phosphorus pentoxide (P ₂ O ₅)	0.057
Sulphur trioxide (SO ₃)	0.11
Carbon dioxide (CO ₂) and water	7.60
Total	100.297

The kheri or steel which is produced direct by smelting the Dhanwai ore, is of excellent quality and far superior to ordinary imported steels and it is much more lasting than the materials used at the present day for such agricultural implements as axes, 'husias', 'khourpis', etc.

(For an account of the 'kheri' which used to be produced and its superiority over foreign steel see Jubbulpore District Gazetteer, pages, 259, 260 and 261).

The iron ore is abundant and easily worked; the cost of raising and sorting would not exceed Re. 1 per ton at Dhanwai and if the blast furnace were situated at any place (e.g., at Sihora Road Railway station) within a 10 miles radius, the transport would not be more than Re. 1 per ton making the cost at the furnace Rs. 2 per ton.

(c) Flux.—The Dhanwai ore is practically a self-fluxing ore and no flux except a small amount of lime stone or quartz is needed. Limestone is available in the Sihora tahsil and could be delivered at Sihora Road Railway Station for Rs. 3 per ton.

(d) Labour.—Labour is cheap and plentiful in the Jubbulpore district.

Process and plant:—

The traditional small blast furnace used by the Agarias of the province has been described by Mr. R. S. Hole, I.F.S., in Agricultural Ledger No. 17 of 1898.

These small crude furnaces are very wasteful in material and labour, the blast is also not sufficient nor is the quantity of material in the furnace at any one time large enough to get a clean and uniform flow of molten steel. If the industry is to be revived and is to take its place in competition with Indian and imported steel made on a large scale under modern metallurgical practice, the Swedish type of blast furnaces must be introduced. It should not be difficult to design a small furnace on scientific lines to suit the local conditions of the provinces.

The air blast required is a problem which will have to be investigated with special reference to local conditions. If Kheri is to

be made after investing a capital of Rs. 20,000, then this is not important as standard air blowers and engines can be installed, but if it is to be a cottage industry then water wheels or hand driven blowers will have to be devised.

Cost of production.—Taking the above figures for the cost of raw material and allowing Rs. 10 per ton of Kheri produced for labour, power and repairs, the cost of production would be as follows:—

	Rs. a. p.
2½ tons iron ore at Rs. 2 per ton	5 0 0
1½ tons of charcoal at Rs. 6.12-0 per ton.	10 2 0
0.5 ton limestone at Rs. 3 per ton	1 8 0
Labour, power and repair	10 0 0
Total	26 10 0

These figures are exclusive of interest on capital and depreciation.

The present price of pig iron in the Central Provinces is about Rs. 90 to Rs. 100 per ton and mild steel cannot be had for less than Rs. 150 per ton.

Demand.—The imports of iron and steel in commercial forms into the province for the year 1938 were 690,070 maunds (25,554 tons).

The manufacture of agricultural implements and ordinary tools as hammers, chisels, screw drivers, drills, etc., is of vital importance and these articles can well be made from Kheri.

There is ample scope for the establishment of the industry.

The limitation which will be most prominent is the supply of fuel. This is a matter for investigation. One square mile of forest will probably produce 80 tons of charcoal per annum. Under good working conditions that should be enough to produce 100 tons of Kheri, but the figure for consumption taken in the estimate of costs of production is 1.5 tons charcoal per ton of 'Kheri' produced.

CHAPTER XII.—MAT-WEAVING AND BAMBOO-WORK

(See Part I, Vol. I, Pages 23 and 30.)

(Submitted by one of the Schools of Handicrafts, Central Provinces and Berar.)

There are few articles of every-day use more common than mats and baskets. All castes, high and low, use them.

This industry has been hit hard on account of the fall in demand of the articles made from bamboo. Demand has fallen, firstly because the other village industries such as paddy-husking and flour-grinding in which these articles find use are decaying on account of the advent of rice and flour mills, and secondly because of the introduction of substitutes. As instances of the latter may be cited the use of iron scale-pans and 'taslas' for the bamboo scale-pans and baskets. 'Tattas' and 'chatais' are much less used for fencing and partitions since the introduction of galvanised iron sheets. The use of bamboo fans ('pankhas') is also declining considerably in view of their substitution with those made of other materials.

The principal castes engaged in this industry are 'Burads' and 'Basods'. In addition, a few 'Mahars' 'Pradhans' and 'Mangs' have also taken to it.

Ordinarily, the earnings of a worker range from annas two to annas four per day but when a special type of work is done e.g., making of 'tattas' (hoods) for carts, he can earn from annas six to annas seven per day.

The raw materials used are reeds from river-banks and fields, and bamboos from forests. There are various products of the industry viz., baskets of various types, large containers for storing grain, traps for fishing, big packing cases for pottery works, scale-pans, 'supas' fans, floor, ceiling and roof mats, hoods for carts, baskets for packing oranges etc.

Every village either makes its own baskets or gets them from neighbouring villages. Mention may be made of Chhindawara, Balaghat, Bhandara, Hoshangabad and Chanda districts where this industry is still practised on a wide scale. An approximate estimate of the extent of this industry can be had by a perusal of the figures of export of baskets and mats from Gondia from where alone more than 2 lacs of mats and 20,000 packing baskets are sent out on an average annually. In the orange growing districts of this province such as Nagpur, Wardha, etc., the making of orange baskets gives employment to a large number of people.

As these are articles of common use, they are readily sold in villages where they are made. This is one of the few cottage industries in which the middleman has not been able to secure a footing owing to the universal and recurring demand for the finished goods at the place of production.

The making of these articles by hand is an agreeable home occupation, the chief reason for its popularity being the inexpensive equipment that is required for the work and the ease with which the work can be learnt. One 'Katti' (a big knife) and one 'Ambu' (a blunt spear head) are the only tools that are required and can be had from the village blacksmith for about a rupee.

This industry can be encouraged and developed to a great extent if arrangements could be made for imparting instruction and training in the weaving of coloured designs. These new designs will not only be attractive but will also fetch better prices. The introduction of the practice of making some new articles such as chairs, tables etc., will also go a long way to encourage this industry.

CHAPTER XIII.—ROPE-MAKING

(See Part I, Vol. I, Page 23.)

(Submitted by Sjt. T. Y. Deo, Village Uplift Organiser.)

This subject may be divided into the following parts:—

- I. The extraction of fibres from fibrous plants.
- II. The spinning and twisting of fibres into ropes.

I. Extraction of Fibres.—The raw materials employed in the manufacture of ropes in our province are very numerous. They can be divided into the following three groups:—

(a) *Cultivator's crops.*

- (i) Flax or linseed fibres—*Alsi*. (*Linum usitatissimum*).
- (ii) Sunn-Hemp—*San*. (*Crotalaria juncea*).
- (iii) Roselle Fibre—*Ambadi*. (*Hibiscus cannabinus*).
- (iv) Cotton—*Kapas*.

(b) *Capitalist's crop.*

Aloe—*Ketki* (*Agave*).

(c) *Potential Fibres, worth Experimentation and Investigation.*

- (i) *Bhendi*. (*Hibiscus esculentus*).
- (ii) Plantain or Banana.
- (iii) '*Munj*' and '*Kus*' Grass. (*Saccharum arundinaceum* and *s. spontaneum*.)
- (iv) Woody fibres of *Palas trees*. (*Butca frondosa*.)

Flax.—Flax is a plant which can yield two products of commercial value, viz., (i) fibre and (ii) oilseed, known as linseed in India and as flax seed in the United States of America. This plant is remarkable in this respect that it is grown either solely for the fibre or for the seed but not for both. Attempts to produce a stock from which both the fibre and the seed could be obtained of good quality and in good yield have up till now been unsuccessful. The Indian crop of linseed is raised principally for the oil seed. The fibre which is obtained from this crop is stated to be poor both in quality and quantity when compared with that produced from plant raised for the purpose of fibre only, e.g., in Ireland, the linen from where is noted for its superiority.

The fibre obtained from the linseed grown in the province can be most profitably used for cordage, twines, canvas, etc.

The following extract from Watts "Commercial Products of India", page 722 is of great interest.

"The demand for cheap cordage, to be used as 'binders' has suggested the possibility that the stems of the linseed-yielding plants (while they doubtless do not contain fibre of sufficient merit and abundance to justify being elaborately separated, cleaned, and placed on the market as Indian flax) may still by a simple method of preparation afford a cordage fibre that, as a catch crop, might undersell even jute."

To remove fibres out of the stems needs no particular technical knowledge. Cultivators can do this easily, once they are shown the method to be followed. When the bolls begin to show signs of hardening, the stems are uprooted and dried. Seeds are then removed and the stems are put in water for retting. When the stems are sufficiently retted, they are taken out and dried. They

are passed through a contrivance called a 'Scutcher' or through rollers. The linseed fibre which is going to waste at present could be profitably utilized for cordage with the help of existing devices with us.

Sunn-hemp (*Crotalaria juncea*).—Sunn-hemp is well known as a commercial crop of the Central Provinces and Berar. The area under cultivation is 141,484 acres. The principal districts where it is grown for its fibre are Jubbulpore, Seoni, Chhindwara, Betul, Chanda, Akola and Mandla. The raising of sunn-hemp crop possesses the following advantages over that of other fibrous crops:—

- (1) It takes only 3 to 4 months to mature.
- (2) The yield is 4 to 7 maunds per acre.
- (3) It does not need the same amount of attention and care as the other fibre yielding crops do.
- (4) Its cultivation enhances the fertility of the soil and kills weeds on lands.
- (5) It grows well even with a moderate rainfall.

Process of Extracting Fibres.—The harvested crop is left for 10 days on the field by which time it is thoroughly dried. The stems are then made into bundles. The top parts are removed for seeds. As the fibres surround the woody matter, retting or rotting has to be resorted to to free them. Retting is a process by which the gummy matter which binds the fibre to the woody part is decomposed by fermentation and dissolved out. The bundles are retted flat in ponds and are weighted down with stones or logs of wood. It is preferable to have shallow running river water if available. The period of retting in flowing water varies with the season. It takes about 8 days in December, 11 in January and 14 in February. It was observed that in still water the period is shortened by 4 days.

The retted material is washed by shaking the bundles gently in water. It is dried in the sun for 4 to 5 days. The fibres are then extracted by breaking the stems at different places and pulling them out of the woody part of the stem. In many cases the retted material is taken up in large bundles and beaten on flat stones. They are next well rubbed and washed for thorough cleaning, and spread on the ground to dry.

All fibres prepared in the above way have a dark colour. To avoid this discoloration, the woody plant should first be well beaten with a mallet and then the bark should be separated from the stalk, as it is on the inner part of the bark that the fibres for cordage are found. The bark should then be brought to a pulpy state and washed in clean water to remove as much of the sap as possible, as otherwise, this sap, if left with the fibres, will soon cause putrefaction.

The cultivation of this crop ranks low in social estimation in the Central Provinces and is usually confined to people of the *Gond* caste. Even if others grow the crop, the sowing of the seeds and the thrashing of the top parts for seed are done by the *Gonds*.

The dry sticks are used as fuel. In some parts of the Central Provinces, they are used as a support underneath the ordinary grass during thatching. The major portion of fibres are produced in Bhainsadehi tahsil in Betul district. Sunn-hemp fibres are made into 'Sutali', 'Charpoy' strings, cords, ropes and coarse canvas in most of the districts of our province. The industry is of local importance only. Most of the fibre is exported.

The tediousness and monotony involved in the process of taking out the fibre account for the apathy of the people to develop and exploit this industry to its fullest extent. The devices designed by the writer to simplify the spinning and twisting of the fibre will be instrumental in attracting people back to their old trade. At least this is certain that they would be able to supply their own requirements of ropes and would succeed in competing with imported goods.

Roselle Fibre (Ambadi) (Hibiscus cannabinus).—In our province, Roselle Fibre is grown only as a mixed crop, but not as a commercial crop for export, as is being done in Bombay and Madras Presidencies. The fibre is strong and could be used for making ropes, canvas and sacks. This plant requires very little care in growing it and in separating its fibres. Cultivation of this plant should be encouraged.

Capitalists' crop (Aloe) Kethi (Agave).—Aloe is a native of America but has become naturalised in many parts of India. It grows to a gigantic size, with sword-like leaves, 8 to 10 feet in height, radiating in clusters from the root. The edges of these leaves are prickly. This makes these plants useful as hedges, a use to which they are put in India. The leaves of these plants furnish fibres of great length and considerable strength.

The usual way of obtaining the fibres is to steep the leaves in water for 3 days and then to clear away the herbaceous parts. Fibres can also be separated by first beating and separating the rest of the vegetable tissues. Beating is required on account of the hardness of these leaves. Pressing them between grooved cylinders would be more efficacious and expeditious.

As the fibres are extensively used in different parts of the world, aloe would form a valuable crop in our province. It grows wild without much attention and care on poor stony soil, and under all conditions of rainfall. Its cultivation should be encouraged on lands unsuitable for agricultural purposes. The leaves are ready for cutting after 3 years. (This proposition needs thorough investigation.)

The fibres of aloe are used for making marine ropes, (artificial silk?), paper, brushes, rugs and carpets of various designs, binders, twine, matting, door mats, brooms and many other articles of common use. The fibres can be dyed in all colours. (The expressed juice of the leaves is a useful substitute for soap.)

Potential Fibres which need further investigation.

Bhendi (Hibiscus esculentus).—The Bhendi plant grows freely and attains a height of 8 feet in three months. The

method of separating the fibres is similar to that used in the case of linseed fibre. At present, as the fibres of this plant are going to waste entirely, they could be profitably used for cordage and paper-making.

Plantain or Banana.—Plantain fibres are useful in paper-making but little use is being made of them for this purpose. The fibres are obtained either by scraping the sheaths by passing them repeatedly under a knife fixed to a wooden board, or by beating them.

Munj and Kus Grass. (Saccharum arundinaceum and S. spontaneum).—'Munj' grass grows wild in many places in the Central Provinces specially in the districts of Jubbulpore, Chhindwara, Chanda, Mandla and Bilaspur. It is collected after the rainy season and stored for use. It is used for making strings for 'charpoys' and ropes for tying bullocks. It is also widely used for rush-weaving.

Roots of Palas Trees (Butea frondosa).—In almost all forest areas, the fibre obtained from the roots of 'Palas' trees is used in making ropes. In view of the varied commercial uses of that tree, the present practice of using its roots to supply fibres for making ropes should be discouraged. Much harm is done to the plants by disturbing their roots. The tree should be reserved for the cultivation of lac and for the supply of flowers which yield the familiar yellow dye.

II. Rope-making.—Generally speaking, "rope" implies a large stout cord made of some kind of fibre and exceeding one inch in circumference. Thinner kinds are known as cords, line, twines, thread, etc. Yarn is made by twisting the fibres together. Two or more of these yarns twisted together will form a strand. Three, four or more strands twisted together will form ropes of different sizes. Three or more ropes twisted together will form a cable. A rope of three strands is called hakaser. A rope of four strands is called a shroud.

Ropes are either plain or tarred. Tarred ropes are neither made nor used in our province. Plain ropes are commonly used.

The strength of ropes is calculated approximately as given below:—

Square the circumference (in inches) and divide by five in order to determine the number of tons of dead weight that the rope can bear.

There are three distinct stages in the manufacture of ropes:—

- (1) Hackling or the process of making fibres loose and soft.
- (2) Spinning, i.e., spinning of fibres into yarns.
- (3) Twisting yarns into strands and turning them into ropes.

(1) **Hackling.**—The first stage in the manufacture of ropes is hackling after which the hackled material is tied into bundles for twisting into yarns.

The hackle consists of a wooden board $16\frac{1}{2}'' \times 5' \times 1\frac{1}{2}''$. A space of $9\frac{1}{2}'' \times 4''$ in the centre of the board is studded

with steel pins six inches long. There are eleven pins per row lengthwise and five breadthwise.

This simple contrivance is not used in our province. The process of hackling separates the fibres from one another and at the same time cleans the stuff to make it suitable for spinning.

In our province, the separation of fibres and cleaning is done with hands, which is called hand-dressing or hackling by hand.

(2) *Spinning the yarns.*—The tedious operation of spinning the fibres into yarns is usually done in our province with the help of a 'Dhera' or a 'Chakri', a wooden whirl, and a 'Charka'. In the case of villagers, they do it with their fingers alone.

Process of spinning.—The spinner carries a bundle of dressed fibre around his waist. He takes out the required quantity of fibres with his hand and twists them with his fingers. He makes a loop of the twisted yarn and inserts it into the hook of a whirl which is driven by a wheel worked by an assistant. The spinner walks down the 'rope-walk', an open space, feeding the fibres into the twisted yarns as he goes. He takes care that the fibres are evenly supplied. When he reaches the end of the walk, his assistant takes out the yarn off the whirl and winds round a reel to be used later on for twisting into strands.

The professional rope-makers of our province called *Bhamtis* use a simple contrivance, "a wooden whirl", driven by hand. The process followed is the same as referred to above. Persons working singly resort to *Dhera* or *Chakri*.

The above processes have been considerably simplified by the introduction of devices designed by the writer. These are simple enough in construction for the village carpenters and blacksmiths to make them. They are pedal-driven. A single man can keep the whirl moving and feed the fibres at the same time. Further improvements are being constantly tried.

(3) *Twisting yarns into strands and rope.*—Yarns are stretched according to the length and thickness of the rope required. In the absence of suitable contrivances in the villages for making ropes, the ordinary worker, after spinning the yarn by the hand, also twists it into the required rope with his own hand. Like the process of hand spinning referred to above, the twisting process is equally tedious and lengthy.

The contrivance commonly used by the villagers at present is as follows:—

A pair of stout logs are driven vertically into the ground. Across these is bolted a strong horizontal rod having three holes at equal distances along its length. Three wooden cranks turning in these holes are attached. This arrangement is called a 'tackle board'. The required number of yarns to form the strand are affixed to the hooks attached to the free ends of the cranks. All these three strands pass through three corresponding holes of a wooden piece at the other end, the strands being attached to another revolving hook at this extremity. The twisting is then commenced at the tackle

board. When all the strands have received sufficient twist, the formation of rope begins from the other end. As the rope is being made, the wooden piece at the other end is gradually brought towards the tackle board.

Taking into consideration all the difficulties involved in the old processes mentioned above, the writer has devised a handy and cheap rope-making device simple enough to be made by village carpenters and blacksmiths. Ropes of any length and thickness can be turned out with this machine in a shorter time and with less efforts.

The strands to be twisted together are each attached to one of the hooks of this machine which is fixed at one end of the walk. The other extremities of the strands pass through the corresponding holes of a triangular board and are all attached together to a revolving hook fixed to the rod at the other end. Here the strands are closed into a rope by being twisted together in the reverse direction to that in which the strands themselves are being twisted. The strands are kept pulled tight along the walk from the hooks of the machine at one end and the hook of the rod at the other.

There are other mechanical contrivances in possession of the writer, but they are complicated and it is far beyond the ability of the village workman to produce them.

A cursory glance at the present condition of rope production in our province will convince any body of the paucity of the village manufacture. Only a small percentage of the *Bhamti* people produce some ropes for sale. A very large percentage of the rural needs for ropes is supplied by imports from foreign countries. All this is particularly lamentable, when many kinds of fibres are available in our province. The cottage industry must be commercially organized so as not only to meet rural needs but also to command the market in and out of the province.

CHAPTER XIV.—TANNING INDUSTRY

(See Part I, Vol. I, pages 24 and 25.)
(Submitted by Sjt. G. R. Valunjkar, Goseva Charnalaya, Wardha.)

After cloth, leather is the first requirement of modern society and hence leather industry comes second in importance only to the textile one. In a sense it ought to precede textile industry because animals die in every village and the villager must dispose of the carcasses anyhow and make use of this commodity. Primitive man was a hunter before he knew any thing of agriculture. Hence the industry of dressing and curing hides and skins is very old. The *Rigveda* refers to tanners and skins of animals prepared by them. In India, this industry became the special avocation of certain classes and gave rise to a vocational class which, though one of the depressed classes of India, is numerically one of the most important.

It must be remembered that in an agricultural country like India where the system of

agriculture hinges on oxen, while the domestic cow supplies some of the chief household needs such as milk, ghee, curds, etc., the sentiment in favour of the cow and the ox is very old and the slaughter of cattle was unknown from at least the Pauranic period of Indian History.

A certain number of dead cattle were, therefore, available for manufacture and trade. Owing, however, to the prejudice among the religiously-minded Hindus against the use of leather, this was not as highly developed an art in India as in other countries where there was no such prejudice. Still, leather was greatly used for ropes in agriculture and as an article for footwear even in the Vedic period.

The different processes, involved in the disposal of a carcass up to the finished products, in themselves constitute a vast series of small industries each independent of the other. I may mention some of them:—

(a) Disposal of carcasses—

- (1) Flaying.
- (2) Bone-meal Manufacture.
- (3) Flesh Manure.
- (4) Fat Extraction.

(b) Gut-making.

(c) Horn-work.

(d) Tanning and Finishing—

- (1) Vegetable Tannage.
- (2) Mineral Tannage.
- (3) Oil Tannage.
- (4) Fur-leather Tannage.
- (5) Finishing or currying.

(e) Glue-making.

(f) Leather works—

- (1) Drums and other musical instruments.
- (2) Leather bottles.
- (3) Harnesses.
- (4) Bridle and other equestrian equipment.
- (5) Water-lifts, ropes, whips and other agricultural requirements.
- (6) Different types of foot-wear, purses, leather-bags, belts and other requirements of modern society.
- (7) Belts, washers, laces and other machinery requirements.

Of these (a), (b), (c) and (e) are either unknown to this Province or are new, showing great potentialities of success. These can be easily practised by Mahars in the Marathi speaking districts of this Province and Chamars in the Hindi districts.

(a) Disposal of carcasses.—India has nearly 30 per cent. of the world's cattle, and her estimated production of hides and skins, viz., 25 millions, amounts to between 25 to 33 per cent. of the world's production. India's position, therefore, in the world's hide markets is that quantitatively she is in the position of a large supplier, but qualitatively she falls far in the rear. The reason is

obvious. About 75 to 80 per cent. of her hides are from dead cattle, the carcasses of which are scattered all over the country and are not properly looked after. The carcasses in a slaughter-house are well supervised and can be neatly flayed and properly cured. The opinion of experts is that the value of Indian raw hides will be doubled if proper care is taken as regards flaying and curing. It is, therefore, recommended that the Government should arrange to look after the carcasses of the animals scattered all over the province, get them properly flayed and the hides well-cured, so that their value may be enhanced and make commercial use of other parts such as flesh, bones, fat, hoofs, horns, putthas, etc., that are now being wasted and lost, and also cause insanitation.

According to Government statistics for 1934-35, the cattle population of Central Provinces and Berar excluding the 14 Native States is: Oxen, 11,650,361; buffaloes, 2,193,039; and the calculated deaths are: Oxen, 1,398,065; and buffaloes, 693,039. Besides these, there are other animals, such as, horses, mules, asses, cats, dogs and others whose carcasses are not touched but are left to be taken care of by vultures. It is expected that the proposed department should take possession of all such carcasses also and turn them into useful products. The number of inhabited towns and villages in the British area of the Central Provinces and Berar is 39,874 according to the Census Report of 1931. If we calculate the death-rate of such animals other than cattle, at 4 per year per village, the number of deaths per year for the whole province works out to 159,496. So the total number of carcasses that the department will be required to handle, as it becomes stable, would be—

Oxen	1,398,065
Buffaloes	693,039
Others	159,496
Total	2,250,600

But the department may not be able to obtain all these carcasses in the early years of its inception. Still it can be reasonably assumed that the department, if properly organized, may not find it difficult to obtain half the actual number, and the following calculations are based on this assumption.

The figures for the number of deaths per year given above include calves. It is calculated that the calves would be 12½ per cent. of the total number. So the total number of carcasses that the department will have to handle is as below:—

Oxen—(1,398,065—12½ per cent. calves.)

$$\frac{2}{100} \times 1,398,065 = 611,653$$

Buffaloes—(693,039—12½ per cent. calves.)

$$\frac{2}{100} \times 693,039 = 303,204$$

Calves—130,694 (cows—87,379 and buffaloes—43,315).

Others—159,496.

The following figures of the average number of carcasses available in a town or village will be more convincing:—

Oxen	...	15
Buffaloes	...	8
Calves	...	6
Others	...	4
Total	...	33

The commercial products of a carcass are:—

- (1) Hide or skin.
- (2) Bones (Bone-meal).
- (3) Flesh manure.
- (4) Fat.
- (5) Hoofs, horns, putthas and others.

Hide or skin.—Dry hides and skins of cattle are sold by weight, while the fresh ones by number. The rate of the primary producer is about Rs. 15 for oxen and Rs. 12 for buffaloes, while the merchant sells them at Rs. 18 and Rs. 15 per maund, respectively. The buffalo hide is much heavier in weight. The green hides are sold by *kodi*, a term to denote a measure of 20 in number. The present prices of the merchant are—

Buffaloes—Rs. 55 to Rs. 60 per *kodi*.

Oxen—Rs. 50 to Rs. 55 per *kodi*.

The following are the lowest prices in Nagpur and Berar:—

	Rs.	a.	p.	
Buffaloes	...	2	8	0 each
Oxen	...	2	0	0 "
Calves	...	0	12	0 "
Others	...	0	4	0 "

The price of a hide or skin is greatly enhanced, if there are no scratches and flaying cuts on its surface and if it is well preserved by salting. In Chhattisgarh, the cattle are of a very low stature and ill-fed and, therefore, they fetch a much lower price. The following are, therefore taken as the average prices for the whole province:—

	Rs.	a.	p.	
Buffaloes	...	2	0	0 each.
Oxen	...	1	8	0 "
Calves	...	0	8	0 "
Others	...	0	4	0 "

Kind	Hide		Flesh		Bone		Fat		Others		Total	
	Rs.	a. p.	Rs.	a. p.	Rs.	a. p.	Rs.	a. p.	Rs.	a. p.	Rs.	a. p.
Buffaloes	2	0 0	0	14 0	1	2 0	1	0 0	0	4 0	5	4 0
Oxen	1	8 0	0	10 0	0	14 0	0	12 0	0	4 0	4	0 0
Calf	0	8 0	0	2 0	0	2 0	..	..	..	..	0	12 0
Others	0	4 0	0	1 6	0	1 6	0	1 0	..	..	0	8 0

(b) Gut-making.—Guts can be made from putthas that are found on the spinal cord of cattle and intestines of sheep and goats. All the intestines of sheep and goats

Bone-meal.—Bones, when slightly charred, become brittle and can easily be crushed. But they lose in weight when charred. According to results obtained in the laboratories, they ought to lose only 10 per cent. But our practical experience shows a loss of 30 to 35 per cent. In order to allow a wider margin, a loss of 40 per cent. is taken for the purposes of making estimates. The following is the approximate weight of bones from each animal and the weight of the bone-meal, and their value at the rate of Rs. 2 a maund:—

Buffaloes—40 seers—24 seers—Rs. 1-3-0.

Oxen—30 seers—18 seers—Re. 0-14-0.

Calves—5 seers—3 seers—Re. 0-2-0.

Flesh-manure.—The value of flesh-manure increases, as it becomes fat-free. It contains nitrogen (over 11 per cent.), and can be sold at Rs. 2 per maund.

The following are quantities recovered from each animal, and the amounts they fetch:—

Buffaloes—17½ seers—Re. 0-14-0.

Oxen—12½ seers—Re. 0-10-0.

Calves—2½ seers—Re. 0-2-0.

Animal Fat.—The highest amount of fat that can be recovered from a buffalo is 20 seers and from a well-fed ox, 16 seers, while there were others that yielded no fat at all. The fat is sold at Rs. 10 a maund, or annas 4 a seer. It is presumed that on an average a buffalo may yield 4 seers of fat, and an ox 3 seers. So the income from the fat would be—

Oxen—3 seers—Re. 0-12-0.

Buffaloes—4 seers—Re. 1-0-0.

Horns, Hoofs etc.—Horns are sold at one anna per seer. The fresh horns of a buffalo weigh 3 to 4 seers, while when dry they weigh 2 to 3 seers. Putthas may yield about an anna. These may fetch on an average annas four.

Gorochan (gall-stones) stone.—This is found in the gall bladder of some oxen and is used for medicinal purposes. This is sold at Rs. 3 to Rs. 5 a tola. But, as this is not a sure factor, it is not taken into calculation.

The following table shows the average income that the carcass of each animal may yield:—

of this province are exported to Sialkot for preparing them into guts. A net work of agents of Sialkot merchants is spread throughout the whole province and yearly contracts

are made with practically every butcher in every slaughter-house. This year we tried to open this section but could get no raw material even from Hinganghat, Arvi, Nagpur and Amraoti, because of these contracts. The flayers in the Marathi districts, (except in some parts of Chanda), know nothing of putthas and waste it from sheer ignorance. The *chamars*, the flayers in the Hindi districts, export them to Sialkot. Last year when the Maharashtra Charkha Sangh wanted to begin this industry, they had to order the raw material from Sialkot at the rate of Rs. 350, per 1,000, while this year they have made a contract with local agents in the Chhindwara district at the rate of only Rs. 22 per 1,000. On an average it can be safely said that out of a total of 22 lacs of dead bodies of animals every year in the province, at least 12 lacs of putthas can be exported for this purpose, which means one lac per month and calculating at the rate 25 working days in a month, it comes to 4,000 per day. Two men are required to begin the work of gut-making. They will prepare 2 bundles of 100 yards each per day. It will require about 7 to 8 putthas and small quantities of the following chemicals:—

- (1). Washing soda.
- (2) Fruit salt.
- (3) Gut bleaching powder.

The implements required are quite simple and can be had in the village. The production of intestines in the province is estimated at 586,130 in number being equal to the number of sheep and goats that are slaughtered in the slaughter-houses of the province. According to these calculations, if the whole industry is organised, it will give work to not less than 2,000 men. Guts can be used for various purposes, the main being strings of carding bows, tennis racquets, musical instruments and others. It is, therefore, possible to find a ready market for this article.

(c) Horn-work.—This provides articles more or less for display than for use, but combs, pen-holders, knife-handles, mounts for brushes, etc., can very well be counted as articles of utility. This industry, however, cannot find work for more than a few artisans who know carpentry.

(d) Glue-making.—Tannery waste such as fleshings, ears, cheeks and other parts of the dead animals, forms the glue-stock. It is, however, premature to say at this stage whether the hot weather of our province is suitable for this industry. Fleshings from the few tanneries that exist in our province are exported to the Punjab and foreign countries. No statistics of this export are available. The fleshing and other glue-stock of the village tanner are wasted. Scientific research in this branch will help a good deal to develop this branch.

(e) Tanning industry—*Historical*.—According to the Indian tradition of self-sufficiency in villages as regards their primary needs, this province was not only self-sufficient as regards its leather goods, but was also producing a surplus for export. But with the advent of better transportation facilities on account of railways, there was an impetus to export more tanned leather than raw hides.

The increase went on steadily till about 1900, when the export of tanned leather reached its maximum. At this time the export merchants of Bombay and Madras, who are merely the agents of foreigners, might have found it more profitable to tan these hides and skins in their own place than import them from other places. They, therefore, encouraged this industry there and hence the export of tanned hides and skins in this province began to fall from this period onwards. The following table shows the gradual fall of the export of tanned hides and skins from 1891 to 1938.

Export of tanned hides and skins.

Year	Weight in maunds			Price in rupees.		
	Cattle hides	Sheep skins	Total	Cattle hides	Sheep skins	Total
1891	23625	471	24096	708750	15307	724057
1900	76630	796	77426	1915750	27860	1943610
1910	1109	7	1116	57791	384	58175
1921	16	..	16	868	..	868
1931	..	..	..	..	..	..
1938	..	..	..	..	..	..

Compare with this the export figures of raw hides also—

Export raw hides and skins.

Year	Weight in maunds			Price in rupees		
	Cattle hides	sheep skins	Total	Cattle hides	sheep skins	Total
1891	15922	10504	26426	199025	157560	316585
1900	65870	16480	82350	1317400	292518	1609918
1910	68826	47955	116781	2363411	1157513	3510924
1921	68008	37483	105491	12111027	1746590	2957617
1931	33905	37528	71433	465664	653664	1119328
1938	53403	44963	98366	..	..	..

The second table shows the steady and considerable increase in the export of hides. This is how the tanning industry of this province is dying out; the result is that in 1911, 80,000 *chamars* were employed in the industry, while in 1931, only 16,900 men were engaged in it, thus nearly 63,000 men were thrown out of employment in two decades.

In addition to this fall in the export-trade of tanned leather, we find another setback to the industry. The city people, and in their footsteps the villagers too, gradually began to use foreign articles, and we find certain occupations found only in the records of history. For instance, among the *chamars* there was a sub-caste in the province, called *Budhele*. Their occupation was to prepare leather bottles or *budhalas* as they are called locally. But with the advent of the foreign tin receptacles as substitutes for these bottles, the *budhalas* have become a matter of historical interest only. It is the same case with horse equipments—the harness and bridle. The leather required for these as well as some of the articles themselves are imported from outside.

In the case of footwear also, the rich and city people began to use freely the fancy imported footwear without any consideration for the occupation of the poor village *chamar*. The government too is indifferent to him. All the leather goods required by the Government are imported from outside. Although the footwear for the villager remained the sole monopoly of the village *chamar* till recent years, with the merciless invasion of the Bata Shoe Company, this monopoly also has begun to crumble down; and if this state of things is allowed to go on without let or hindrance on the part of the Government and the intelligentsia, the leather industry of the village *chamar*, in this province in particular and in India in general, may become a matter of history in the course of a few years.

	Oxen
Dead ..	13,98,065
City slaughtered ..	65,312
Village slaughtered ..	3,000

Add to this the import figures for the year 1937-38.—Buffaloes and cows: 4,484 maunds.

The total weight of hides produced in this province in 1937-38 was 331,200 maunds, yielding a price of Rs. 58,71,600. Add to this the import of hides 4,484 maunds. Thus the quantity of hides available in the province is 335,684 maunds. Of these, in the same year 53,503 maunds were exported untanned, while the rest were tanned in the province.

Tanning materials.—The chief tanning material in the province is *babul* bark. An abundant quantity of tanning materials is available in the province, there being no district where tanning material of one class or another is not found. Very little is known about the quality, effect and nature of the tannage produced by the various tanning materials and hence their right application is not understood by the majority of the tanners. Some of the tanning materials used in

In my personal talk with an expert who is considered an authority in the Indian Tanning Industry, I was flatly told that the days of the village *chamars* have gone. Can such experts and the Government that rely on their advice, ever revive the industries of India and keep alive the poor villagers that form a large part of the population?

Raw hides and skins.—Skins of large full-grown animals such as cows, buffaloes, horses, etc., are usually called hides. Skins of very young animals such as, calves, goats, sheep and deer are called skins.

Raw hides in this province are, as in other parts of India, generally hides of cows and goats. Hides of horses, sambhar, *neel gai* and deer are also available in small numbers. As the tanning industry is not organised in this province, the quality of raw hides is very bad. The chief defects are the following:—

- (1) Improper flaying: butchers' and flayers' cuts and holes.
- (2) Damage to grain and texture caused by branding, dragging, goading, etc.
- (3) Insect vermin bites.
- (4) Yoke marks.
- (5) Want of proper curing.

The inferiority of the hides and skins and their flimsy texture are due to the semi-starvation in which the animal population is living almost perennially. If by various forms of propaganda, the village *chamar* or the *mahar* is educated to realize his own economic loss, caused by his own actions which he can control, the quality of raw hide can be improved.

Production of raw hides and skins.—Accurate figures of hides and skins produced in this province are not available, but from general information gathered from various sources, both official and non-official, an approximate estimate can be formed—

	Buffaloes	Sheep	Goats
Dead ..	6,93,039	1,50,883	4,35,247
City slaughtered ..	15,949	..	..
Village slaughtered ..	7,000	..	..

the different districts are *tarwad*, *babul*, *anjan*, *ain*, *kahua*, *anwala*, *saj*, *sunari*, *myrobalan* and others.

Of these, *babul*, *tarwad* and *sunari* give better results than others. But the village *chamars* cannot get them because they have to be stored in the season, as there is no regular market for these barks in the province. Those who want to use them are required to store them in the season for the whole year. If depôts of these barks can be opened in every district for the *chamars*, they can be made commercially successful.

Tannic Acid Manufacture.—The province abounds in *myrobalan* trees known as *harra* and this is specially so in respect of Betul, Jubbulpore, Raipur, Chhindwara, and other districts. In the Bombay markets "Jubbulpores" are a class of *myrobālans* by themselves.

The *harra* nuts are collected mostly by contractors, dried in the sun; crushed to remove the seed, and then exported to Bombay, Cawnpore, and Calcutta; but no refining or extraction of tannin is done in any district in the province.

Myrobalan contains 30 to 40 per cent. of tannin the extraction of which is a simple matter which can be done as a cottage industry. The process of extraction is that the nuts are crushed in a disintegrator and then extracted in wooden or copper vats with hot water. The liquor is filtered and evaporated to dryness. The result is dried myrobalan extract.

In 1935-36, about 1.5 million cwts. of myrobalan costing about 4.5 millions of rupees and 42,000 cwts. of myrobalan extract worth 4.2 lakhs of rupees were exported from India. The exports have increased in recent years.

The extraction of tannin from myrobalans has been investigated by the Indian Institute of Science, and published in Volume 21/A, Part XII of their journal, pages 131 to 147.

This industry is one which can be started immediately. It requires very little investment and can greatly benefit the province. It can serve as a cottage industry to help the villagers.

Labour.—The following is the population of castes that work on leather and leather goods according to the census of the year 1931:—

Chamars	...	615,506
Dohars	...	6,616
Mochis	...	6,848
Total	...	620,416

Of these, cottage tanneries in villages give work to 16,513, and the 5 or 6 tanneries that are in the province give work to only 400 people. The total number employed in the trade is therefore only 16,913, i.e., a little over 2½ per cent. of the total *chamar* population. The census report of 1911 shows that the industry was providing work to 80,000 people. That means during the last 20 years more than 63,000 people were thrown out of employment. The six tanneries with 400 men tan 150,000 hides per year, i.e., 375 pieces per head per year, while 16,500 village *chamars* tan only 2,032,000 pieces, i.e., 123 per head per year. The highest wages that can be offered for the kind of tannage we get in our province cannot go beyond annas 4 per piece, i.e., in the tanneries of the province the tanner on an average earns Rs. 93-12-0, while the village *chamar* earns Rs. 30-12-0 per year. I do not think this varies much from the actual position.

From my observation of the tanning centres in the different parts of India and my personal experience in the industry, I can say that it is possible for an average tannery worker or village *chamar* to earn annas 8 a day easily, if he is provided with sufficient work. If the export of raw hides is stopped, and arrangements are made for finishing the half-tanned leather, sufficient work can be found.

Implements.—Implements required are some wooden beams and knives which village artisans can easily make. Some slight improvements which also a village artisan can effect will greatly facilitate the work of the village *chamars*.

(j) *Leather goods.*—The village *chamars* supply agricultural leather requirements and also footwear to the villagers. The urban requirements of leather are met from leather imported from Cawnpore, Bombay or Calcutta. Generally speaking, the *mochis* in urban areas know only footwear manufacture.

The other necessary articles of leather mentioned in the foregoing list are not manufactured. If a school, where all these arts can be taught, be opened and the *chamars* taught these various arts, much of the half-tanned leather that is exported out of the province can be consumed locally. In the year 1937-38, 5,695 maunds of half-tanned leather were exported.

Some observations and recommendations

It is of great importance to improve the condition of raw hides so that better results in tanned leather may be obtained. The *Mahars* or *Dheds* who are actual flayers of dead animals have little idea of the importance of proper flaying and of the way in which hide should be preserved properly so as to give the best results. These people get hides free and have little notion as to what their real value can be if proper care is taken in flaying, preserving and presenting them in the market in the best possible condition. I, therefore, recommend that the village *chamar* should be relieved of the duty of flaying dead animals. According to Hindu sentiments as the owner of the dead animals has no interest in the carcass, the property right of the dead animal should be vested in the State by an act of legislature.

The Government may lease out by auction this right of collecting and disposing of the dead animal to any intelligent man or society with a commercial and national out-look, so that the dead body may be fully exploited. This alone will improve the hide and greatly enhance its quality and price.

This method will also eliminate the five or six intermediaries that are between the primary producer of the raw hide and the tanner. A technical assistant with a good knowledge of hides and skins and their tanning should be appointed by the Government and he should inspect the depots of these contractors and study carefully the defects in flaying and curing the raw hides and instruct the men in charge how to minimise them. Defects like branding and goading marks could be minimised by the touring officers of the Veterinary and Agriculture Departments making special reference, during their tours, to the heavy loss the province has to suffer owing to these practices.

Labour.—Tanners, especially in the Marathi districts of this province, practically know nothing of the art of tanning while those in the Hindi districts have as yet much to learn. Today, owing to the tottering condition of this industry, only a small percentage of the large number of tanners, as I have shown above, are doing actual tanning while

the rest of the vast population have become a burden on other industries, especially agriculture. Some of them are anxious to improve their condition but in this province there is no organisation to guide them. I recommend that a model tannery be established on self-supporting lines with a tanning school attached to it.

Capital.—Till recently there was a prejudice against this industry among the high class and moneyed people, but it is fast dying out. The tannery at Nalwadi has helped a good deal to drive out this prejudice and has created an interest among these people. If therefore, these people are shown the proper way, they will come forward with money to push intelligently this tottering industry. The Government should do its duty at this opportune time, while the interest of these men with money and intelligence lasts.

Some suggestions for the tanning industry.—There are chances of a good deal of waste in this industry, if proper attention is not paid. Sun-dried hides are sure to putrify in lime. Owing to the faulty methods of soaking and liming, many hides are spoiled which means a heavy loss to the tanners. Again, in the bark-yard, owing to the prevalence of crude and primitive methods, the tan-stuffs are not utilised to their fullest extent. Spent tanning materials that are thrown away contain as much as six or seven per cent, of tannin. Taken collectively for the whole province, this means a heavy loss. A village *chamar* should be taught to preserve the fleshings which can be utilised by a central glue factory for the whole province.

No quantity of the leather tanned in the whole province is dressed or finished. Central curing shops should be encouraged at important places such as Nagpur, Jubbulpore, Raipur, Amraoti and others, where all the country tanned leather may be dressed and finished. The Government should see that no half-tanned and undressed leather goes out of the province.

Chrome tanning.—As regards chrome leather, practically nothing is being done in this province. A few years ago it was believed that the climate of India was not suitable for producing chrome leather of superior quality; but today, chrome leather of good quality is manufactured in some provinces, which has proved the possibilities of successful chrome tanning in this country. The efforts at Nalwadi Tannery are encouraging. Even a village *chamar*, if he has sufficient training, can produce chrome leather in his own cottage. The climatic conditions in this province are in no way a hindrance to the success of this section of the industry and hence I think it will not be wrong to say that immediate development of chrome tanning industry on cottage scale is possible. The chief materials for chrome tanning are salts of chromium. Although chromite occurs in India, commercial attempts to produce chromium compounds from this ore have not yet succeeded. Chromium salts are likely to be produced in the country some time in the future. Till then, they have to be imported from abroad.

Assistance to the Industry—(1) Export and Import Duties.—The provincial industry suffers a good deal on account of the fluctuating market for raw hides. The merchants of Madras and Calcutta are only the agents of foreign companies. The rates are doubled or reduced to half by a wire from London. Today you may get the hide at Rs. 10 a maund, the next day you are asked to pay Rs. 25. If a protective duty is levied on this article instead of a nominal duty or cess, it will help to consolidate the tanning industry a good deal.

(2) *Railway Freight.*—We have found that rates for goods from the interior to port-towns for a given distance are much lower than those for the same goods from one centre in the interior to another for the same distance. A maund of raw hide from Calcutta comes to Madras at a charge of less than a rupee, while a maund of raw hide from Raipur to Wardha is charged Rs. 18-0. It is the same case with myrobalan and other materials. The provincial government should take immediate steps to redress this handicap in the interests of the industry.

(3) *Municipality.*—Municipalities also cause a good deal of hindrance by imposing heavy octroi duties on tanning materials. We buy myrobalan at the rate of Rs. 10 a maund, and are required to pay octroi duty at annas 2 a maund. Nothing can be said against the imposition of this duty but it should be proportionate to its cost price. If the Local Government were to recommend to the Municipalities to consider their tariff from the point of view of encouraging their industry, I think the handicap can easily be removed.

Combine of merchants.—In 1936, we had ordered one wagon load of unslaked lime from the Lime Works at Raipur. The manufacturers there had formed themselves into a combine (union) and were supplying their lime to Madras and Bombay at the rate of annas 4 a maund in order to compete with other lime works. But to us they supplied at the rate of annas 9 a maund. The same is the case with other commodities also. The wholesale merchants, in order to compete in the big markets of Bombay, Calcutta and Madras, supply their goods at cheap rates in the big cities, while to the local manufacturers they charge comparatively high rates. Can the Local Government interfere in the matter?

Marketing.—In one of the foregoing paragraphs, I have traced how the industry got a set-back for lack of a proper market. It is not possible to improve the condition of the villagers until and unless the spirit of true Swadeshi is developed among the masses. Owing to the virulent propaganda in favour of Swadeshi, people think that Bata shoes and Flex shoes are Swadeshi simply because their factories are located in India. We have to imbibe a still deeper meaning of Swadeshi. True Swadeshi implies buying a thing which a neighbour produces. If this idea is imbibed thoroughly, we shall have sufficient markets for our goods. Government ought to take the lead in the matter. All the leather requirements of the Government must be purchased from the *chamars* in

the province. Even though the provincial Government may not be able to impose protective duties on goods that are imported from outside, they should withhold their good-will by taking away their support from such firms as Bata, Cooper Allen and other concerns which are Indian only in name. If the city people and intelligentsia also follow suit, the ignorant villagers will understand that Bata has come not to help them by offering cheap foot-wear, but to ruin them by killing their village *chamars*. Government officials and national workers should, whenever they find an opportunity, bring this fact to the notice of the people.

CHAPTER XV.—PISCICULTURE

(See Part I, Vol. I, Page 25.)

(Submitted by Dr. S. S. Patwardhan.)*

Introductory.—In a poor country like India where the masses are not able to obtain a balanced diet and where milk is not procurable in sufficient quantities it is imperative to supplement a diet based chiefly on rice as a staple food with a chief source of proteins such as fish. This is not difficult on lands bordering the sea where fish can be obtained to an extent for the mere catching; but in an inland province like ours with rivers and tanks of a limited capacity, it becomes incumbent on us to husband our resources in this matter and to increase every possibility of obtaining more supplies by controlled and scientific means. Hence fish-culture, which means rearing of fish, assumes an important role in our province.

Present Condition of the Fishing Industry.—Fishing industry in this province has not attained that eminent position which it occupies in some of the sister provinces. There are very few large fishing areas, although the Nerbudda, the Wainganga, the Mahanadi and their principal tributaries and a few tanks in the Raipur, Bhandara and Nagpur districts provide fish which is usually consumed locally but for that caught in the Bhandara and Jubbulpore districts, from where it is sent to Nagpur and Bombay markets. Many of the larger species of the fresh water fishes like 'Mahaseer', 'Rohu', 'Wal-lago', Singhala 'Bam', 'Marrel', etc., are available. The market rate varies from annas four to annas eight per seer. Fishing season begins in November or December and continues up to May or June. Netting, trapping and draining off water are the usual modes of catching fish, although cases of poisoning fish are not infrequent in the Chanda district and Berar. Introduction of new kinds of fish in the provincial rivers or tanks has not been reported but transfer of fry from local streams into small private tanks is done in the Nagpur, Jubbulpore, Bhandara and Chhattisgarh districts. Where local export is possible, it is done by keeping the fish in wet weeds or cold water, rarely by salting or under cold-storage. Smoking and drying of fish, especially of the smaller varieties, are frequently practised in

order to preserve them for use at a later date.

"*Dhimars*", "*Kahars*", "*Kewats*" and other allied castes follow fishing as an occupation but very often they are engaged in subsidiary callings, as the income from fishing alone is insufficient to support them.

Breeding Habits of Fishes.—As the methods adopted to increase the fish supply are directly related to the breeding habits, of fishes, a brief description of these would not be out of place. During the floods in the early part of the monsoon, many fishes migrate from deep to shallow waters by ascending rivulets and streams which join big rivers and tanks. This ascent of the fishes into shallow waters is attended with the laying of eggs which usually takes place on the beds but in certain cases it may also be on the ground, sand, weeds or even on the surface of the water. The males as they pass over the eggs shed milt and the eggs thus fertilized develop into fry under suitable conditions of temperature, pressure, humidity, aeration, etc. The fry, as also the eggs, have to escape through heavy odds. Besides the uncertain physical and chemical conditions mentioned above there are biotic factors like the swimming and wading birds, frogs and piscivorous fishes ready to devour any spawn or fry which they come across. The fry which survives determines the fish population and consequently the fish supply of a particular locality.

Usual Methods Adopted to Increase the Fish Supply and their Dependence Upon Geographical Conditions.—The usual methods advocated for increasing the fish supply consists in the introduction of certain regulations, e.g., (a) declaring closed seasons for fishing so that breeding fish may not be destroyed and ultimate production of fry may be greater, (b) restricting the size of the mesh of the nets so that fry may escape and grow or (c) prohibiting the draining of streams or rivulets to catch fishes, as the smaller fry is left high and dry.

Much stress cannot be laid upon the usefulness of these measures which may have been attended with a certain amount of success in other provinces, as conditions in other provinces with a long coast line or with large rivers flowing all the year round, with a perpetual supply of water at the source, bear little comparison with those prevailing in this province. Rivers in this province are no doubt full of water in the rainy season but with a few exceptions, they get either dried up in the summer or reduced to rivulets punctuated with deep pits where fishes may continue to live. The case of the numerous ponds and the tanks scattered all over the province especially in the Northern and Southern parts is still worse, for many of them invariably dry up soon after the rains, though a few may retain a little water in winter and fewer still in summer. The mortality of the fish and fry under these unfavourable conditions may well be imagined. The irrigation reservoirs and the larger lakes in the province, however, hold out better prospects of improving the fish supply by the introduction of these

methods. Already some of these reservoirs like the Khindsi tank in the Ramtek tahsil, provide profitable fishing grounds and if scientifically managed, they are bound to assume greater importance as a source of revenue.

Fish-culture.—The dangers to which the growing fry are exposed have been briefly mentioned above. The object of fish culture is to take care of the fry, so as to carry them successfully through the dangerous period of their lives. The technique of fish-culture may be briefly stated thus. It constitutes rearing of females and males during the breeding season or securing fertilized eggs or collection of spawns whenever possible, transfer of the eggs to specially prepared jars, troughs, or tanks in which aeration, water supply, temperature, food supply and other factors could be controlled to the best advantage of the fry. The fry obtained at the end of a successful fish-culture can be transported to and introduced in the irrigation reservoirs, tanks or rivers where it might grow and breed. Fish culture is thus calculated to increase the supply of fishes already found in the waters. In addition, it can also be useful as a means for the introduction of new game and food fishes of greater economic value. Exotic larvicidal fishes which may be more efficacious than the local species of *Barbus*, *Esomus* and *Basbora* as anti-malarial measures can also be introduced to combat the mosquito nuisance.

Introduction of pisciculture would involve a preliminary survey of the fish fauna and of the fishing industry in the province. Selection of proper kinds of local or exotic fishes which may be adopted for cultural treatment and study of the ecological factors governing their successful life history, both by field observation and experiment in the laboratory will have to be done. Unless the whole plan is based upon the scientific principles underlying the fishing industry, it is not possible to obtain results of far reaching consequence.

Complementary factors governing the success of the scheme.—Economic and financial success of the scheme would depend upon several complementary factors. Improved methods of preparation and handling of the fish for transport, e.g., removal of the entrails, cold storage, salting, drying, smoking, etc., coupled with a scientific marketing system, would no doubt go a long way in improving the industry. Perhaps the most important factor would be the provision of a wider market for increased production. It may perhaps be necessary to have an intensive propaganda in favour of eating fish. This is very essential not only for the economic success of the scheme but also for the improvement of the general health of the masses. It is hardly necessary to point out that the diet of an average Indian is not only insufficient but it is also deficient in the essential food factors like proteins, fats and vitamins. If fish could be introduced in the diet this would go a long way in restoring the balance.

CHAPTER XVI.—POULTRY FARMING

(See Part I, Vol. I, Page 26.)

(Submitted by the Extra-Assistant Director Animal Husbandry, through the Director of Agriculture, Central Provinces and Berar.)

Poultry Farming is one of the few cheap and remunerative cottage industries which can be taken up by each and every man both in rural and urban areas.

The industry of poultry farming is not followed on any intensive scale or on improved business lines, but is followed extensively by a number of people mostly Muslims, Christians, low caste Hindus and tribal classes both for home consumption and for the market. Those residing in towns or in the neighbourhood of market places carry on business mostly in eggs, and rarely in chickens, for table purposes. The tribal class of people living in the interior far away from market places carry on this industry for selling birds for table purposes.

In a country where the diet is very poor and the quantity of milk available is next to nothing, eggs form a very substantial addition to the diet. Villagers should be encouraged to produce and use them themselves selling only that surplus which they cannot utilize.

Want of good marketing facilities and caste or religious prejudices are the two main causes that hinder the development of this industry in this province. There is an increase in demand for eggs and that is very encouraging for the development of this industry which has a very good future.

The estimated number of hens including pullets in Central Provinces and Berar, excluding fourteen states, is about two millions. The greater number of fowls are found in hilly and jungly tracts and comparatively few in the plains. In jungly tracts, the poultry are kept for hatching chickens for table purposes. Very few people in the interior of the jungle use eggs as their food instead they use birds. The estimated annual production of eggs is about 106 million which works out to 53 eggs as an annual output by one hen.

In addition to this local production, a good number of eggs is imported from outside the province to meet the increased demand. The import generally takes place from the United Provinces and Calcutta.

The export trade in eggs and poultry birds is not much from this province. A small quantity of eggs is exported from Nimar to supply the demand of the military station at Mhow in Central India.

It will thus be seen that there is a good demand for poultry products, especially eggs for food purposes, and with the growth of population and development of industries the demand will always be on the increase.

To meet this increased demand, encouragement must be given to develop this industry and improvement in local poultry birds must be effected. The quickest and most economical way to bring this about is to encourage the cultivators and others residing in village to keep a few poultry birds of local

breed and improve them by grading with improved cockerels and thus gradually substituting the country uneconomical fowl by high grade birds of good laying capacity. This substitution could not be done straight away by providing pure-bred cockerels and pullets, as the question of combating various kinds of diseases that affect the pure-bred imported stock must be taken into consideration. It would, therefore, be advisable to work up to the standard gradually taking as a base a local fowl, so that the natural immunity of the village fowl to diseases may be transmitted to the grades and there may be no loss of resistance to diseases. The graded fowls will be able to stand up to adverse conditions better than pure-breds introduced into the far-from-ideal conditions, under which they are bred and reared in the villages.

Improved cockerels might be supplied by the Government free of cost from the Government Poultry Farms under certain conditions.

The conditions under which free supply of improved cockerels for breeding purposes is made from the Government Poultry Farms are given below :—

- (1) For each improved cockerel, the number of hens should not be more than 10 or 12.
- (2) The hens and cockerels should be housed and fed properly. Precautions should be taken to protect them from the attacks of wild animals and other enemies.
- (3) Proper treatment should be given to sick birds.
- (4) No other cockerels except the ones supplied by the Animal Husbandry Section should be kept in the flock.
- (5) At least 50 chickens should be hatched every year from the eggs laid by the flock of hens headed by each improved cockerel.
- (6) Selection in the chickens so hatched should be made and only strong ones retained for further propagation.
- (7) Male chickens produced should be eliminated before they attain the age of six months.
- (8) The cockerels must be replaced or changed every year from one flock to another. No cockerel in one flock should be kept for more than one year to avoid in-breeding.
- (9) The flock of hens, chickens and cockerels should be kept open for inspection by the staff of the Veterinary Department, whenever they visit the place.
- (10) The same rule applies to the housing, feeding and watering arrangements of the birds. The expert advice of the staff of the Veterinary Department should be sought in all matters concerning the above.
- (11) Applications for the supply of improved types of cockerels be made to the local Veterinary Officers who will forward them with their recommendations to the Live-stock Officer, Nagpur, for considerations and compliances. The cockerels will be issued free of cost

ex-farm delivery. Arrangements to remove them from the farms will have to be made by the party requiring cockerels.*

[* Note—It is hoped that in administering these rules the department will keep before it the means of the Villagers to fulfil these requirements. Many of them can be made exacting and vexatious in practice and the formalities may be very intricate for the unsophisticated. J. C. K.].

CHAPTER XVII.—THE DAIRY INDUSTRY

(See Part I, Vol. I, Page 26.)

(Submitted by Sjt. S. M. Parnekar, the Ashram Gosala, Segaon, Wardha, C. P.)

[A few extracts and appendices from the Note on this subject submitted by the Extra-Assistant Director, Animal Husbandry, have been incorporated in this note instead of publishing two notes containing almost the same information. J. C. K.].

Of the many factors that go to accelerate the growing poverty of our rural population, the present state of animal husbandry is one that claims serious attention. Ours is decidedly an agricultural province. More than ninety per cent. of the people depend upon agriculture for their maintenance. Cattle can be said to be the backbone of our rural life and on account of the gradual weaning of cow-keeping from crop growing, our villages are going out of a balanced economy.

In the rural areas, cattle are mainly maintained for work, the small amount of milk they yield and for manurial purposes.

The problem of the supply of pure and clean milk and its products in our province has been found to be very difficult and perplexing. There is no single problem in the realm of modern sanitation and hygiene that is so complex, so involved, so intricate and so vexatious. This may be ascribed to various factors such as climatic influences, peculiar customs and habits of our people, illiteracy and ignorance of our farmers and milk vendors, and the lack of proper sanitary and legislative control.

There are several reasons why we have a dairy problem :

- (1) Milk and milk products ought to be an almost universal article of human food.
- (2) Milk is likely to convey diseases directly by pathogenic microbes when it is polluted or to cause it indirectly when it is adulterated.
- (3) Milk is an essential article of diet during infancy and early childhood.
- (4) It is a perfect food not only for the infants but also for the bacteria which grow abundantly on it.
- (5) It is quite impossible to obtain milk or ghee which has been handled with scrupulous care and cleanliness.
- (6) In this climate milk and butter decompose quickly and hence are likely to become dangerous to health.

In our province, of all the domestic animals cattle are the most important. From

an agricultural point of view, our province would appear to be essentially a crop growing one. Our live-stock industry, though in a disorganized state at present, can be converted into a valuable asset when developed on organized and scientific lines.

The number of cattle (bulls, bullocks, cows, buffaloes, and young stock) in our province amounts to about 123 lakhs. It works out to be about nine per cent. of the whole cattle population of India.

The number of cattle per hundred acres of sown area comes to about 56 while it is 89 for every hundred of human population. Such figures for the various British provinces and for the whole of British India as are available are given below in a tabular form:—

	Number of cattle	
	Per 100 acres of sown area	Per 100 of population
Assam	100 II	69 II
Bengal	108 I	52 VIII
Bihar and Orissa	88 IV	57 VI
Bombay	38 IX	60 V
Central Provinces and Berar.	56 VII	89 I
Madras	75 V	53 VII
North-West Frontier Province.	50 VIII	44 IX
Punjab	60 VI	67 III
United Provinces	91 III	67 IV

[The Hindu, 19th August 1937.]

From a study of the figures given in the above table, it would be seen that this province stands seventh in possessing the number of bovine cattle per 100 acres of sown area and stands first in possessing the number of bovine cattle per 100 of population. In the former case, though its number stands seventh it is self-contained while in the latter case though it stands first it is not capable of producing enough milk. From this it is very clear that what is needed is an improvement in the quality of cattle and not in their number.

The total number of cattle in a particular area depends on the availability of extensive grazing and grass-land and forest areas. In that respect the Central Provinces and Berar

stands third, while Assam and Sind stand first and second, respectively.

The following table gives the estimated area of grazing land in each province per 100 acres of net sown area in 1924-25:—

	Acres
1. Assam	242
2. Bengal	33
3. Bihar and Orissa	56
4. Bombay	33
5. Sind	195
6. Central Provinces and Berar	107
7. Madras	79
8. Punjab	62
9. United Provinces	52

[Report of Royal Commission on Agriculture in India, page 181.]

In this province we have 12,346,000 heads of cattle (bovine), 1,578,000 ploughs and 1,078,000 carts. The details of the cattle are as follows:—

Bulls and bullocks	4,101,015
Cows	3,262,920
Buffaloes	509,054
She-buffaloes	7,92,814
Young stock	3,681,176
Total	12,346,979

In our province, we have 32 lakhs of breeding cows above three years of age, used for milk production, and eight lakhs of she-buffaloes of the same type. The average lactation yield per year for a cow may be taken to be five hundred pounds, while in the case of a she-buffalo it comes to seven hundred pounds. So the total milk production (in thousand maunds) will come to 19,745 for cows and 7,221 for the she-buffaloes, i.e., 22,966 thousand maunds in all. If we take a round figure of Rs. 4 as the price of a maund of milk, we will be producing 10,78,64,000 (ten crores of) rupees.

Besides, to maintain soil fertility it is necessary to keep live-stock on farms on an extensive scale and that is why mixed farming is advocated nowadays by all prominent authorities. The constant growing of cotton and other grain crops depletes the soil of its fertility. The yields of crops on farms where dairy cattle form an important part of the farming enterprise have not only been maintained but frequently increased, as will be seen from the following table:—

Serial No.	Year	Fodder in maunds	Grain in maunds	Remarks
1	1932-33	12,595	219	The area under the crops were uniform throughout. On account of examination and inoculation of work stock by the Veterinary Officer proper and timely cultivation could not be given to grain crops and therefore, the yield is less.
2	1933-34	12,694	506	
3	1934-35	18,028	350	
4	1935-36	15,143	529	
5	1936-37	18,272	634	
6	1937-38	19,024	433	
7	1938-39	19,473	610	

[From the Annual Report of the Telankhery Dairy-Farm for 1938-39].

The above figures for the total value (*viz.*, ten crores of rupees) of milk and for the increase in the yield of crops will show the great importance of the dairy industry in our economic life, and the vast scope for improvement in our province.

A visit to any of our villages and an enquiry there will disclose the large number of working bullocks we import for our farm work from the adjoining tracts like the Nizam's Dominions and Central India States, etc. Looking to the enormous breeding facilities we have in our province, we should be ashamed to allow the drain of so much provincial wealth. I do not see why our province should not be an exporting province rather than an importing one in this line.

Milk and Milk Products.—Their Production and Consumption with reference to their Dietetic Value :

The actual data of milk production and consumption in this province are not available but very recently a rapid survey of the production and consumption of milk and also its products in 53 villages was undertaken, the results and conclusions of which will be dealt with later. It is always stated that, throughout India as a general rule, the supply of fresh milk in villages is defective. In Central Provinces, the supply is estimated at less than 3 oz. or $7\frac{1}{2}$ tolas per head per day or $6\frac{1}{2}$ gallons or $32\frac{1}{2}$ seers per head per annum. It is also found that the consumption of milk and its products is markedly lower in urban than in rural areas. An enquiry very recently conducted in 53 villages, having 1,050 holdings, selected at random in various tracts of this province, reveals that a cow on an average produces 25 oz. of milk per day and a buffalo-cow produces 85 oz. The estimate yields per lactation for a cow is 476 lb. in 288 days and for a buffalo-cow it is 1,446 lb. in 305 days. The average dry period both for the cow and the buffalo is 348 days.

The consumption of milk and its products in the area surveyed, when worked out, is as follows :—

Out of 70 oz. of milk produced per holding, 2.6 oz. are consumed by an adult or child and 1.2 oz. by an infant. The average consumption of fluid milk per capita is 2.5 oz. only. These figures of consumption generally agree with those given in the Report of the Royal Commission on Agriculture. Dr. Wright, in his report on the development of cattle and dairy industries in India, quotes the figures of daily production and consumption per head per day in Central Provinces at 6.1 oz. and 0.8 oz., respectively, which is still very low indeed.

The next step is to determine to what extent this daily per capita consumption ought to be increased in order to meet the minimum requirements of the population. European standards are only of a limited value in this connection, for they are based on the assumption that the population lives on a mixed diet which includes meat and other sources of animal protein. Moreover, such standards are based on the needs of the body in temperate zones. In Central Provinces, the climate is tropical and most of the population subsists on a vegetarian diet derived from a very limited variety of food

stuffs. Milk is in fact frequently the only available source of first class protein, while it has also to supply a considerable proportion of the mineral and vitamin requirements of the diet.

In view of the special importance of milk as the sole source of "first class" protein, the quantity needed in the average Indian dietary can best be calculated on the basis of protein requirements. A recent Indian publication puts the requirement at 65 grams of total protein of which about one quarter should be of animal origin. Using this standard, the calculation of milk requirement would be—

	European standard	Indian standard
	grams	grams
Daily requirement of first class protein per head.	37	16
Quantity of milk needed to supply this quantity of protein.	1,000	340
<i>or</i>		
	oz.	oz.
Daily intake of	35	15

It will be seen that the standard European requirement coincides closely with the actual consumption in the self-supporting countries shown in Table I of Dr. Wright's Report (Appendix). Although the standard of Indian requirement is very much lower, it is still more than double the quantity of milk at present available in the province, namely, 6.1 oz. per head. Moreover the Indian requirement is based on an admittedly low standard. "This scale", it is stated, falls short of the ideal as defined by modern physiologists and may often with advantage be exceeded. It is nevertheless excessive, as far as India and especially this province is concerned in the sense that economic circumstances and dietary in the sense that economic circumstances and dietary habits of the people prevent its attainment. If the standard were to be set at a level more nearly akin to that aimed at in progressive European countries, the present output of milk in the province would have to be increased even sixfold.

In the article "India's Food Problem" the Economist, dated the 26th December 1936, writes that an attempt was made to estimate the adequacy of India's net food supply for the nutrition of her population. It was found that whereas the total energy available was adequate and the amount of carbohydrate was actually in excess, the quantities of fat and of "first class" protein were markedly deficient. The author further writes that "the most important task confronting the social reformer who seeks to make India's food supply satisfy decent standards of nutrition is to increase milk production in India vastly. The increase in milk supply will not only increase the quantity of first class protein available per head but will also increase the element of fat in the diet of a good number of people which at present is largely supplied by vegetable oils and fats derived from it."

While the argument for increasing milk consumption has so far been based on the requirement of first class protein, the value of milk as a protective food must not be lost sight of. With a vegetarian diet derived from a very limited variety of food stuffs, there is a serious risk of a deficiency in both minerals and vitamins. An increase in the consumption of milk would go far towards correcting the present deficiency of protective elements in the dietary, particularly in so far as growing children are concerned and its price also must be within the purchasing power of the majority of the population.

Topographical distribution of dairy products.—This province can safely be divided into two distinct tracts viz., (i) plains and (ii) hills. The plains constitute thickly populated cultivable areas and hills constitute mountainous tract full of forest growth. The milk and other milk-products of everyday use are produced in plains and readily sold. The production of ghee is principally carried out in hilly tracts where climate and other economic factors are favourable. The production of fluid milk for domestic consumption, when other factors such as proximity to large groups of consumers, good roads and high prices of the product and good weather conditions are favourable, will certainly serve to foster dairying in plains and will take precedence over all other dairy products.

There are several aspects of the milk problem which demand a thorough investigation on the part of the scientist, the practical sanitarian, the economist, the dairy expert, the sociologist and the legislator.

The sanitary aspect involves the study of the various sources of milk supply, the manner in which it is collected, distributed, and manufactured, the condition of cattle, e.g., their housing, feeding, breeding, diseases, etc., that affect the quality as well as the quantity of the milk and the milk products.

2. Chemical and bacterial examination of the supply with a view to find out the composition of various products, the kind and extent of their adulteration and pollution, if any.

3. The relation of milk to public health, and

4. The practical sanitary measures such as the inspection of production and distribution centres which can be readily applied and are most suitable to the existing conditions.

The social aspect.—The intricate caste system, the religious beliefs, the social customs of the people, the illiteracy of the masses, the domestic habits of the people, etc. are all important factors and have some bearing on our problem. The customs and habits of our people who deal in milk are most unfavourable to the production of clean and wholesome milk. The method of milking, transporting, and processing are greatly objectionable from the sanitary point of view. Education, in the broad sense of the term, is essential to overcome ignorance, prejudice and indifference. This alone will give the people a keen sense of appreciation

of public sanitation and personal hygiene. The milk problem involves a systematic and sympathetic study of the various conditions of social and domestic life in the town as well as in the villages and of devising ways and means for the removal of unfavourable conditions by the spread of education.

Milk legislation.—The legal aspect of this problem is quite a new one in this province. There appears to be no control of any sort. The importance of licences is not yet well understood and hence the production of clean, hygienic and unadulterated milk and milk products do not pay when the competition is with an unscrupulous producer and an equally ignorant consumer. The various standards, chemical as well as bacteriological should be fixed and unadulterated and clean products guaranteed. Some form of legislation is no doubt necessary for an effective sanitary control, but if that renders the economic problem more complex by causing a further rise in the existing high prices of milk, thereby making it practically impossible for the masses to obtain it, such legislation may be open to objection. Adequate measures for the production and supply of milk should precede such legislation. It must be remembered that legislative measures alone will not solve the problem. Many other factors have to be taken into consideration before passing any laws.

The Economic Aspect.—The improvement of the dairy industry is chiefly an economic problem in many respects. It is of the greatest importance in our province where there is widespread poverty among the people and where the dairy industry is in a very bad condition. It is very difficult to get pure milk or ghee at a reasonable price in any of our towns. It indicates that there is something radically wrong in its method of production or distribution. The economic aspect of milk also involves the question of scientific breeding and feeding, sanitary housing, proper tending of milch cattle, the provision of cheap fodder, the supply of plentiful and clean water, suitable and rapid modern methods of transport, the establishment of modern cattle sheds and modern dairies on co-operative basis, etc. Unless there is a vast improvement in the present method of both production and distribution of milk and its products, the price is likely to remain high. It is quite impossible to introduce any control so long as the production does not become cheaper. This is one of the vital factors in solving the problem, and as I am mostly interested as a dairyman in the economic production and distribution of milk and its products, I will confine myself to this aspect of the subject.

The dairy industry in our rural areas is admittedly in the most unsatisfactory condition. This is largely due to the fact that the indigenous breed of milch cattle, particularly the cow, is a very poor milker. With the exception of a very few Government cattle-breeding centres and some private farms, no systematic attempt seems to have been made regarding scientific breeding. From numerous inquiries made, it appears that our milch cattle show a deterioration in quality and the number of good animals is

rapidly diminishing. This may be ascribed to the following causes:—

1. Lack of scientific breeding.
2. Defective feeding and management.
3. Neglect in the proper rearing of calves.
4. Supplying the large towns with thousands of milch cattle which eventually fall into the hand of the butcher.
5. Grinding poverty of the masses.
6. The lack of due sympathy for their cattle and of adequate measures to improve them.

Lack of scientific breeding.—We have in our province only one breed of cows—the *Gaolao*—and one of she-buffaloes—the Nagpuri or Waradi—worth mentioning. *Gaolao* cows are generally found in the northern parts of the Wardha district at the foot of the Satpuras, Saunsar tahsil, Kurai Pargana, the southern portion of the Seoni tahsil, and Baihar tahsil. The average yield of milk from a good cow works out to approximately ten to fifteen pounds a day with a fat content of 4.5 to 5.6 per cent. The animals are of a fair size and will turn out to be good dual-purpose animals suited to the needs of the locality.

The Nagpuri buffalo is generally found in Berar and in parts of Marathi Central Provinces. The average milk yield of a good she-buffalo may be taken to be approximately 10 to 15 lb. with a fat percentage varying from 7 to 9, and it is by far the most sought-for animal in the locality for *ghee* production. In the rest of the province, the animals are of a non-descript breed resembling a degenerated type found in the adjoining areas.

We had in the past some good forest areas in various parts whence a fair amount of fodder was available. We also grew good amount of fodder yielding crops. The result of this was that the farmers maintained as many animals as they could. However, with the increase in the pressure on land and the introduction of money crops that do not yield any fodder, the animals began to be under-fed. They turned out less work and so more animals were maintained which accelerated their deterioration. And now a vicious circle is in operation. At present, rich as well as well-to-do cultivators instead of themselves raising better type of bullocks prefer to purchase them from the adjoining tracts. Qualitative selection has no place in their breeding programme. From the cows at the Segaoon Goshalas and others of the locality, it is apparent that there is a vast scope for selective breeding of our cows. In some localities our Government is trying to introduce some other breeds like the Hissar and the Montgomery. I have serious doubts as to their success. It is not possible to say how far they will be suited to the local conditions. It must be borne in mind that we want a dual-purpose type of animal that could be maintained by an average farmer in a village. In Berar we may try the introduction of the Nimadi or the *Khargone*; in the central parts, of the *Gaolao*s; and in the districts adjoining the Malwa tracts, of the *Malvi*. Importance of pure-bred bulls cannot be over-emphasised. At present very little attention is being paid

to the selection of bulls. Any scrub animals is being allowed to serve the cows. Pure-bred bulls are to be introduced and scrubs to be castrated.

In our province we have 32 lakhs of breeding cows, and for them we would need 50 thousand breeding bulls. In the year 1937-38, we had only 132 approved bulls, and in the same year the Government granted the use of only 36 bulls. From 32 lakhs of cows, we expect at least 14 lakhs of male calves every year, and all these will not be fit for breeding purposes. Such of them as are unfit should be castrated. But during 1937-38, only 161, 534 castrations were performed. This works out to be 2.2 per cent. of the total number of bulls in the province. It is, therefore, highly necessary that the department must issue more pedigree bulls and castrate the scrub ones. This could be done by subsidising the breeding of good bulls in suitable localities and by enacting the necessary legislation to castrate the scrub ones.

The need for economically increasing the milk of our animals is of utmost importance. There is probably no single measure which could do more towards achieving this end than the improvement in the milk yield per head of cattle. The average estimated yield of milk from a cow is about 500 lb. a year and that from she-buffalo about 700 lb. This is very low in comparison with the milk yields recorded at some other centres in India. From a *Sahival* cow at Ferozepore, 7,000 lb. of milk was obtained in a year. Even the figures at Segaoon show that it is quite possible to increase the milk yield of our cows to 2,500 lb. with but little extra care. Any increase in the milk yield per head of milch cattle would spread the maintenance cost over a large output of milk with a consequent lowering of the fodder bill. The higher this yield is, the lower are the costs of labour, depreciation and fodder.

On the whole, the cattle-breeding policy of our province must be founded upon the requirements of an ordinary cultivator. He needs a cow that will give a good draught bullock and a good quantity of milk. Some of our indigenous cattle promise to be good breeders in this respect, but I do not know of any place, either Government or private, where this has been taken in hand earnestly. Our results at Segaoon are encouraging but not conclusive at this stage.

Cow or buffalo.—Whether to use the cow or buffalo is an important question that needs careful study at this stage. It is now almost an established fact that in a poor country like India where the cattle-feed problem is getting more and more acute every day we cannot afford to maintain two sets of animals, one for milk and another for bullocks, or waste half the progeny born—as it is not found economic to rear it, the female calf of the cow and the male calf of the buffalo. Experience in various parts of India has shown that a good cow is decidedly more economic for milk production than a good buffalo. But the economic life of an average cow in Central Provinces falls below that of an average she-buffalo. Experience gained by Military Dairies has also proved that there is ample scope for raising the milk production of cows, while, in the case of a she-buffalo, it is

very limited. It may be possible to evolve a dual-purpose cow, whereas a similar proposition seems an impossibility in the case of the she-buffalo. Even in tracts like Chhattisgarh, we can replace the male buffalo on the farm. It would, however, be not possible to introduce buffalo draught animals in other tracts. At present when the prices of fodder are low, the she-buffalo can compare favourably with the cow in butter production. This is the main reason why the villager prefers the she-buffalo to the cow. But with the increase in the price of fodder and with the growing need for stall-feeding the animals on raised foddere, we shall find that the cow will excel the she-buffalo in the aggregate, i.e., in the production of butter and that of a draught animal.

The specialized needs of cattle of various tracts in this province are as follows:—

Rural Berar and Western Circle—

- (i) Active, quick-moving bullocks capable of dealing with a large acreage of light cultivation;
- (ii) Greater size and weight to provide for the general tendency to deeper primary cultivation;
- (iii) Better milking cows to provide more milk for human consumption and for calves, making her worth a better care.

Rural North—

- (i) Capacity for heavy and deeper cultivation; strength and ability to pull is more essential than speed;
- (ii) Milk, if procurable.

Rural Southern Circle, Nagpur Division, and parts of Plateau—

- (i) Quick-moving with some increase in body weight;
- (ii) Milk, if procurable.

Chhattisgarh—

A small, hardy, well-muscled male suited to the condition of the particular climate and food supplies.

Urban and Semi-urban areas in any of above parts of the province—

- (i) Higher milking cows;
- (ii) Working males, type not so important; but tending if possible to the particular rural needs in its own tract, as providing a better selling animal.

Taking into consideration all these requirements in various parts of the province, following breeds of cattle are recommended:—

For Berar, a medium type of *Hariana* cattle is more suited than any other type, as this breed is well-known for its purity of blood and possesses both the qualities, viz., high milk yield in cows and quick movement in bullocks.

For Rural North, *Malvi* breed, now of some years' standing at Powerkheda Farm, suits the main need of this tract, i.e., powerful but slower draught ability.

The *Montgomery* bullock by itself will not be very effective except in urban areas. A cross-breed between *Malvi* and *Montgomery* may, however, in time provide the breeders

with an ideal stock for that area, i.e., a dual-purpose combination of efficient heavy draught and milk.

Southern Circle and Nagpur Division and parts of Plateau—

The well-known indigenous breed—*Gaolao*—provides milk and working requirements of that tract. A combination of a cross between local cattle of a non-descript type and a *Montgomery* bull would, if established, find a suitable market. In addition to this, the medium type of *Hariana* breed will be of immense use.

In Chhattisgarh the problem is difficult. There is no use attempting to build a big breed by grading Chhattisgarhi cows with either a *Malvi* or a *Montgomery* bull. The climate and food supplies are all against the survival of such a breed. The only resource is to work with Chhattisgarhi material, with a definite programme of breeding, by medium type of *Malvi* bulls.

For urban areas throughout the province, the *Montgomery* is indisputably the best breed to 'push'. It may be a mistake to do so in rural Central Provinces and Berar, but it is not so when milk becomes the chief source of profit. This herd is being developed at Telankhery Dairy-Farm in Nagpur which has succeeded in developing a medium type of heavy milking animals suited for both milk and draught.

Feeding of Cattle.—There is no doubt that most of our cattle are greatly underfed. This is apparent from a casual inspection of the village stock which lacks the sleekness and the bloom of the well-fed cattle and not infrequently have an emaciated and ill-nourished look, and also from the slow rate of growth and maturity and long dry periods of cows which are kept under conditions normally prevailing in villages. It is quite usual for a cow to get her first calf at 4 or 5 years of age with calving intervals up to 475 days. That this is not a hereditary shortcoming is proved by the early attainment of maturity and the results of controlled breeding experiments at dairy-farms where the feeding and management are satisfactory. It may be stated that the inadequate nutrition is an important factor in accounting for the low yield of milk from the cow. If the production is to be increased, the provision of a very much larger food supply is essential. This involves many problems like those of the grazing areas, forest contracts, growing of fodder and fodder-yielding crops, conservation and preservation of foddere and concentrates.

The Common Grazing Areas.—Practically every village has some waste land called *nistar* land which is set apart for cattle grazing. The area which is classified as "scrub jungles and grass", which is about 42 lakhs of acres in the Central Provinces and 55 lakhs in Berar, is very little when we consider the quality of the land and the large demand made on it by the cattle seeking fodder. Again, so far as our province is concerned, it is estimated that for each 100 acres of net sown area, there are 107 acres of uncultivated land available for grazing to which if we add the area of fallow lands we shall find that in that much area we have to

maintain 47 heads of bovine cattle and a large number of goats, horses, etc., which means starvation, complete or partial.

Having regard to the very poor quality of the grazing lands available and to the fact that it fails to afford adequate maintenance at the season of the year when fodder grown on cultivated land is scarce, we find that the present number of cattle is a very heavy stock to carry. If the cattle are to yield a profit, the bullocks would be required to be fully employed, the cows to be of a very heavy milking strain, and the manure to be carefully conserved and returned to the land.

Due to the peculiar position we are in and in view of the change in our international outlook, it will no longer be economical for us to set apart the better lands for common village grazing. Even grazing lands that are not well looked after slowly deteriorate and ultimately become a waste. The average farmer looks to the number of animals he keeps and not to their quality. This outlook cannot be changed by merely allowing more common grazing areas. I think the grazing areas should be the property of individuals who have duly paid for them. The owner will then try to improve and make the best use of them.

The Forest Contracts.—We have a number of forest areas scattered throughout the major portion of our province. Cattle are allowed to graze in these areas on payment of small dues. We have some professional breeders, like the *Gwalas* and the *Vanzaris*, who take to the tending of cattle in such areas. They live on the sales of young stock and of the ghee produced. These breeders maintain herds, large in number but not of good or superior breed. These areas are also over-stocked. In order to realize more money, the State grants licences for the grazing of the largest number of animals with the result that the whole stock is under-fed. There is no provision for cutting grass in season, or reserving any areas for bad days. This lack of foresight tells upon the growth of the cattle. There is a section of opinion which advocates the free opening of the areas for cattle grazing. But I do not think it will help the breeder. In each area, the Government should allow only that number which could be well maintained. In this way, though the number may be reduced, the quality is bound to improve. The Government should provide adequate facilities for drinking water for cattle in these areas. Rotational grazing will greatly improve the yield and the quality of the grass produced.

The Fodder and the Fodder-Yielding Crops.—Agricultural statistics show that during the year 1937, we had in our province only 5 lakhs of acres under fodder crops which is very little in comparison with the large number of animals we have to maintain. Again, the average output of fodder crops is very low. Observations show that there is considerable scope for improvement in this direction. One reason why the ordinary farmer does not take to fodder-growing is that the milching capacity of our animals is very low. It does not pay the farmer to grow fodder. Introduction of silo-making in dry areas and the growing of

irrigated crops like Berseem, Lucernes, Guinea grass, etc., will be found to be very useful for this purpose. In the general cropping system of the average farmer, we find many crops which yield a fair amount of fodder like the *jowar*, rice, millets, wheat, etc. But the fodder part of the crop is not well taken care of. In tracts where cotton and sugarcane are the money crops, the fodder problem becomes acute, as the farmer goes in for ready money only. The cropping scheme has to be so balanced that the farmer should have enough to feed himself and the cattle. The losses due to the careless handling and the wrong way of feeding have to be checked. My experience at Se-gaon is that we lose nearly 30 per cent of the *Jowar* fodder simply because it is not chaffed. Then, again, the stage at which the crop is cut and the method by which it is stored, also deserve careful attention.

We can have a fair amount of cattle-food 'concentrates' in the form of cotton seeds, oil cakes, *chunis*, brans, etc. On account of the lack of enterprising concerns, however, we have to export a lot of them. We have a very large quantity of cotton seeds available, yet we have no crushing plant to get the oil from them. In some villages *dal* is made by splitting the grain seeds and the resulting *chunis* are given to the cattle; but gradually this industry as well as that of oil-pressing is being concentrated in the towns, depriving the village of the *chunis* and the oil-cake. A revival of these industries in our villages will bring about improvement in cattle-breeding.

The Management of Cattle.—In our province, where we find great variations in the climate at different times of the year, the management of cattle, specially when higher milk production and better physique is aimed at, becomes an important factor. With intense milk production there is bound to be a constant rivalry between constitution and economic performance. It has been found by experience that the maximum limit of milk production is affected by diurnal and seasonal variations in temperature, the humidity and the extent of protection given to the animals against heat and rain. Any breeding scheme must take the environmental conditions into consideration. If the cattle of the rice tract are to be improved by better sizes, we must make provision for the introduction of better feed and better management. Early maturity and shortening of dry period are now receiving attention in many places. If the maintenance of the vigour and constitution is not attended to immediately, it is bound to have an unwholesome effect on the future of the cattle stock.

The nourishment and care of young stock deserves special attention, because it is only at this stage that the body is built up; but we find it is a general practice in our villages to under-feed the young stock. It is particularly so with the female calves of the cow and the male calves of the buffalo and constitutes a grave evil. And in urban areas, as it is unprofitable to rear a calf, the *Gwala* neglects it completely. This means a great loss to the country of a large number of male and female calves.

Cattle diseases.—With such a big animal population as 123 lakhs and under the trying conditions of our province, it is but natural that we must have a large number of cases requiring veterinary assistance. From the reports of 1937-38 we gather that there were only 104 dispensaries in the province and that the number of veterinary assistant surgeons including 10 inspectors was 161. This works out to one veterinary doctor for every 76,683 animals in the province and one dispensary for over 118,711 heads of cattle. The government spends annually four lakhs of rupees on veterinary aid and about 80 thousand on animal husbandry section. This works to one rupee for more than every 30 heads of cattle in a year. And further when we realize the fact that most of this money goes towards the high salaries of the superior staff, we see how inadequate is the help given to our cattle. What is needed at this stage is that the District Veterinary Assistant should be strongly reinforced with a trained band of veterinary compounders stationed at different places. During the same year we find that 223,000 cases were treated in these institutions, which works out to one case to every sixty of the animal population. If more compounders are engaged in the villages, it is certain that more attention will be paid to the animals, and eventually the death-rate, which is very high at present could be reduced.

The slaughter of useful cattle.—Even a casual observation in the breeding tracts of the country will show the number of the 'dalals' exporting the best of the cows to the towns for milk production. The town *Gwala* keeps the cow so long as she gives milk, and when once it is dry he sells it away to the butcher. It means an enormous loss to the country more especially when the further breeding operations in the villages are confined to the rejected stock left with the breeder. This enormity, if allowed to go on unchecked year after year, will lead to still further deterioration in the quality of the cattle. This ought to receive immediate attention of the Government and village workers.

The Economic Condition of the Cattle Keeper.—This has a great bearing on this vital problem. In our province, we have the following three main classes of cattle breeders:—

1. *The Malguzar.*—Every village has some waste land in charge of the Malguzar; he also does some farming; and in some cases, moneylending. He adds to the stock of animals every time with animals which he gets for the money lent or the land revenue to be paid to him. Due to various factors, the *malguzari* is now passing into the hands of *Banias* who have very little interest in the village life except that of getting as much money, in cash or in kind, as they can and hence the breeding of cattle recedes in the background with the malguzars. They have the necessary capital and, if they step in, they can help the industry much.

2. *The Village Cultivator.*—Generally, the farmer keeps some animals for rearing cows and for milk production. The cow in the first place and the she-buffalo in the second place are the favourite animals. There is practically no sale for the milk. Generally

the cow is not milked when with a male calf, the calf being allowed to suckle it; when the calf is a female one the farmer sometimes draws a few tolas of milk for his own use. The milk from the buffalo is turned into *ghee* and sold to the village vendor. In this way, he raises a few animals to get some money for the weekly market. There is a vast scope for co-operative breeding, marketing, controlling of diseases, etc. This side of the industry is wholly neglected. The separation of this industry from general agriculture will greatly retard our progress.

3. *The Forest Cattle Breeder.*—On account of the cheapness of fodder in forest areas, the professional cattle breeders roam about in these places. They keep small herds and live on the sales of cows, calves, and of the *ghee* produced. They are mostly in the hands of *dalals* and moneylenders. Considering the hardships they have to undergo, they are barely able to get their maintenance. Cheap credit and scientific breeding facilities will greatly help this industry.

The Poverty and Illiteracy of the Masses.—On the whole, the villager is debt-ridden and quite illiterate. This makes him always dependent on the village *Bania*. He has no knowledge of the science of animal husbandry and no money to invest. There is a great scope for the village worker in this field and with due care he can educate and raise their credit. Of course, he has to be backed up by the Government and the town people. The Government can do a lot in training such workers. In our province, we have only one College of Agriculture whence only 20 graduates passed out in 1935-36. We have one school at Pawarkheda which turned out only nine students in the same year. We have no institution for training in veterinary or animal husbandry. For want of proper records, we do not know how many of these 29 trained students went to their villages to apply their knowledge to their needs. Short courses on cow keeping and manufacture of milk products should be held in suitable centres to impart instruction to the actual workers. We are running this year such a short course of one and a half months at Segaon.

Milk and Milk Products.—The tendency of the Indian cultivator is to sell as much of his products as possible for cash even at the risk of causing nutritional deficiency in his own diet. Little can be done to check this tendency, as he is repeatedly taught to measure his things in rupees, annas and pies. His dire poverty is also one of the causes. The farmer situated near about the urban areas sells all his milk as whole milk, while the one who is not within an easy distance has to convert it into *ghee*. Milk and milk-products of any sort have practically no place in his dietary. When the milk is sold as such, even his calves are to starve; but when it is turned into *ghee*, the *chhanch*, i.e., butter-milk, is left with him. We are at times painfully confronted with cases of farmers in which even their children are denied milk and its products, as the calves which would in future be used for ploughing have to be maintained on the milk which could, otherwise, have been available to the farmer for

his use or for sale. The animals had to be better fed, as they were the source of income and the importance of nutrition to the children was not thought of. This is the direct result of widespread poverty.

Any scheme to handle this problem should take the following into consideration:—

- (1) Attention should be concentrated on the production of indigenous milk products such as *ghee* and *khova*, and not on that of the western products as butter, cheese, etc.
- (2) Large scale factories have very little scope in our province.
- (3) The development of this industry must be designed to meet the needs of the vast population of small cultivators.
- (4) A village industry system of dairying should prove the most effective form of dairy organization.
- (5) Adequate facilities should be given for the proper grading and marketing of milk and milk products.

The greatest stumbling block to this industry is the lack of marketing facilities for milk. There is no market in the villages for milk as such. The marketing system of *ghee* is not so bad, but the farmer has to sell his products at a loss. With prices as low as Rs. 60 to Rs. 65 per cwt., it will not be possible to make it economically. From 100 lb. of milk we get about 5.25 lb. of *ghee* and thereby realise about three rupees which comes to 33 lb. of milk to a rupee. When we take into consideration the low milk yield of our animals and other difficulties such as the brokers' charges, short weights, etc., we can easily see that he conducts the business only because there is no alternative for him. This is one of the reasons why men who have capital and business foresight do not go in for this type of business; it is worked unremuneratively by the illiterate and poor people.

Our experience at Segaoon of the past year shows that if proper facilities are given, it is practicable to produce milk of good quality in villages. About two years ago, we had to purchase our milk supply from Wardha, but only with a little organization and capital of Rs. 200, we have been able to make available about 150 lb. of cow-milk a day in the locality.

A greater portion of the milk produced in the villages is used in the making of *ghee* in the families of the cultivators or of the cattle breeder. Though the farmer might get more money by selling his milk to a dairy concern, this should not be encouraged as he will be deprived of the by-products—the *chhanchh*—which is an important article of diet. The production of *ghee* by the indigenous method is open to many objections and needs improvement. The loss of butter fat in the butter milk has to be minimised. The flavour or aroma, the texture and the keeping quality of *ghee* need to be improved.

Our experience at Segaoon has shown that best quality *ghee* can be made with less loss and with greater ease by the use of a hand cream-separator and by bringing about some changes in the local churn to facilitate the washing of butter, etc. This could be done on a small co-operative basis in individual villages.

The marketing of *ghee* presents rather a different problem as the producer is frequently not within easy reach of the convenient market at which he should dispose of his produce. Eventually he has to store it for some time and sell it through a middleman. Again, the producer has no means of getting his *ghee* graded and tested for purity. Under such circumstances, there is no incentive to produce a better article.

Any attempt to improve the quality of *ghee* may prove abortive, unless adulteration with cheaper and inferior fats can be effectively checked and an economic price can be guaranteed for the pure *ghee*.

More than ninety-nine per cent of the *ghee* produced in our province is made in small houses. As butter-milk, the by-product of the *ghee*-making industry, fetches no price, it being customary to distribute it *gratis*, the *ghee* maker suffers not an insignificant inherent loss inasmuch as he gets much less for the *ghee* produced from a certain quantity of milk at the prevailing rates than he would otherwise get by selling the same quantity of whole milk.

We find that from every 100 lb. of milk, we produce by the *Deshi* process about 4.75 lb. of *ghee* which fetches about Rs. 2.67, the price of *ghee* being Rs. 63 per cwt., but, if the same *ghee* is produced with the help of a separator, we get 5.25 lb. of *ghee* and 90 lb. of separated milk. The cost of producing *ghee* will be proportionately lower, depending on the remunerative disposal of the separated milk. In our villages, where the consumption of milk and milk products is so low, all the energy we can muster to popularise this important article of diet will be well repaid in the end. For various reasons, we ought not to encourage the making of such products as casein and to turn this valuable food amongst the half-starved people into a dead article. It is quite necessary to try a series of experiments to make the most of this food by manufacturing sweets and other articles of food that will find favour with the village as well as city consumers.

Manufacture of other milk products like *khova*, *chhana*, *dahi*, etc., will be found to be very successful in suitable localities and active research work in this line is very necessary at this stage.

Keeping quality, packing, export and marketing of these perishable articles have not yet claimed the attention of research workers in this line. It is now high time to undertake the necessary investigation, as we cannot afford to wait much longer.

Urban Milk Supply.—The dairy industry in the urban areas of our province is acknowledged to be in a very bad condition and is in need of a thorough organization along modern lines. Some of the principal facts regarding the urban milk problem may be summarised as follows:—

1. Milk is lacking in quality.
2. The milk supplied is inferior from the analytical as well as the bacteriological point of view, it being adulterated as well as contaminated or infected. This has an important bearing on the public health, and particularly with reference to the feeding of infants.

3. Our milch-cattle are very poor milkers and are deteriorating. This is due to several causes, e.g., lack of scientific breeding, want of proper feeding, tending, housing, etc.

4. The milk-trade is mostly in the hands of town *Gwalas* or the village producers who have no knowledge of the principles of economic dairying and who are quite indifferent to the rules of hygiene and sanitation.

5. Part of the milk supply is from the adjoining villages where the ordinary cultivator keeps buffaloes and a few cows, and sells this milk produced under very insanitary conditions, at a high price.

6. The price of the milk sold is already very high and will go higher if the methods of production are not improved and if the producer has to be paid a fair price.

7. There is considerable room for improvement in the sanitary, supervisory and legislative control of milk-trade. At present, little is being done in this line.

The Location of Cattle-sheds in Urban Areas.—On account of the lack of rapid and cheap transport facilities, the *Gwalas* generally cluster on the outskirts of a town with a few animals. They produce and retail their milk under the most uneconomic conditions and have to adulterate it to make both ends meet. Now, as transport facilities are increasing and as it is becoming possible to send milk cheaply to long distances, it would be advantageous to locate the *Gwalas* at some distance from the towns. The advantages in this system are many—

- (1) More economical.
- (2) Possible to raise one's own fodder.
- (3) Grazing and exercise in the fresh air which slightly improves the milk-yield.
- (4) Manure can be utilized for intensive farming.
- (5) More natural and healthy surroundings.
- (6) During epidemics, isolation of cattle is possible and so it is safer.
- (7) Milk is less likely to be contaminated with pathogenic bacteria, dirt and dust.
- (8) The taste of the village milk is better than that of the milk produced in urban areas.
- (9) Scientific breeding can be undertaken.
- (10) Cheaper to maintain dry animals and raise young stock, etc.

The supervising focus will, of course, have to be shifted from the towns to the villages and suburbs. The increased cost of transporting milk will be off-set or made good by the reduction in cost on account of the advantages enumerated above. And so the consensus of opinion of dairy experts is decidedly in favour of keeping milch-cattle in the country, particularly in suburban areas, near a trunk line, within convenient distance from the towns. This, will ultimately be a very economic method of milk production.

As regards the management of cattle, it appears that a milch-animal will give better results in the hands of a careful *Gwala* or a village cultivator who personally looks after the animal than in the case of a large commercial dairy-farm where it is treated as one of the herd. This is also my experience in many places; the man employed in the larger commercial farms, usually takes very little interest in the well-being of the cattle, and being only a hireling is inclined to be careless in his tending. This is specially the case in Central Provinces, where the labour is so illiterate and ill-paid.

Distribution of Milk.—The existing methods of transporting and distributing milk are far from satisfactory and need a considerable amount of improvement. The *Gwala* generally produces and retails his whole milk under very insanitary conditions, which have a great bearing on the general health of the people and the milk business as a whole. It is high time for the State to intervene and help the milkman to organise and most economically handle the situation. In towns, where the temperature is very high, the keeping quality of milk is very low. Suitable methods both for rapid transport and keeping the milk for a long time have to be studied. From the little experience gained at Segaon, we could find that keeping milk hot is cheaper than keeping it cold, especially when our customers do not mind it so much, as some of the Europeans do. The economic side of the methods of transport has to be studied in individual cases. We find various systems in use today such as the head-load, the *Gund* system, the *Kauwor*, the bullock cart, the hand cart, the motor and the railway. Of these methods, the distribution in bottles is found to be the most efficient. I have tried this system at Dhulia, Bombay Presidency, on a small scale and found it to be very attractive to the customers and economical to the producer. The method of selling it loose is found to be very objectionable and cannot satisfy the fastidious customers.

The Processing of Milk with regard to the Keeping Quality.—Since milk is an ideal food for bacteria, as it is also for human beings, bacterial action readily sets in. It has always been a perplexing problem for our housewives, especially during summer days, to prevent milk from turning 'sour'. I do not know how far pasturisation of milk, as done in foreign countries, will be suitable under existing conditions in our towns. But any system of heating the milk above say 75°C. and keeping the milk at this temperature for some time will go a long way to solve the problem. The method of distributing milk as practised by the Calcutta Corporation deserves a study.

Co-operative vs. Private Dairy Concerns.—We need to study this aspect under two heads: (1) the production, and (2) the distribution of milk.

Production.—It has already been stated that if the animals are better looked after, the milk is more economically produced when the business is carried by the owners themselves than when it is carried on by big

concerns with hired labour. But the lack of sufficient capital and the necessary equipment come in the way of the prosperity of the small *Gwalas*. Experience gained at the Telankhedi Co-operative Dairy has now fully shown that co-operative milk production on this line has a great future in most of our towns. The *Gwalas* keeping milch-cattle in the towns should be induced to keep their cattle outside the town; the society should provide cattle-sheds outside the cities, should provide enough water and grazing facilities, should grant them loans for purchasing animals and cattle-food and should give them all the necessary veterinary and medicinal help needed. The milking should be done under supervision; the marketing of milk should be taken away from the individual producer and entrusted to the managing committee of the society; and the breeding policy should be controlled by the society in the interest of the country as a whole.

I doubt greatly the chances of success of private concerns with large capital who could probably take up the town milk-trade and employ experts and competent dairymen and use modern methods for the production and distribution of pure milk. Monopolies in general should be discouraged, and the present milkmen should not be deprived of their hereditary occupation. They must be formed into co-operative societies.

In villages, especially round about urban areas, some farmers take to cow-keeping as a subsidiary occupation. They maintain but few animals and sell their milk either to the middleman who purchases it at their doors, or to the city *Halwai* who uses it for making sweets. This practice is open to many objections. As there is no safeguarding of the interest of the producer, he is at the mercy of the middleman. The customer also does not get the satisfaction he looks for. The retailing of milk is always a difficult item for the producer. The middleman has done more mischief to ruin this trade than any other single factor concerned. The lion's share of the profit goes to him and not to the producer or to the consumer. Co-operative collection of milk and its distribution through a suitable agency under State control will be of great help under the circumstances. Our Segaon experience shows that it is not very difficult to increase the production of milk, if a steady market is available. The methods of collection of milk and its distribution as practised at Calcutta, if introduced in this province, will have a very beneficial effect on the industry in most of the urban areas of Central Provinces.

The Supply of Milk.—Our milch-animals are very unsteady milkers, the demand of the consumers is fluctuating, then there are the seasonal variations and therefore some milk is always left unsold every time. It is very difficult to keep milk fresh for a long time and the dairyman has to solve the surplus milk problem. Turning it into *ghee* is out of question. I do not know how far it will compete with the butter producer in better located areas. The making of milk products, specially of *khawa* and of milk

sweets, should be scientifically studied in various places, particularly from the point of view of lower costs. If the surplus is put to better use the prices of whole milk could be lowered and attention could be paid to the hygienic side.

Instead of its being divided under the various heads such as producer, the middleman, the distributor, and the *halwai*, the urban milk industry should be concentrated in one place on a co-operative basis.

It is for the State (1) to enact rules and regulations for the efficient production and distribution of milk in the interests of the producers as well as the consumers, (2) to supervise and control the sanitary side of the question and to ensure hygienic supply of pure milk, (3) to afford suitable facilities such as grazing, veterinary aid, technical advice, services of bulls, cheap credit, etc., for cheap production and distribution of milk and thereby help this industry.

The success or otherwise of the industry will largely depend upon the number of good quality animals produced and maintained in the villages. And so in any scheme for the betterment of this industry, cattle improvement should have the most important place, and as most of the cattle are found in the villages or come from the villages, the work must begin from the villagers upwards. A scheme on the following lines will go a long way towards the betterment of this industry:—

In every village or group of villages, cattle improvement associations should be started. The associations should study the quality of cattle and cattle-breeding conditions in that area. The number of animals maintained should be in accordance with the needs of the locality. It is the quality and not necessarily the quantity that will pay in the end. The present number could be reduced, the production could be increased, or the wastage be minimized. The question of cow *versus* she-buffalo should be carefully studied. In the end, the dual-purpose cow will be the only animal that will stand and the sooner we recognize this fact the better it will be for the rehabilitation of the dairy industry. The associations should control the village common area. A village co-operative store for fodder as well as for cattle food concentrates will be very useful. The breeding should be controlled. Only the best animals should be allowed to propagate. All the scrub bulls should be castrated. All the cows should be tested for milk and *ghee* yield, and a regular register should be maintained. For the present at least, it would be a wise policy to develop the local breeds on dual-purpose lines. All the surplus milk produced by the individual should be purchased by the association and be disposed of as milk, wherever it is possible; and where it is not possible it may be turned into *ghee*. Assistance may also be given to them to dispose of their surplus live-stock. Generally there is a large number of village cattle which bring no gain to the farmer. Such animals may be handed over to the nearest charitable organization run for the purpose.

The chances are that large funds will not be necessary. For petty expenses a cattle cess could be levied on the animals in the village. The association should fully co-operate with the various Government departments and other organizations.

The *Goshalas* should take charge of all the useless cattle that come to them and maintain them till death at some cheap place. The village dead-cattle industry should be put on sound and scientific basis. The Co-operative Department should run Co-operative dairies for the purposes of urban milk supply, and *ghee* centres in suitable villages for the production of pure *ghee*. Arrangements should also be made for maintaining the *gwala* cattle when they go dry.

The Veterinary Department should appoint trained compounders and other assistants in sufficient numbers to advise the farmers on maintaining their herds in good health and on the ways of improving them through better breeding, feeding, and management. They should also have model dairy-farms at the district headquarters where better types of animals are bred, where experiments on the methods of milk supply and the making of milk products are conducted and where economic methods of animal feeding are demonstrated by giving a balanced diet, and growing and preserving fodder or fodder-yielding crops. Educating the public by training the enthusiastic farmers at such centres, and carrying on the propaganda work on suitable occasions will greatly help the matter.

Experience at Segaoon.—Experiments on more or less the above lines have lately been started at Segaoon, and these show signs of good success. In the *Gosha'a* herd, we have some good *gwala* cows yielding a fair amount of milk and healthy calves. The purchasing of milk on fat basis from the village farmers has induced them to keep better animals and has added to their income. The calves are better cared for, and the off-springs from our village bull will be much better in their milk-yielding capacity and for draught purposes, and make the owner cattle-minded to a great extent. Experiments and demonstrations on fodder-growing and its economic uses are also in hand to show that the keeping of good cattle should be and is an integral part of agriculture, where a suitable balance should be maintained between crop-growing and cattle-breeding.

I. A Scheme for a Cattle-breeding Farm in the Forest Areas with 100 Breeding Cows.—In the province, we have some well-to-do *malguzars* suitably situated near their own or Government forests. To improve the local cattle, we need a large number of pedigree cattle. And these could be bred by these *malguzars* with the help of the Government.

100 well-selected cows, preferably heifers, and two pedigree bulls should make the foundation herd. They must be kept in separate groups of 50 each served by a bull. From amongst the male progeny, the best ones should be reared as bulls and others should be castrated in due time and should be used as bullocks. The best of the heifers

should go to replace the old ones and the others sold off. Rigid selective factors should be prescribed. A small farm with about 50 acres should be attached to this centre for the economic utilization of the manure, and the profits received from the same should go towards the maintenance of the management expenses.

It is estimated that such a centre will be a self-supporting one by the end of five years.

Capital needed—

Price of—	Rs.
(i) Animals ..	3,300
(ii) Sheds ..	1,200
Miscellaneous implements, etc. ..	1,000
Floating capital ..	500
Loss during the 1st year ..	750
Loss during the 2nd year ..	350
Total ..	<u>7,100</u>

II. Scheme for a Co-operative Dairy with 10 Gowalas keeping 100 Milching Animals.—At a convenient distance from the town, a co-operative dairy should be situated. The society should provide suitable sheds for the cattle and for the *gowalas* to stay, maintain a store for 'concentrates' as well as for fodder, and retail these to the *gowalas*; should acquire suitable grazing area, a good breeding bull; and veterinary and other technical aids should be provided. All the milk from the *gowalas* should be purchased at a fixed rate and retailed to the customers. A small farm of about 50 acres should be maintained where the manure should be utilised. The net proceeds from this farm will go towards the maintenance of the management. In this way a cheap and clean supply of milk will be ensured which is one of the primary needs of our urban life today. There is no reason why such a scheme should not pay its way in the very first year.

Capital needed—

	Rs.
Land grazing .. 200 acres } and Farm .. 50 acres }	10,000
Water facilities, pump, etc. ..	2,000
Miscellaneous ..	1,000
Buildings ..	10,000
Floating capital ..	2,000
Total ..	<u>25,000</u>

III. A Scheme for the Establishment of Village Ghee Centres in suitable localities.—In places where sale of milk is not possible, *ghee* centres should be started on a co-operative basis.

The surplus milk at the farms should be purchased at a fixed price on the fat-percentage basis. With the help of a cream separator and other dairy appliances, it should be possible to produce good grade *ghee* and

to market it. The separated milk should be made good use of. This encourages the farmers to keep milch-cattle as a part of their crop husbandry and gives them the money needed for the weekly market. Other facilities like good bulls, veterinary and technical aid, co-operative stores, etc., will go a long way towards improving their lot and cheapening the production-cost of ghee. For a small concern handling a hundred to about 350 lb. of milk a day, the following capital may be needed and if efficiently

managed, it would not be impossible to sell ghee and yet make a profit:—

	Rs.
Cream separator ..	75
Testing machine ..	75
Utensils, etc. ..	50
Floating capital ..	100
Housing, etc. ..	200
Total ..	500.

Statement showing the number of bovines treated and castrated by the Veterinary Assistant Surgeons and Veterinary Inspectors during tour and the number of bovines treated and castrated at the Veterinary Hospitals and Dispensaries.

[Figures taken from the Annual Reports of the Veterinary Department, Central Provinces and Berar.]

Number of out-patients treated in the hospitals	Number of in-patients treated in the hospitals	Number treated during the tour	Total	Number of castrations performed during the tour	Number of castrations performed in dispensaries and hospitals	Total.
1935-36						
155,996	4,946	603,971	764,913	148,190	18,774	166,964
1936-37						
167,953	5,340	543,353	716,646	140,501	22,597	163,098
1937-38						
176,750	5,736	598,311	780,797	134,102	27,457	161,559

TABLE I

[Supplied by the Extra-Assistant Director of Animal Husbandry, Central Provinces and Berar.]

*Estimated total production of milk, and estimated production and consumption per head of twenty countries **

Country	Total production of milk (1930—34) Million gallons	Human population Thousands	Daily production per head of population oz.	Daily consumption per head of population. † oz.
New Zealand	870	1,559	244	56
Denmark	1,200	3,551	148	40
Finland	620	3,666	74	63
Sweden	980	6,233	69	61
Australia	1,049	6,630	69	45
Canada	1,580	10,377	66	35
Switzerland	607	4,066	65	49
Netherlands	970	7,935	54	35
Norway	290	2,814	45	43
U. S. A.	10,380	122,775	37	35
Czechoslovakia	1,200	14,730	36	36
Belgium	651	8,092	35	35
Austria	545	6,760	35	30
Germany	5,096	66,030	34	35
France	3,150	41,835	33	30
Poland	1,990	31,948	27	22
Great Britain	1,474	45,266	14	39
Italy	1,050	41,177	11	10
Roumania	382	19,033	9	9
India	16,400	352,838	8	7

*The first and fourth columns are taken from the Problem of Nutrition, Volume IV. Statistics of Food Production, Consumption and Prices (League of Nations Publication). The second column is from the latest Census figures. The third column is calculated from the figures in the first and second columns.

†Includes both liquid milk and milk products, expressed in milk equivalents.

‡ Assuming India's total production to be 800 million maunds.

CHAPTER XVIII.—INDIGENOUS DYES

(See Part I, Vol. I, Page 27.)

(Submitted by Dr. R. S. Thakur.)

This note is based on the information supplied by the Deputy Commissioners in reply to a questionnaire appended at the end of the note, and on that collected from books given in the bibliography (Appendix E). No attempt has been made in this note to cull all the relevant information from these books, as it would amount to producing a large volume. The reader is therefore referred to the books for detailed information.

A Brief History of the Advent of Artificial or Synthetic Dyes.—The first synthetic dye—as distinguished from those produced from plants or animals—was made by Sir W. H. Perkin (Sr.) in 1856 by a happy accident when he was engaged in doing some thing else, and its manufacture was started in 1857. This dye was termed Perkin's mauve. This year marks the commencement of a vigorous period of investigations directed towards the making of synthetic dyes in Europe. The commercial process of manufacturing the first *natural* dye, viz., that from madder root, was found simultaneously by W. H. Perkin in England, and by Caro, Graebe and Liebermann in Germany in 1869. In a very short period this discovery threw the considerable number of growers of madder root in South France and elsewhere out of employment. When asked about the madder plantations, these growers would say that they cultivated it no longer, as the substance was made by 'machine' in Germany.

Today the number of synthetic dyes is reckoned in thousands and this is being increased every year with unrelenting research.

A correct estimate of the advanced state of the dyeing and printing industry, as it existed in India before the introduction of synthetic dye-stuffs, can be obtained from a perusal of the Textile Specimens—700 in number—collected in sets of 18 volumes.* These specimens illustrate in a complete and convenient manner the styles of Indian manufacture. Twenty such sets were prepared that year by Dr. Watson at the cost of India. Of these, only seven were sent to India, whereas the remaining thirteen were distributed in England to important textile manufacturing centres.

Nagpur is fortunate in having one of these valuable sets in the Museum, and it is pleasing to note that these specimens are in a good condition even after the lapse of more than eighty years.

It is a pleasure, though not altogether unalloyed with deep sighs, to look at these specimens, where one finds cloths dyed in red, yellow, green, blue, orange, violet, black, and in their pretty intermediate shades. The colours on cotton are as a rule dull, whereas those on wool, and particularly silk, are bright and lively in tone.

*Textile Manufactures of India: Prepared at the India Museum, London, in 1858, under the direction of Dr. J. Forbes Watson, Reporter on the Products of India, forwarded by order of the Secretary of State for India in Council.

Those who are interested in the textile industry can usefully refer to this important collection which is not merely of historical importance but also one that may prove helpful as regards designs.

The dyeing of red with madder root, and of blue with indigo are processes which were known to the people of this country, of China, and of Egypt several thousand years before the Christian era. Those who practised the art of dyeing long before and after the introduction of synthetic dyes did not know a word of Organic Chemistry and its present-day complicated symbols. And yet their work, which was carried out with the rule of thumb or empirical methods founded on the traditional and cumulative experience of the ages, stir today the admiration of the whole world. This must not be interpreted as derogatory to Chemistry or to the present-day qualified dyers, as the old trade was based on art and secret processes, whereas the present-day dyers can use formulæ and processes—which are no longer the monopolies of an individual or of a group of individuals—and can produce colours and shades never heard of before with a guarantee.

In 1896, Mr. Russel, I.C.S., wrote the following in the concluding paragraph of his Monograph on the Dyeing Industry of the Central Provinces (page 21):—

“Owing to the introduction of the imported aniline powders, the dyeing industry no longer requires the professional knowledge and artistic sense of colour which it formerly did, and becomes merely a mechanical process capable of being performed by any one. It is to be regretted that Indian dyers should abandon the natural tinctorial agents and knowledge of their application which they have inherited from their ancestors and by which they obtained results which were formerly the envy of European workmen. But unless the application of chemical knowledge cheapens and simplifies the use of the vegetable dyes of India, there seems little likelihood of their again being able to obtain a footing in the market.”

Since the above was written, the cultivation, collection and use of indigenous dyes has deteriorated to such an extent that one can hardly be persuaded to believe the erstwhile existence of this art and industry.

Before the introduction of synthetic dyes, India produced not only enough of dye-stuffs for its own use but it also exported considerable quantities to Europe and to other foreign countries.

There are no specimens of dyeing and printing to be seen from Central Provinces and Berar in the Collection of 700 textile manufactures referred to above. From this, it does not however necessarily follow—though it is not unlikely—that this province did not enjoy any particular reputation in this art.

In olden days, say, fifty to seventy-five years ago, the dyeing industry gave employment not only to dyers but also to a considerable number of cultivators who grew

such plants as *al* safflower, madder, indigo*, etc., and to those who collected the forest produce, such as *palas* and *dhawai* flowers, bark of *rohan*, etc., used in this industry. Nowadays one finds thousands of maunds of *palas* flowers going to waste in the forests. It is reported from Seoni that formerly there was a factory there near the Civil Court for the manufacture of vegetable dyes. There used to be extensive fields of safflowers in Raipur and Chhindwara districts covered with golden yellow flowers which presented a very fascinating appearance.

All these are now things of the past. The area under the cultivation of dye plants is given in Appendix A. It would be seen from it that this area is very insignificant compared to that under other crops. A statement giving the area under indigo and other dyes in different districts of Central Provinces and Berar is given in Appendix B. The number of dyers, as given in the Census Reports of 1921 and 1931, are given in Appendix C. It will be seen that the number following the occupation is diminishing steadily. The dyeing industry is an auxiliary to weaving and the yarn dyed by the local dyers used to be woven by the weavers and the plain cloth produced by the latter used to be dyed and printed by the dyer depending on the nature of its use.

The use of indigenous dyes began to decline during the later decades of the 19th century. The dyers gave up the use of natural dyes in favour of the synthetic ones with the result that growers had to change to other crops and that the collection of forest products lost its former importance. Later on, the increasing decline in the indigenous weaving industry led to the displacing of the dyers themselves from their occupation as a consequence.

The dye-houses attached to mills can dye the yarn and the cloth in standard colours and shades at a lower rate than the dyer can do. The same holds good about the printing industry. In other words, just as spinning and weaving industries have been smothered by cheaper production, so also have the indigenous dyeing and printing industries almost vanished for a similar reason. The few dyers who still practise their profession do dyeings and printings of a special character, just as some weavers, who make distinctive designs of cloth, not possible on the power loom, or which can be made only at a higher cost, are still continuing their traditional occupation.

A monograph of the dyeing industry of the Central Provinces by R. B. Russel was published by the Government in 1896. Even at this early date he wrote: "that the use of many of these dyes (native Indian dyes) is diminishing and in a few years may have entirely ceased". It did not take long to reach this prognosticated state of affairs, for it is recorded that in 1915 the prices of the imported synthetic dyes soared at the outbreak of the Great War, as no more stocks

*Indigo was grown only to a small extent in Central Provinces and Berar, as it is recorded that good quantities of indigo were imported from the United Provinces (then North-West Frontier Province). (See also the acreage under indigo cultivation in appendices A and B) The small quantity of natural indigo that is required at present by the dye-houses attached to the mills is generally imported from Madras.

could be secured. The Government then attempted to induce cultivators to grow, and the dyers to use, indigenous dyes. All these exhortations had little effect as is shown by the insignificant increase in acreage under cultivation of these dyes during the period, 1914 to 1920 (See Appendix A). The people believed that their success would be very short-lived, as the ruthless competition would soon smother their occupation as soon as the War was over. In Bihar, however, the plantation of indigo increased and natural indigo was sent in large quantities to European countries and to the United States of America during the War. A few years after the War was over, the synthetic dye came into its own again and displaced the natural dye-stuff from the market to a great extent.

To ascertain the extent of the present use of vegetable dyes, a questionnaire (See Appendix F) was sent to the Deputy Commissioners of all the districts in the province. In regard to the question whether vegetable dyes are still used for dyeing and printing and to what extent, almost all the district and tahsil (taluk) reports with barely a few exceptions are silent. These exceptions are the Waraseoni tahsil of Balaghat district and Sihora tahsil of Jubbulpore district. It is reported from Waraseoni that a red dye† is still made from the roots of *al* plant in the villages of Changera, Murdara and Bakhora and that about half a dozen families living in Mehndiwada are using this dye to the extent of Rs. 300 worth annually. Similarly the dyers in Sihora tahsil are reported to be using *al* root for dyeing red.

Palas flowers are still used, though to a very limited extent, during the Holi festival. The dye-houses in the mills use natural indigo imported from Madras to a small extent together with the synthetic indigo.

It is reported that a little *kunku* is made from turmeric in the Shendurjana village (district Amraoti). With these few exceptions, synthetic dyes imported from foreign countries are used by almost all the dyers except perchance by those living in remote places.

Castes engaged in Dyeing.—The classes which followed or are following the occupation of dyeing in this province are—

- (1) *Rangaries* (Hindu).
- (2) *Rangrez* (Muslim).
- (3) *Koshtas, Julaha, Bhulias*. (They belong to the caste of weavers.)
- (4) *Nilkar* or *Nilgar*, that is, those who specialise in dyeing blue with indigo.
- (5) *Chhipas* and *Bhaosars*. (These do dyeing as well as printing.)
- (6) *Patwas* who do dyeing of silk.

Desirable Qualities in a Dye.—For a dye to be satisfactory, apart from its giving a good colour or shade, it must satisfy the following conditions:—

- (1) It is not washed off by water alone or with soap water. It does not come off on rubbing. It should be unaffected by perspiration, i.e., it should be fast to perspiration.

†As a rule, the dye from the *Al* root is made only at the time of dyeing. It is, therefore, to be presumed that the reporter means the cultivation of the plant and the preparation of the root for the dyers and not the preparation of the decoction from the roots, as no dyeing industry has been reported in these villages.

- (2) It should be fast to light and air, i.e., it should not fade on standing.
- (3) It is not toxic to the skin.
- (4) It does not absorb the heat rays which would cause discomfort when the wearer is out in the sun.
- (5) It should be inexpensive and easy of application.

Uses of Dyes.—In addition to their use for dyeing textile fibres, dye-stuffs are used for a variety of other purposes, such as, for dyeing leather, making 'lakes' ('gulal' and 'kunku' are also such substances) for the paints-making industry. They are used for making inks, for colouring food-stuffs and beverages, dyeing candles, oils, soaps and cosmetics.

Dyes from Plants.—The colouring matter or principle which is the desired constituent of certain plants can be extracted by boiling the necessary parts in water, and the resulting decoction is employed as a dye-bath.

How these colouring matters are made in the plant, or what their function is, is a mystery. In the flowers, apart from looking very pretty, the colour helps to attract the bees who do the pollination. In the roots, bark, wood, etc., whether the colouring matters are the by-products or waste materials of plant metabolism or whether they have any particular function to fulfil is still unknown.

The processes employed by the plant in the production of these dyes appear very simple compared with those of synthetic chemistry where one has to use strong, corrosive, foul-smelling, poisonous chemicals, high temperatures and pressures to produce the same substances which nature yields in a mysteriously simple way.

With the old dyes it was not always possible to get brilliant hues in many cases and the range of shades available was narrow and not capable of much extension without seriously complicating the dyeing process. Coal-tar colours provide these days the most varied shades and most delicate and brilliant hues.

The old methods of dyeing were unscientific, crude and more or less surrounded with mystery and secrecy of skill. As stated before, they were the result of the traditional and cumulative experience of a long period and were empirical. The processes were long and tedious and time appeared to be of little avail in the operation.

Character of Fibres.—*The present day fibres can be divided into three classes; viz. :—

- (1) Vegetable or plant (cotton jute, etc.).
- (2) Animal (silk and wool).
- (3) Artificial silk (rayon, celanese, etc.) and wool (lanitol).

Of these, the artificial fibres do not interest us. The most important for this province is the cotton fibre, and the next important, though of much less significance, are silk and wool. Cotton consists almost wholly of pure cellulose—other fibres of plant origin also consist of this material—which is chemically indifferent. Hence such fibres are usually unable to absorb the dyes directly until mordanted. Wool and silk consist of nitrogenous (protein) substances and are therefore basic. They can be dyed directly

by immersion in a solution of the dye, as absorption occurs between the fibre and the dye. On account of the above difference in chemical composition and structure, the same dye cannot be used for dyeing the different classes of fibres by the same process. A different process is therefore to be used.

Before a fibre or piece-good can be dyed, it must be cleaned in order to give a delicate shade, unless it is desired to produce a deep or dark colour. It is likely that in olden days the dyers used *sajji matti*, soap-nut, wood-ash, etc., for cleaning the cloth or yarn before dyeing. In no district report, however, is there any reference to this important process prior to dyeing. In the dyeing factories, the material to be dyed is bleached before it is put through the process.

Quality of Water.—The quality of water plays not an insignificant part in the process of dyeing. Thus, in Mr. Russel's Monograph on Dyeing Industry in Central Provinces and Berar the following statement occurs under "Dyeing with madder root" on page 8 :—

"In Chanda there was formerly a large export trade in *al-dyed* cloth to bazars held in the neighbouring districts and in Berar. One large dealer in the town states that the value of his export trade was then Rs. 4,000 a month, but now it does not amount to Rs. 100. The reason for this is stated to be that cloths are now imported from Nandor in Berar, *the Nandor cloths being preferred to those of Chanda owing to their brightness of colour which is said to be due to some special qualities of the water of that place*".

Similarly, in the District Gazetteer of Saugor, page 143, the following statement occurs :—

"Cotton cloths are dyed in Rehli, Garha, Kota and Gourjhamar, but the industry is also decaying. The colours produced in Garha Kota and Gourjhamar from the water of the Sonar are considered to be specially good."

From what is said above, it is not unlikely that the Chanda water contained appreciable amounts of iron to produce dullness in the colour of the cloths dyed with madder root, whereas the water at Nandor may be free from it. There is another point to which this discrepancy of brightness in colour can be ascribed, namely, to the presence of substances other than the active colouring matter, viz., alizarin, in the natural dye-stuff. These have a tendency to produce a dull shade. It is very likely that at Nandor the dyers were using synthetic alizarin dye-stuff which is not contaminated with any such substances.

The water employed for the dyeing of silk should be specially pure and soft.

Mordants, Fixing. Agents for Mordants, Auxiliary Substances—Mordants.—A considerable number of substances were used by the dyers in the past to fix the colouring matter of plants on textile fibres. A few of these are given below :—

- (1) Aluminium compounds, such as alum (*phithari*) and aluminium acetate; iron compounds, such as, iron sulphate (*green*

vitriol—*hirahasi*); iron acetate; tin compounds, such as, tin chloride; copper compounds, such as, copper sulphate (*tutia*); chromium compounds; lime.

(2) *Tannin*.—The extract of substances rich in tannin were also used for this purpose. Chief amongst these were *harra* (myrobalans), *bahera*, *aonla*, catechu, barks of *Acacia arabica* (babul), *Terminalia tomentosa*, pomegranate tree and the rind of pomegranates.

Fixing Agents for Mordants.—Sometimes it is necessary to fix the tannin on the fibre instead of leaving it in a free state. This is done by combining it with the oxides of certain salts of aluminium (alum, etc.), when an insoluble compound is deposited on the fibre. (See Russel, *loc. cit.*, page 6.)

When it is desired to use a metal as a mordant, the material to be treated is immersed in a solution of the salt of that metal, taken out, squeezed, and then treated with a solution of *sajji* (soda or caustic soda or potash). In this way the metal (its oxide) is firmly deposited on the fibres.

Auxiliary substances.—A number of auxiliary substances were also used during the process of dyeing such as *nagarmotha* (*Cyperus longus*)—this gave a fragrance to the dyed material; powdered mica which was used to give a twinkling appearance to the dyed material; cow or sheep dung; soluble gums, borax, iron sulphate, *tarota* seeds, castor oil, gingelly (*tilli*) oil, etc.

In order to get the acidic solutions, the dyers of old used to employ tamarinds, raw mangoes, juice of lemon, etc.; to get alkaline solutions, they used *sajji matti*, ashes of particular plants, etc.

Now, a short description of the natural dyes—particularly, though not exclusively, those grown in this province—together with their properties is given in the next few pages under the heads, blue, yellow, red, and black, according to the primary colour they impart. The intermediate shades were obtained by reducing the quantity of colouring matter employed in the process, i.e., by employing a weaker dye-bath. Combined colours or mixed shades were obtained from these natural dyes by varying the amount and kind of mordants and auxiliary substances and by mixing colours, the latter process being affected by first dyeing the cloth in one colour and then immersing it in a solution of another colour.

The action of acids and alkalis (such as, lemon juice, tamarinds, *sajji matti*, ashes) also used to a certain extent in modifying the colours or shades.

Blue—Indigo (*Indigofera tinctoria*).—To get blue colour and shades containing blue, indigo was employed. Indigo was cultivated in Central Provinces only to a very small extent, as is shown by the figures given in Appendix A.

The colouring matter is obtained by cutting down the plants and placing them in wooden tanks. The plants, weighted down with stones and bamboos, are covered with alkaline water, when vigorous fermentation lasting for some 15 hours sets in. By this process, glucose and indoxyl, both of which

are soluble in water, are formed. The solution is drawn off and mechanically agitated in the presence of air, whereby the colouring matter is precipitated in glistening blue particles which are almost insoluble in water. The clear water is drained off and the sludge is boiled with water to prevent destructive fermentation, the dye-stuff filtered off, pressed into blocks which are broken up and dried. This is the natural indigo which is far from pure and contains, besides the blue colouring matter, other colouring materials, known as, indirubin, indigo-red, yellow indigo, etc., as well as foreign material arising either as products of the fermentation or through mechanical introduction. The pure colouring matter is called indigotin and an interesting and lucid account of its process of manufacture from the plant is given by Sir George Watt in his book, "The Commercial Products of India" (pages 680–682).

Though, in the beginning, indigo was used only as a pigment, methods were later on found of bringing indigo into solution as indigo white by the aid of reducing gases given off when organic matter is allowed to ferment and an alkali is present to dissolve the reduced indigo.

Nowadays indigo is produced synthetically and it has for all practical purposes replaced the natural and impure product.

Wrightia tinctoria (*dudhi*).—The leaves of *Wrightia tinctoria* have also been known for a long time as a source of blue dye.

Yellow dyes.—In the Central Provinces, the following indigenous dyes were or are used for dyeing yellow to a very limited extent, particularly, in homes:—

- (1) *Flowers of Butea frondosa* (*palas*, *chheola* or *tesu ke phul*).
- (2) *Curcuma longa* (*haldi*), turmeric.
- (3) *Symplocos racemosa* (*lodh bark*).

(1) *Flowers of Butea frondosa*.—*Butea frondosa* is a common tree in the forests of Central Provinces. It is used as a host tree for the lac insect and it yields *palas* lac.

The flowers, which lend a very pretty appearance to the tree, are collected by the villagers and forest people in the months of March and April, particularly, at the time of the Holi festival. The flowers can be had merely for the labour of collecting them, but, as there is no market for them, the collection is neglected and one finds the flowers going to waste in the forests.

The flowers are used for dyeing cloth a brilliant yellow. The flowers are boiled in water and the pieces are dipped either in the hot or in the cold solution. The colour produced in this way is not durable because it can be washed off. This fleeting character of the dye is an advantage when it is used during the Holi festival for sprinkling on clothes. In addition, the freshly dyed cloth emits a pleasant aroma. Unfortunately, even for the Holi festival, aniline dyes are used, although the *palas* flowers certainly possess an advantage over them.

It is stated that a fast colour can be obtained if the cloth is first impregnated with a solution of alum or with a suspension of wood-ash.

The decoction of the flowers gives a variety of shades on mordanted wool depending on the nature of the mordant (chrome, alumina, iron, tin). Unfortunately, all the colours and shades obtained from these flowers are not at all fast to light.

As in the case of indigo, so in this case, the colouring principles (butein and butin) are not present as such but as glucosides. In order, therefore, to get a strong colour, the flowers should be boiled with water to which a little acid (hydrochloric) has been added.

(2) *Curcuma longa*.—Turmeric is grown to a very small extent in Central Provinces and it is better known as a condiment than as a dye. It is used as a colouring matter for food-stuffs, the usual notion, however, being that it is a spice. In other countries, it is used as a colouring matter for fat, wax, butter, cheese, rice, salves, wool, silk, paper, leather, wood, metal, varnish, pharmaceutical preparations, and as an adulterant for insect powders, saffron, and any other spice in powder form. In India, it is used for colouring vegetable *ghee* which is passed off as pure *ghee*.

Turmeric contains a yellow colouring substance called curcumin to the extent of about 1/3 to 1/2 per cent. in addition to woody fibre, starch, gum, a sharp smelling oil, etc.

Turmeric is the only yellow natural colouring matter which dyes cotton—as also wool and silk—directly without the use of a mordant giving them pleasant shades of yellow which are, however, fugitive to light and washing. Half an hour's treatment of the material with a warm decoction of turmeric powder suffices to colour it, producing a pleasant yellow colour. In spite of its instability towards light, soap, alkalis, etc. it is still used in cotton dyeing establishments for tinting purposes.

Turmeric solution or the colour produced by it on a fabric becomes reddish brown by the addition of alkalis but this changes to yellow again by the addition of acids. It is sometimes noticed that turmeric spots on clothes turn red when soap is applied to them. The yellow colour, however, returns when the cloth is washed with water, whereby the alkali is washed away.

Turmeric was used as an *auxiliary* to such other dyes as *al* safflower, lac-dye, etc., and with indigo to produce shades of green. As large quantities of *haldi* are imported into Central Provinces, steps should be taken to encourage the cultivation of *haldi* in suitable parts in this province.

(3) *Symplocos racemosa* (*lodh tree*).—This is reported to be a rare tree in the 'sal' forests of this province. A yellow dye is extracted from its bark and the leaves which are, however, probably used more as a mordant than as a colouring material.

The bark of the mango tree (*Mangifera indica*) is also stated to yield a yellow colour.

Red dyes—*Safflower* (*Carthamus tinctorius*) (*Kusum* or *Karar*).—Safflower used to be grown extensively in Berar, though less in Central Provinces, where Raipur and Chhindwara used to be the principal centres of cultivation. On account of the increasing introduction of artificial dye-stuffs, safflower has lost its former importance.

Safflower is an annual plant in which the flowers appear at the end of the stem in July or August. The first and the last flowers of every harvest are proportionately poor in the colouring material. The dried flowers are filled in sacks and these are placed in trusses which are washed in running water. The washing out is continued by treading with feet until the water runs absolutely uncoloured. The damp mass is dried in the shade. The purpose of treating flowers in this way is to remove the almost useless yellow colouring matter which is soluble in water. The flowers thus treated give no colour to cold water.

In order to use these flowers for dyeing, they were mixed either with *sajji malti* or ash both of which contain soda, and water added to the mixture. The resulting red water was strained and was used for dyeing, using juice of fermented tamarinds or of fresh lemons as an auxiliary substance.

The unwashed flowers contain 20 to 30 per cent. yellow colouring matter which is soluble in water, 2 to 6 per cent. yellow colouring substance soluble in alkali but insoluble in water and only 0.3 to 0.6 per cent. red colouring matter (*safflower red*) which is the most valuable constituent.

The pleasant colours obtained by using safflower, even by the addition of various substances such as alum, potash, etc., are not fast. Even small quantities of soda removes the colour from the fabric; so also does sulphurous acid. The colours and their intermediate shades are not fast to light. On account of this lack of fastness to soap, alkali, light, etc., this dye has been ousted by the synthetic dye-stuffs. It is, however, still used for the colouring of cosmetics (make-up), liquors and confectionery, as well as for the preparation of fine perfumery and incense.

Indian madder (*Rubia cordifolia*) (*Munjeet* or *Manjesta*).—No information about the cultivation of this plant in the Central Provinces and Berar is available nor does Mr. Russel make any reference to it in his Monograph (*loc. cit.*) The species that used to be grown in Europe is called *Rubia tinctorium*.

Madder is a perennial plant with small leaves and flowers and profuse roots. It is only the latter which contain the colouring matter to the extent of about 1.9 per cent. An older plant contains more colouring matter than a younger one. The plant is harvested three years after sowing the seed. The roots are dug out usually in November. They are freed from the earth and dried. They are then cut into large pieces or reduced to a coarse yellow powder with a characteristic smell. This powder swells on keeping for a long period and, therefore, it must be protected from the action of air, light, and dampness.

The roots appear yellow but become red when dipped in or damped with water. This is explained by the fact that the colouring principles are not present in a free state but in combination (with glucose) which is split—yielding the red alizarin or other

*These should be dried in the shade because the sunlight decomposes a part of the required red colouring principle.

colouring matter—under the influence of an enzyme also contained in the roots.

One of these combinations contains alizarin which is only sparingly soluble in boiling water, but is easily soluble in alkaline water, *i.e.*, in water to which *sajji matti* or ash has been added. This was used for the dyeing of wool, silk and cotton after mordanting. When the mordanted fabric, *i.e.*, that impregnated with one of the metallic hydroxides, is steeped in a warm decoction of the dye, combination occurs between the dye and the mordant with the production of a coloured insoluble substance (*lo ke*) which remains firmly attached to the fabric.

In the presence of lime and castor oil, the beautiful Turkey red colour (*tusia*), the favourite of ladies for bodices, used to be produced on cotton cloth mordanted with alum.

Because alizarin—and so the madder root also—can give different colours according to the mordant used, it is classed as a poly-genetic dye-stuff.

All the colours resulting from the use of madder root are characterised by great fastness to washing and light and by the richness of shade.

The other constituents of madder root have also been isolated and they serve merely to tone down the colour produced by the predominant constituent, alizarin.

This was the first natural dye-stuff to be synthesised, and this was done in 1868 by Graebe and Liebermann (German chemists). By 1870, all the European plantations came to an end, because the price of the synthetic product was nearly one-sixth the price of the natural product. Today, the natural dye has a very limited use in a few specialities, such as, wool-dyeing and for the preparation of madder lake for the painters.

Morinda tinctoria and *M. citrifolia* (*Al plant*).—These two species of the *al* plant, *viz.*, *M. tinctoria* and *M. citrifolia* resemble each other very closely. Whether both these varieties are grown in this province, *viz.*, *M. tinctoria* in forests, and *M. citrifolia* in cultivated lands or whether there is only one variety available, *viz.*, *M. tinctoria*, cannot be stated definitely for lack of information on this subject. Mr. Russel who referred to *al* as *M. citrifolia* is referring no doubt to the cultivated plant.

The *al* plant used to be cultivated extensively in Central Provinces, particularly, in Nimar, Buldana, Damoh and Jubbulpore. A good account of the working use of *al* plant as a dye is given by Mr. Russel in his Monograph, pages 3 to 8. As stated elsewhere, this plant is now being cultivated and used to a very small extent in the Balaghat and Jubbulpore districts.

When the plant has attained a height of five or six feet in the fields, which happens after about three years' time, the roots are dug out. The thin ones are more valuable than the thick ones. The dried roots are brown from the outside and are coloured yellow inside. The bark of the root contains a rich colouring matter. Dyeing is carried out in the same way, as in the case of madder root for producing Turkey red. According to the age of the root and of the proportion

of bark to wood, one obtains reddish yellow, rose, red, and dark-brown red colours. Purple red to chocolate brown shades are obtained by the addition of iron sulphate. The colours and shades obtained by using the *al* root are fast to washing and to light.

The colouring constituent in the root is a yellow substance called morindin which is split up into a sugar and an orange red substance called morindone by boiling with water containing a little acid.

Caesalpinia sappan—*Sappan wood* (*patang ki lakadi*).—There are conflicting reports about the occurrence of *Caesalpinia sappan* tree in this province. Its wood, like many other red woods, is known as Brazil wood.

The wood yields a valuable red dye which, before the days of aniline dyes, was exported very largely from India to Europe. The decoction of the old wood was used with lime and tamarind (*imli*) to give a red colour. The use of *lodh* (*Symplocos racemosa*) bark as a dye auxiliary, of chalk to deepen the colour, of alum to fix it, as also the circumstances that the above colour is bleached or destroyed by acetic acid, was known long ago. The red wood extract formed by decocting the root with water and concentrating the resulting fluid is still used in cotton printing and dyeing; though only to a small extent for fashionable shades. As mordants, are used tannin, tin and iron salts. The colours obtained by the use of this wood are not fast to light, soap and acids. They are altered also by alkalis and acids and there is, therefore, less demand for this natural dye-stuff.

When cotton has been treated with tannin and basic aluminium sulphate, it gives with red wood extract a dull bluish red colour; with tin mordants, an orange red; with alumina, a scarlet red; with iron mordant, a violet grey tint, etc. The active principle or colouring matter in red-woods is haematin.

Woodfordia floribunda, (*dhawai*)*.—It is a useful shrub which is found growing abundantly throughout the forests of Central Provinces and Berar. It yields beautiful flowers which are collected in the Jubbulpore district and are reported to be sent to Benares for dyeing silk. The flowers appear from February to April when they are gathered and dried. They are used as a pink dye by themselves or as a mordant chiefly with *al* (*Morinda citrifolia*). They contain about 20 per cent. tannic acid and they have long been used as a tan to a small extent, though for this purpose, the flowers have been neglected in favour of the leaves.

Nyctanthes arbor-tristis (*Harsinghar* or *Parijata*).—This is a decorative shrub with coarse leaves which is stated to grow wild in the jungles about Jubbulpore and in other parts of the Central Provinces such as the foot of the Vidhya Range. It is also cultivated in gardens on account of the fine smell of its flowers. It flowers generally during the rains. The one remarkable peculiarity about the flowers is that they open out towards the evening and drop off the following morning. The flowers are white but their corolla-tubes are of an orange colour. The

* This has been incorrectly described as 'dhaura' by Mr. Russel in his Monograph (*loc. cit.*) Dhaura tree is *Anogeissus latifolia*.

flowers collected in the morning are either used for making garlands—on account of their sweet fragrance or they are dried for being used for dyeing. For this purpose, they are boiled in water and the textile material (silk or cotton) to be dyed is dipped in hot or cold infusion and dried. This gives a beautiful but fleeting buff or orange colour. It is stated that the addition of alum or liquid glue makes the dye from the flowers less fleeting or more durable. This dye is generally used in combination with kusum, turmeric and sometimes also with indigo and catechu.

A red crystalline colouring substance has been isolated from these flowers.

The other products which can be obtained from this tree are its bark, which can be used for tanning and its large green tough stalks which are used for making baskets.

Mallotus philippinensis (*kamela*).—This is obtained in the form of powder from the red glands found on the surface of the fruit of the evergreen *kamela* trees (*Mallotus philippinensis*). Mr. Russel reports that it used to be grown in the Sambalpur district. None of the present district reports mention its production any where in the province.

In order to obtain the dye, the fruit is shaken in baskets so that the powder falls down on a piece of cloth spread below, or the hair and glands are brushed off. In this way, a brick red scented powder called *kamela* is obtained which possesses a very fine and pleasant odour in the fresh state. It is unaffected by cold water and is almost insoluble in boiling water. It is not moistened or wetted with cold water. As a dye-stuff, *kamela* is used only for dyeing silk. This is done without the use of mordants. A beautiful and lasting bright orange colour is obtained. Watt gives the following process employed in Central Provinces in his book "The Commercial Products of India", page 756: "In Central Provinces, in dyeing *tussar* silk the powder is first mixed with the ash of the myrobalan and then put in water and allowed to stand till the sediment subsides. The water is then decanted in another vessel in which is placed finely powdered *lodh* bark (*Symplocos racemosa*). The *tussar* silk is next soaked for six hours in the preparation, then taken out and dried, put back in the fluid, dried and again submerged till the fabric obtains the desired shade." The most important constituent of *kamela* is rottelerin, to which the powder owes its dyeing properties.

Lac-dye.—This is a by-product obtained from the lac resin secreted by the lac insect. In the early days, however, it was the resin which was the by-product and the dye was the desired material. At present, all the lac dye in the province and elsewhere with the exception of what is produced in one or two factories in Mirzapore, United Provinces, is going to waste. In the former days, lac dye was not only used in the country or in the province for dyeing silk and wool but was also exported. Lac dye is not used for dyeing cotton.

When crude lac, called stick lac, is subjected to the process of washing to get seed lac, this dye is disengaged. The coloured water after being strained through cloth to remove

pieces of wood, grains of lac, etc., was collected in earthenware vessels and treated with lime or alum whereby the dye-stuff settled to the bottom. The sediment was filtered, pressed in box frames, and the cake cut into pieces of required size and dried by being aired. This formed the lac-dye of commerce.

The exact method of obtaining the pure dye is not described clearly in any of the books. In order to remove the impurities, the lac-dye of commerce is dissolved in sulphuric acid whereby the resin remains behind. The solution is treated with alkali whereby the alumina 'lac' is again precipitated.

As the lac dye does not dissolve in water at all, either dilute iron-free hydrochloric acid solution or tin solution (tin dissolved in *aqua regia*) is used. The resulting dye solution is used for the dyeing of wool to which it imparts a scarlet colour which is not so bright (it has a brownish tone) as that obtained from cochineal. When it is intended to get the dye from the lac, the resin is treated with soda or potash solution instead of with water only as is done in the manufacture of shellac. In his Monograph Mr. Russel states that the lac incrustation is boiled with *lodh* bark, *datia khar* (carbonate of soda) and water in definite proportions, for two hours. The boiling is discontinued and the decoction is allowed to stand for three days. The sediment is discarded and the clear solution is strained off. This is mixed with fermented tamarind juice and heated over a fire. When it is hot, the silk thread to be dyed is put into the mixture and boiled in it for about a quarter of an hour, when it becomes thoroughly impregnated with the dye.

Lawsonia alba—*Henna* (*Mehndi*).—This plant is found extensively in this province, usually as a hedge. The colouring matter is contained in the leaves and in the stems as also in the root.

The powdered leaves are used as a colouring material with which the finger and foot-nails, the palm of the hand, toes and the hair are stained a dull orange colour. When it is made into a paste with catechu, it is used for dyeing leather.

The root is employed for the colouring of fats, pomades, salves, hair-oils, tooth-tinctures, cosmetics, soaps, and in pharmacy and perfumery, as well as for the colouring of spirits, silk, linen and cotton.

The colouring principle of henna is alkanin, and is obtained on a commercial scale by extracting the drug with petrol-ether or benzene. It is a dark green fatty resinous or slave-like product of great tinctorial power; it is insoluble in water, soluble in alcohol and in essential and fatty oils, with a red colour.

In combination with indigo, it is known as 'henna-reng' which is used for dyeing the hair black. When used alone, it gives the hair a light copper colour.

It is not an important dye-stuff and is only very seldom used in dyeing cloth to a shade of light reddish brown.

Iron buff from Iron oxide.—The colour iron buff is obtained by soaking the material

in a solution of iron salt, usually iron sulphate or iron acetate, squeezing out the excess and then passing it through a solution of *sajji matti* or soda. The iron is deposited on the fibre in the form of iron oxide which is of a reddish brown colour.

Red ochre 'geru'.—It is the sesqui-oxide of iron and is found abundantly in the Jubbulpore district near Katni and elsewhere in the province. It used to be employed in a powdered state when suspended in water for dyeing clothes to a *gerua* colour. This colour is a great favourite of ascetics (*Babas* and *Sanyasis*).

As stated above, this cannot be truly termed a dye-stuff.

Black—Tannins.—Although there are artificial dyes for dyeing a fabric directly black, there appear to be no such vegetable dyes of any significance. The usual method adopted is to soak the material to be dyed black with the extract of one of the many vegetable substances rich in tannin and then to treat it with a solution of an iron compound. Tannate of iron which is black and insoluble in water is formed on the fibre. It is fast to washing and to light. This is particularly useful for dyeing silk black because the weight of the silk is increased during the process. Various shades of grey can be obtained by adjusting proportions of tannic acid and iron compound (e.g., sulphate). Hence in dyeing black or shades of black, tannic acid acts as a colouring material by itself.

Another function of tannin as stated above is to act as a mordant, because it has the property of forming insoluble compounds with dye-stuffs. It is very useful as such for the dyeing of cotton. Sometimes the tannic acid, instead of being left in a free state, is converted on the fibre, into an insoluble tannate. For this purpose the material to be dyed is soaked in a solution of tannic acid and after being squeezed, it is passed through a warm solution of salt such as alum or tin salt. Tannic acid has the power of combining with the colouring matter in the subsequent dyeing operations.

The substances which are rich in tannin are the following:—

- (a) *Myrobalans* or *Harra*, *terminalia chebula*; *Bahera* or *terminalia bellerica*; *Aonla* or *phyllanthus emblica* or *Emblica officinalis*.
- (b) *Catechu* (or *Acacia catechu*) wood.
- (c) Dhawai flowers or *Woodfordia floribunda*.
- (d) Bark of *babul* (*Acacia arabica*).
- (e) Bark of *saj* (*Terminalia tomentosa*).
- (f) Bark of Pomegranate (*Punica granatum*) tree and rind of its fruit.

Other sources of tannin in the province, less known on account of their low tannin content, are—

1. *Acacia leucophloea* (*Hiwar*). Its bark contains 10 to 20 per cent tannin.
2. *Shorea robusta* (*Sal*). "The bark of this is said to yield a red and black dye and to serve as a tan (Watt's Commercial Products of India, page 990.)

3. Fruits of *Zizyphus xylopyra* (*Ghont*).

4. *Ficus religiosa* (*Pipal*).

"The bark of the *pipal* tree is a useful tan and yields in boiling water a dye of a faint reddish fawn colour. With other barks, it is converted into a black dye, while the root boiled in water with alum gives a pale pink on cotton cloth". (Watt's Commercial Products of India, page 539).

From amongst *harra*, *bahera* and *aonla* the most important, is *harra*. The collection of both *bahera* and *aonla* is neglected in the forest. The large quantities of *harra* which are collected are either sent as whole nuts or after crushing to remove the stones, to ports such as Bombay, Madras, or Calcutta. No estimate is available of the domestic consumption of *harra*. *Harra* obtained in the province is of a very high quality, as it contains a high percentage of tannin—on an average 32 per cent. The importing countries utilise the extract prepared from it for tanning leather.

Tannin forms the basis of all blue-black inks.

Harra powder by itself yields a yellow colour which was (or is) little used for dyeing clothes.

An average analysis of *Harra* powder—

Water	13 per cent.
Tannin	32 per cent.
Insoluble matter	41.5 per cent.
Non-tannin	11 per cent.
Ash	2.27 per cent.
Total	99.7 per cent.

Cutch, Catechu, Kattha.—In this province the source of cutch which is a brown amorphous mass is the khair tree (*Acacia catechu*) which grows scattered in the forests. An extract is prepared by boiling the chips of the heart wood in water. It is then concentrated and set aside to cool. *Catechu* or *kattha* separates out in crystalline form and consists of catechin, the colouring principle of cutch. This is sold for use with pan leaves (*Piper betle*). The mother liquor yields a dark amorphous mass which is rich in catechu tannin and is therefore useful both as a mordant and as a tanning material. The cutch of commerce contains varying proportions of these two principles, viz., catechin and catechu tannin.

Cutch is seldom used for dyeing wool, particularly of fishing nets and sails—fast brown and many other fashionable shades; but it is used more as a tannin mordant than as a self colour. The colour obtained is stable towards washing, light, acids and alkalis and therefore it is used as a ground for giving greater stability to many dark colours. *Catechu* is used for dyeing silk black and for weighting it. The weight of silk can be increased by 30 to 40 per cent. or even more if desired.

Cutch is seldom used for dyeing wools, although the brown colour so obtained is fast towards washing and light. Large quantities of catechu make the wool hard and rough and affect its property of felting.

Dhawai flowers.—Reference has already been made to the use of these flowers under the section of red dyes. As stated there, they are more used as a mordant on account of their tannin content than as a dye-stuff.

Babul and Saj trees (*Acacia arabica* and *Terminalia tomentosa*).—*Babul* is found sporadically in all forests, mostly on stiff soils. It is most abundant in Berar where there are plantations called *Babul bans*. *Saj* is also found abundantly in the forests of this province. The bark of the *saj* tree contains from 5.7 to 11.7 per cent of tannin and is used by the local *chamars* as a tanning material. The bark of *babul* is utilized for a similar purpose but to a very much smaller extent.

Pomegranate (*Punica Granatum*) *Anar*.—This plant is not grown to any appreciable extent in this province and it is doubtful whether its various parts were used here for dyeing purposes. The astringent rind of the fruit and the bark can be used either for dyeing yellow or as a tanning material; the flower can be used as a red dye, though this is not commonly done.

Colouring substances of minor importance.—A brief description is now given of the colouring substances of minor importance.

Onions—(*Kanda* or *Pyaj*).—The skins of onions were extensively used in England to extract a yellow colouring matter from them, particularly in the house for the dyeing of wool, linen and cotton. The same was the case in Germany. There appears, however, to be no record of the onion skins having been appreciably used for this purpose in this country.

With alum, the skins give a yellowish brown colour; hence cotton mordanted with alum is dyed strongly yellow. It is said that onion skins are still used for the dyeing of Easter eggs. In this case, the lime in the egg plays the part of the mordant.

Indian Yellow or puree.—This is not a dye but is a pigment. It used to be produced in the Monghyr district, Bihar. The process adopted was to feed the cows exclusively on mango leaves, to collect the urine excreted by them and to heat it on an open fire till the separation of the yellow colouring matter was affected. This was strained off, formed into balls and dried.

This Indian yellow is capable of producing colours on metallic mordants. The colour is fast to washing and very stable to light. On this account it is used in the art of painting.

Jack fruit tree wood (*Artocarpus integrifolia*) *Kathal* or *fanas*.—Though this tree is found cultivated in this province here and there, it does not seem to have been used here for dyeing. Its bark has a fair proportion of tanning material and was utilized during the dyeing process. Rased wood of the tree was utilized in India—no information is available about Central Provinces and Berar—to dye silk mordanted with alum, to a yellow colour.

Saffron (*Crocus sativus*) *Kesar*.—Saffron is the stigma of the flowers of saffron plants grown in Kashmir. It comes in commerce as a brown-red or golden-yellow strongly scented fibrous mass.

The most valuable constituent of saffron is the yellow colouring matter, called saffron-yellow, which is easily soluble in water. Its colouring power is enormous because even one part of saffron in two hundred thousand parts of water shows a colour. The aromatic oil contained in it is known as saffron oil, but it is not an article of commerce.

Saffron is used principally as a spice and colouring matter for foodstuffs, whereas it possesses only secondary importance as a dye-stuff. It is used for dyeing only in homes but not in dye-houses on account of its easy solubility which prejudices its durability or fastness. Besides, it is very expensive.

Semecarpus anacardium or *Marking-nut*: (*Bhilwa*).—This tree is found growing in the jungles of Central Provinces, and the nuts and the yellow fruits are sold in the bazars in season, particularly on bazar days. The juice of the black nut of this tree is used as a marking ink by washermen everywhere in combination with lime-water as a mordant. The markings are fast to washing and to light. The use of the fruit as a dyeing material does not seem to have been in vogue in this province.

Marigold (*Genda*).—This is found growing in the gardens, and its flowers yield a yellow colour which can be obtained by soaking them in water and squeezing them. The colour is washable. It is not used by dyers.

Among the exhibits of indigenous dye materials, the Nagpur Museum contains specimens, among others, of—

- (1) *Celastrus paniculata* flowers (*Malkangani*) from the Saugor district.
- (2) Leaves of *Tectona grandis*.

No reference can be found for the use of *malkangani* flowers for dyeing purposes. Similarly, little is known about the dye obtainable from the leaves of *Tectona grandis* (*teak*, *Sagon* or *Sagwan*).

The Balaghat Village Survey Report makes a mere mention of (1) *Ventilago maderaspatana*, and (2) *Hardwickia binata* bark (*anjan ki chhal*).

No information as to the extent to which the tree, *ventilago maderaspatana**, is grown in this province is available to the writer nor is any reference made to it in any of the district reports. From accounts available elsewhere, the root and the wood of the tree contain a dye which can be extracted from them by boiling with water. This extract can dye cotton directly a brownish-purple which is not fast. With cotton mordanted with tannin and alum, it produces a fast colour.

The bast fibre of *Hardwickia binata* gives strong ropes and is also a paper-making material. The tree is also noted for the dark-red heartwood which is very beautiful but extremely heavy and hard. Its use, however, as a dye-material cannot be traced.

*According to Mr. K. P. Sagreiva, the Silviculturist of the Government of Central Provinces and Berar, and member of the Industrial Survey Committee, the local species is *V. Calyculata* and not *V. Maderaspatana* the former being a common climber in the province.

Future prospects

The following lines of work suggest* themselves to revive the use of some of the indigenous dyes :—

1. The indigenous dye plants should be improved by plant-breeding including seed-control and richer stocks should be introduced. It should be found out which variety is the best suited to local conditions of climate and soil. The varieties yielding the highest percentage of colouring matter should be propagated by a generous distribution of the particular seed and detailed instructions should be provided for its cultivation. There should thus be not only a good yield of the plant per acre but also a good yield of the dye per plant. Instead of raising the same crop of the dye plant year after year, alternative crops should be recommended by way of rotation in order to recoup the soil. The plants which should receive particular attention as far as this province is concerned, are *Al* (*Morinda tinctorium*), *kamela*, *saceower*, *indigo*, *turmeric*, etc. Other raw materials such as *palas* and *dhawai* flowers, *lac-dye*, i.e., those growing in the forest, are found in such large quantities that they do not demand any attention at present.

2. Instead of the dyer having to deal with crude materials such as the roots, wood, bark, leaves, flowers or fruits, attempts should be made to prepare strong extracts containing the colouring constituents in a convenient form. It is very necessary that the manufacture of the dye from the plant substances should be considerably improved.

3. A study should be made of the quality of water, cleansing agents, the mordants, the auxiliary substances, wetting-out agents, etc., particularly of Indian origin, which can be used with the indigenous dyes.

4. The processes employed for the application of these dyes to the various fibres, such as cotton, wool, silk, sann hemp, etc., should be studied thoroughly in order to simplify them, because one of the great drawbacks of the vegetable dyes is that the method of application is very cumbersome, complicated and long. The process of finishing is no less important and should receive adequate attention.

5. Two or three centres should be opened in the province where dyeing should be carried out only with the help of indigenous dyes.

It has already been mentioned that dyeing industry is an auxiliary to the spinning and weaving industries. Irrespective of the merits and demerits of the revival of home spinning and weaving, some centres are already working and more are being opened for the purpose. The use of indigenous dyes should be introduced, encouraged and made exclusive at such centres. Under the Congress membership pledge clause, khadi enjoys a certain amount of guaranteed consumption, and the benefit of this shall also

*In making these suggestions, the primary consideration has been the creation of fresh employment for the villagers who can be engaged in the production and use of the indigenous dyes. The question of competition with the cheaper and better coal-tar dyes has been ignored. It may, however, be stated that these may not yield the anticipated results within a definite period. The items one to four are of all India interest.

accrue to the cultivators, collectors, and users of indigenous dyes. And by the way, the traditional knowledge and experience of the art will not be lost.

An attempt should also be made to make *gulal*, a coloured powder used at the time of *Holi* and in marriage ceremonies, and *kunku*, used by ladies as a cosmetic.

No pretentious claim should be made that the indigenous dye industry† will rehabilitate itself in the course of years. It may, but it is doubtful. Art is wasteful and it is in this relation that a revival of this old industry to a limited extent under Government patronage can be recommended. This old art, the marvel of the ages should not be allowed to vanish through an exaggerated sense of economy. If in this attempt the use of a few indigenous dyes could be established on an economic basis, it would not be a mean achievement.

The processes involved in the manufacture of dyes in factories are not very wholesome when compared with the growing of plants or animals in the open. If the production of dyes from the animal and vegetable kingdom and their application could be developed to such an extent that they are not more expensive than the synthetic dyes, and produce as good an effect, it would be a wonderful achievement.

We are told that vegetable dyes are still used by a very insignificant number of people living in remote parts of Wales.

It must be remembered that the foreign concerns which sell their dye-stuffs in this country will not remain inactive. They will sell their dyes, which we start making here, very cheap in order to discourage and smother their production in this country, whereas they will increase the prices of the other dye-stuffs which we cannot get from the plant or animal kingdom.

The publication of formulæ and processes using indigenous dyes, mordants and auxiliary substances may suggest itself as one of the means of encouraging the consumption of indigenous dyes. As very little dyeing is done at home, this will have little effect on the consumption of imported dyes although our main object is to displace the foreign dyes with those of Indian produce or manufacture.

A dye-stuffs factory cannot be started in the province at present for various reasons such as lack of raw materials and of specialised technical knowledge and experience. It is an industry which is of all India importance and should be tackled as such. Its establishment in India is long overdue and is necessary for more than one reason. No price in money should be considered too high to start it on an all India basis, if we wish to maintain our independence, security and position in the vanguard of nations. Dye-stuffs factories serve not only for the production of dye-stuffs but also for that of war materials (ammunitions, tear gases), pharmaceuticals (drugs, etc.), antiseptics, chemicals, etc., whenever the emergency arises.

†It may be emphasised here that the cultivation of dye plants cannot be an effective or useful substitute for production in a dye-stuffs factory, as the vegetable dye-stuffs are, and always must be, incapable of meeting the demands of the dyeing industry at its present scale, both as to quality and quantity.

APPENDIX A

Statement giving the area in acres under cultivation of indigo and other dyes † in the Central Provinces and Berar.*

Year (ending 31st May)	Indigo	Other dyes	Total area under dyes
1892	..	1,696	1,696
1900-01	31	1,204	1,235
1910	42	79	121
1914	32	22	54
1915	18	39	57
1916	21	60	81
1917	51	49	100
1918	35	42	77
1920	19	75	94
1925	14	99	113
1930	..	54	54
1931	..	43	43
1932	3	34	37
1933	6	37	43
1934	..	..	48
1935	9	39	48
1937	14	26	40

*Information gathered from the statistics collected by the Land Records Department.

†It is not known whether these include safflower; in view of the present small area, it would appear as though they do not.

APPENDIX B

1900-01

Area in acres under indigo and other dyes in different districts of Central Provinces and Berar.

1892

Indigo.—Nil.

Other dyes.—Damoh 226, Mandla 31, Nimar 342, Nagpur 156, Chhindwara 224, Bhandara 87, Balaghat 45, Raipur 526 and Bilaspur 59.

Total.—Indigo nil, Other dyes 1,696) 1,696 acres.

Indigo.—Saugor 3, Jubbulpore 3, Nagpur 21, and Wardha 4.

Other dyes.—Saugor 18, Damoh 18, Jubbulpore 2, Narsinghpur 6, Nimar 16, Betul 119, Chhindwara 137, Wardha 55, Nagpur 73, Bhandara 2, Balaghat 49, Raipur 670 and Bilaspur 39.

Total.—(Indigo 31, Other dyes 1,204) 1,325 acres.

1910

Indigo.—Saugor 1, Jubbulpore 4, Nagpur 5, Chhindwara 4, Narsinghpur *nil*, Bhandara *nil*, Akola 1, Amraoti 6, Buldana 19 and Yeotmal 2.

Other dyes.—Saugor 15, Damoh 7, Nagpur 5, Wardha 1 and Balaghat 8, Narsinghpur 22, Bhandara 12, Akola *nil*, Amraoti *nil*, Buldana 9, and Yeotmal *nil*.

Total.—(*Indigo* 42, *Other dyes* 79) 121 acres.

1914

Indigo.—Jubbulpore 13, Nagpur 1, Hoshangabad 9, Narsinghpur 1, Akola 7, and Yeotmal 1.

Other dyes.—Saugor 12, Balaghat 6, Amraoti 2, and Narsinghpur 2.

Total.—(*Indigo* 32, *Other dyes* 22) 54 acres.

1915

Indigo.—Bhandara 14, Amraoti 4.

Other dyes.—Saugor 20, Jubbulpore 13, Nagpur 4, Chhindwara 1, Bhandara *nil*, and Raipur 1.

Total.—(*Indigo* 18, *Other dyes* 39) 57 acres.

1916

Indigo.—Amraoti 3 and Yeotmal 18.

Other dyes.—Saugor 14, Jubbulpore 13, Chhindwara 6, Nagpur 6 and Balaghat 18.

Total.—(*Indigo* 21, *Other dyes* 60) 81 acres.

1917

Indigo.—Saugor 2, Damoh 1, Hoshangabad 6, Amraoti 11, Buldana 2, Wardha 10 and Yeotmal 19.

Other dyes.—Saugor 18, Hoshangabad 5, Chhindwara 1, Wardha 3 and Nagpur 1, Balaghat 21.

Total.—(*Indigo* 51, *Other dyes* 49) 100 acres.

1918

Indigo.—Saugor 9, Damoh 1, Hoshangabad 8, Chanda 1, Amraoti 14, and Buldana 2.

Other dyes.—Saugor 19, Balaghat 14, Amraoti 3, Chhindwara 2, and Nagpur 4.

Total.—(*Indigo* 35, *Other dyes* 42) 77 acres.

1920

Indigo.—Saugor 3, Damoh 1, Mandla 3, Hoshangabad 4, Chanda 4, Bilaspur 2 and Yeotmal 2.

Other dyes.—Saugor 20, Chhindwara 1, Wardha 3, Nagpur 2, Balaghat 28 and Amraoti 21.

Total.—(*Indigo* 19, *Other dyes* 75) 94 acres.

1925

Indigo.—Raipur 1 and Yeotmal 13.

Other dyes.—Saugor 23, Damoh 1, Narsinghpur 7, Nagpur 26, Chanda 33 and Balaghat 9.

Total.—(*Indigo* 14, *Other dyes* 99) 113 acres.

1930

Indigo.—*Nil*.

Other dyes.—Saugor 13, Wardha 4, Chanda 24, Bhandara 1, Balaghat 11 and Drug 1.

Total.—(*Indigo* *nil*, *Other dyes* 54) 54 acres.

1931

Indigo.—*Nil*.

Other dyes.—Saugor 12, Wardha 3, Chanda 13, Bhandara 3, Balaghat 10, Drug 1 and Raipur 1.

Total.—(*Indigo* *nil*, *Other dyes* 43) 43 acres.

1932

Indigo.—Nimar 1 and Amraoti 2.

Other dyes.—Saugor 10, Seoni 1, Chanda 10, Bhandara 1, Balaghat 9 and Amraoti 3.

Total.—(*Indigo* 3, *Other dyes* 34) 37 acres.

1933

Indigo.—Raipur 1, Bilaspur 1 and Amraoti 4.

Other dyes.—Saugor 5, Wardha 2, Chanda 17, Bhandara 5, Balaghat 6, and Bilaspur 2, and Amraoti *nil*.

Total.—(*Indigo* 6, *Other dyes* 37) 43 acres.

1934

Indigo.—*Nil* 1.

Other dyes.—Saugor 4, Chanda 31, Bhandara 8, Balaghat 2, Drug 2 and Buldana 1.

Total.—(*Indigo* *nil*, *Other dyes* 48) 48 acres.

1935

Indigo.—Bhandara 8, and Drug 1.

Other dyes.—Saugor 4, Wardha 4, Chanda 16, Balaghat 10, and Amraoti 5.

Total.—(*Indigo* 9, *Other dyes* 39) 48 acres.

1937

Indigo.—Chanda 2, Bhandara 3, Raipur 6, Bilaspur 2 and Akola 1.

Other dyes.—Saugor 3, Chanda 14 and Balaghat 9.

Total.—(*Indigo* 14, *Other dyes* 26) 40 acres.

APPENDIX C

Statistics from the Census Reports of the Central Provinces and Berar, Part II, 1921 and 1931 regarding the number of persons engaged in the dyeing, bleaching, printing, preparation and sponging of textile industries.*

Name of district	1921			1931		
	Male	Female	Total	Male	Female	Total
	Actual workers			Total earners (principal occupations)		
Central Provinces and Berar ..	3,497	1,859	5,356	2,779	561	3,340
Central Provinces British districts and Berar.	3,486	1,855	5,341	2,761	557	3,318
Central Provinces British districts.	2,450	1,443	3,893	1,963	438	2,401
Jubbulpore division ..	827	303	1,130	558	137	695
Saugor ..	641	113	754	168	40	208
Damoh ..	..	68	68	143	31	174
Jubbulpore ..	35	65	100	218	53	271
Jubbulpore city ..	25	7	32	53	17	70
Mandla ..	75	48	123	5	..	5
Seoni ..	76	6	82	24	13	37
Nerbudda division ..	621	566	1,187	642	153	795
Narsinghpur ..	204	142	346	122	72	194
Hoshangabad ..	164	124	288	223	37	260
Nimar ..	134	201	335	145	15	160
Betul ..	48	69	117	48	22	70
Chhindwara ..	71	30	101	104	7	111
Nagpur division ..	921	487	1,408	761	148	809
Wardha ..	132	84	216	77	4	81
Nagpur ..	429	247	676	396	90	486
Nagpur city ..	224	64	288	201	23	224
Chanda ..	109	42	151	121	21	142
Bhandara ..	122	83	205	95	22	117
Balaghat ..	129	31	160	72	11	83
Chhattisgarh division ..	81	87	168	2	..	2
Raipur ..	9	4	13	..	..	..
Bilaspur ..	72	83	155	1	..	1
Drug ..	..	..	..	1	..	1
Berar division ..	1,036	412	1,448	798	119	917
Amraoti ..	307	111	418	306	32	338
Akola ..	129	30	159	162	28	190
Buldana ..	243	128	371	132	26	158
Yeotmal ..	357	143	500	198	33	231
Year of census ..	..	..		Cotton dyers	Printers	Total
1891 ..	..	..		15,444	2,572	18,016
1901 ..	..	..		6,960	289	7,249

*Only very few of these may be using indigenous dyes.

APPENDIX D

DYES

Exports

(Figures taken from the Accounts relating to the Seaborne Trade of India.)

		Quantity					
Principal article		Twelve months, 1st April to 31st March					
		1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
		Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Indigo	..	500	544	350		No figures recorded.	
		Value					
Principal article		Twelve months, 1st April to 31st March					
		1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
		Ra.	Ra.	Ra.	Ra.	Ra.	Ra.
Indigo	..	96,863	1,06,831	66,774		No figures recorded.	
		Imports					
		Quantity					
Principal articles		Twelve months, 1st April to 31st March					
		1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Indigo	..	1,123,944	1,272,925	1,213,913	799,851	904,909	97,835
Total of dyes obtained from coaltar—							
From United Kingdom	..	1,959,993	1,992,773	2,184,161	11,775,052	2,193,265	1,471,404
From Germany	..	8,777,535	13,433,981	13,854,353	11,665,527	14,945,701	7,917,546
From Switzerland	..	563,146	654,395	675,119	457,931	653,941	686,042
From Japan	..	999,857	1,194,178	1,404,542	1,155,579	990,402	294,490
From United States of America	..	1,072,829	1,023,713	1,427,137	790,673	761,810	745,537
From other countries	..	528,747	1,057,268	909,371	1,103,927	1,343,226	935,417
Total	..	13,902,107	19,356,308	20,451,683	16,948,689	20,888,345	12,050,436
		Imports					
		Value					
Principal articles		Twelve months, 1st April to 31st March					
		1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
		Ra.	Ra.	Ra.	Ra.	Ra.	Ra.
Indigo	..	16,20,671	17,68,331	16,93,979	10,58,688	12,67,630	10,09,348
Total of dyes obtained from coaltar—							
From United Kingdom	..	30,09,089	32,75,363	41,57,974	36,51,262	36,92,052	32,23,167
From Germany	..	1,35,20,344	1,90,62,681	2,01,44,542	1,79,01,225	2,50,58,947	1,70,33,198
From Switzerland	..	15,29,884	17,06,527	20,12,648	15,59,416	20,37,333	29,58,204
From Japan	..	9,96,916	10,17,853	12,33,212	10,66,916	9,55,010	4,61,229
From United States of America	..	10,64,385	10,71,486	14,24,447	7,63,426	7,96,928	7,85,609
From other countries	..	9,60,441	12,52,255	13,89,992	11,51,725	17,35,366	16,52,817
Total	..	2,10,81,059	2,73,86,165	3,03,62,920	2,60,93,970	3,42,75,636	2,61,14,224

APPENDIX E

Bibliography

- (1) Monograph on the Dyeing Industry of the Central Provinces for the year 1896, by R. V. Russel, I.C.S.
- (2) Watt's Dictionary of Economic Products.
- (3) Commercial Products of India by Sir George Watt.
- (4) Memorandum on Dyes of Indian Growth and Production by Liotard.
- (5) Various books on Organic Chemistry with particular reference to Dyestuffs.
- (6) District Gazetteers of Central Provinces and Berar.

APPENDIX F

Questionnaire on Dyeing Industries with Special Reference to Vegetable Dyes

(The information in the Monograph on Dyeing Industry by R. B. Russel, 1896, need not be quoted).

1. What are the local and English (botanical also, if available) names of the plants from which dyes are made? Are these cultivated or grown wild in the forest? Which parts of the plant—whether root, leaf, bark, flower, berry—are used for this purpose? What colours do they give? During which period of the year are these materials collected and worked?

2. What are the processes by which dyes are extracted from these raw materials for dyeing yarn or clothes? Are these used for dyeing all classes of fibre such as cotton, silk, wool, or for only one particular class? What are the mordants (auxiliary substances for fixing dye on the fibre) used with these dyes?

3. Is the dye extracted only at the time of use or is it prepared in a form which can be used at any time; if so, is it stored in liquid, powdered or paste condition? Is there any other economic product except the dye available from the plant?

4. What are the shades available and the formulæ employed at present to get them?

5. Whether these dyes are fast colours, i.e., fast to washing and light?

6. How many dyers using vegetable dyes are following this occupation in your district? Is it a particular class which is engaged in this work? What is their present economic condition? What are the vegetable dyes they use and in what quantities?

7. Is there any prospect of reviving this industry? (In this connection please quote the views of the dyers themselves.)

Any other information which you may wish to communicate on the above will be welcome.

For your convenience, below is given a list of some of the sources of dyes in use decades ago in this province:—

- (1) *Morinda tinctoria* and *citrifolia* (Al plant).
- (2) *Woodfordia floribunda* (dhawai tree).
- (3) *Rubia cordifolia* (Indian madder) 'manjeet' or 'manjestha'.
- (4) *Carthamus tinctorius* (safflower, Kusum).
- (5) *Terminalia chebula* (Harra).

- (6) *Curcuma longa* (Turmeric, hald).
- (7) *Indigofera tinctorium*, (Indigo N).
- (8) *Acacia arabica* (Babul).
- (9) *Bulca frondosa* (flowers of palas Tesu ke phool).
- (10) *Soymida febrifuga* (Rohan tree).
- (11) *Acacia catechu* (Khair tree).
- (12) *Mallotus philippensis* (Kamela t).
- (13) *Ventilago maderas patan* (pitti; pita; Suralpati).
- *(14) *Caesalpinia Sappan* (Indian lo; patang ki lakdi).
- *(15) *Symplocos racemosa* (Lodh).
- *(16) *Terminalia tomentosa* (Saj).
- *(17) *Phyllanthus emblica* (Aonla).
- *(18) Lac dye.

*These had not been included in the question sent to the districts.

CHAPTER XIX.—BRASS INDUSTRY

(See Part I, Vol. I, Page 27.)

(Submitted by one of the Schools of Crafts, Central Provinces and Berar)

Brass-working is an old industry which has been carried on in this country for at least five hundred years. It was a very prosperous industry in the past and supplied a demand of the local and neighbouring villages. But the cheap machine-made brass, mostly of aluminium, are ousting this industry from its former place.

Towns which are noted for brass industry in this province, are situated mostly in the eastern and northern parts of the province. Mention may be made of Bhandara, Chichli in Narsinghpur sub-division, Handia, Seoni Malwa in Hoshangabad district, Lodhikheda in Chhindwara district. These Bhandara and Chichli are known in the province beyond their narrow borders. The trade of Bhandara in brasswares amounts to about 5 to 6 lakhs of rupees annually, that of Chichli to about 3 to 4 lakhs.

Besides charcoal, firewood, sal ammoniac etc., the raw materials for this industry are brass sheets and brass-cuttings. These were locally produced in the past but they are imported from foreign countries chiefly from Japan, Germany, and England. The reason why brass sheets are not produced now in this country is the high cost of production which the indigenous industry involves. The industry is dependent on the supply of raw materials from outside the country except for those articles which are made by casting for which brass cuttings are locally available. Unless the manufacture of brass sheets is started in this country, it is very difficult to improve this industry, as a major portion of costs involved goes for chasing brass sheets.

The class of people originally engaged in this industry are known as *Tameras*, *kans*, *Kasars*, but now other lower caste people have also taken it up. Generally, a skilled worker employs one or two other skilled workers and a few unskilled workers. In a few places, however, he takes the help of the members of his family. In the past, there were many skilled workers in these places who were expert in workmanship and their design was appreciated even in foreign countries.

tastes of people are changing with the march of time and the number of such skilled labourers is decreasing due to lack of demand and appreciation of their work. The makers of brassware are hard-working and skilful in their occupation, and the only thing they require is proper guidance in the form of scientific training and the consequent benefit resulting from the advantages of the division of labour, as at present all the processes are done by one skilled labourer.

To set up a unit of making brasswares on a small scale, a *Kasera* requires about Rs. 200 to Rs. 300 only. The tools and implements required are simple, and most of these are locally prepared with the exception of a few which are imported from other places.

The process of manufacture is as follows :—

The brass sheets are cut into pieces of the size required for a particular ware. They are then shaped into different parts of the ware by beating and the various parts are joined together by soldering or brazing. The ware is then put on a wooden support and finished off. The designs, if any, are engraved on the ware after the article is complete.

The chief sources of finance to this industry are the moneylenders and shop-keepers, who stock brass sheets. The producers, in many cases, sell their products to these shop-keepers. On the other hand, some have their own shops. On account of general economic depression among the masses the demand for these wares has declined with simultaneous deterioration in the financial condition of the brass workers too.

The demand for brasswares is mainly local. Stall charges are paid by the merchants to the Municipal committees. The brasswares of Hoshangabad used to find a good market in a number of neighbouring villages in the Bhopal State; it is now reported that the State people have to pay a heavy duty in crossing the Nerbudda river; hence they have now ceased to come to purchase these articles. The Nerbuda ghats are auctioned for the collection of ferry charge and the contractors charge heavy dues from the people of these neighbouring States which hampers the promotion of mutual business relations. The wares of Chichli are exported from Gaderwara, a station on the Great Indian Peninsula Railway, which is about 16 miles by road from Chichli. This road is in a very unsatisfactory condition in spite of the fact that brass workers pay about Rs. 10,000 in taxes.

Analysis of cost of production :—

	Rs. s. p.		Selling price	
	Rs.	s. p.	Rs. a. p.	
Raw materials	0	8 0	1	0 0
Wages of the unskilled labour.	0	4 0	..	..
Rents, wear and tear of tools and implements, etc.	0	2 0	..	..
Total cost	0	14 0		
Profits	0	2 0		
			1	0 0
			1	0 0

The producers make annas two on an article worth Re. 1, which is the return for their personal labour and skill. The difference between the cost and selling prices is about 12½ per cent. excluding middlemen's profits. There are some producers who work on a contract basis and manufacture their wares at Rs. 8 per maund for the retailers. The average income of a skilled producer is about Rs. 200 to Rs. 250 per year in Hoshangabad, and from Rs. 75 to Rs. 100 in Chhindwara and other places.

The industry, as it is today, is dependent on foreign countries for the supply of its chief raw material, i.e., the brass sheets.

However, there is a possibility for the expansion of the industry in case the producers are helped in both the technical and marketing side of the industry. For this we suggest the establishment of a Technical Institute in the province, which should train the producers on modern scientific methods of production by sending its experts to the centres of this industry. Again, a central shop at Nagpur should undertake to stock these wares for advertisement and to create a demand among the people. One of the functions of this shop should be to supply the producers with information regarding changes in the tastes of people and other marketing conditions.

Other articles such as buttons, parts of machinery, etc., can profitably be manufactured but no start has yet been made in this direction.

CHAPTER XX.—BRONZE AND BELL METAL INDUSTRIES

(See Part I, Vol. I, Page 27.)

(Submitted by one of the Schools of Handicrafts, Central Provinces and Berar.)

The bell metal and bronze industry is carried on in Mandla, Dhamda (Drug district), Waraseoni (Balaghat district), Ratanpur, Champa, Rajim and Narsingpur, but that of Mandla, Dhamda, Drug and Waraseoni enjoys a good reputation and the wares made there are eagerly sought for. As a result, those engaged in the industry enjoyed prosperity which was not very noticeable in view of their indulgence in gambling. The present state of the industry is very deplorable, as the families engaged in it can scarcely eke out a living in spite of their hard work.

Cheap and yet shining utensils made of gun metal and *bela*—a kind of bronze alloy—brass and aluminium, are displacing bell metal wares.

Lotas (water jugs), *katoras* (drinking glasses, bowls) and artistic articles according to the specifications of the customer are generally made. As the wares take a high polish, they look very bright and attractive. Organic acids do not attack the alloy and hence food kept in utensils made out of it does not become poisonous. This is an added reason for their popularity and continued demand.

The people generally engaged in this industry are *Bharewas*, *Kaseras* and *Tameras*.

Men are skilled workers, whereas women and children do the unskilled work. Every man engaged in this work employs a labourer to turn the lathe while the employer himself shapes the wares. As the work is very tiring, this labourer has to be paid six to eight annas per day. The income of the family varies but is hardly ever more than Rs. 200 per year.

The raw materials for the true *kansa* or bell metal alloy are copper, tin and lead in the proportion 16:4:1. These metals are imported by local merchants who have to pay a small duty—a terminal tax—of annas two per maund of metal imported into the town. Clay, horsedung, cowdung-cakes, firewood, resin or *sal*, and vegetable oil are some of the other raw materials used.

For one working unit, one skilled person and one labourer are required and the members of the family help in the work. The equipment is very simple and the tools including the lathe are made locally.

The middleman who is a metalware merchant carries stock of other kinds of wares (excluding aluminium) also.

Finance.—Nearly ten years ago, an industrial co-operative society of *Bharewas* was organized at Mandla by the Department of Industries and Co-operative Societies. It proved a failure and instead of ameliorating their condition, it has sunk them into heavy debts from which they have not been able to extricate themselves even to this day in spite of their hard work.

When they are short of money, they go to the merchant, get the metals, make the requisite articles and take them back to the same merchant and receive a mutually agreed amount as wages. This is invariably very low and scarcely keeps them from starvation. In such needy cases, which are frequent, the merchant makes double his usual profit.

The goods are sold locally or sold at important fairs or are sent to neighbouring districts in the province. Articles of special design are also sent abroad, e.g., to Great Britain, United States of America, etc.

It is usually the merchants that take the goods to the markets. They have to pay from two to four annas per shop. The artisans themselves carry no stock.

If demand is increased by providing marketing facilities the output can be increased by improving the processes. The prices will not fall much but the condition of workers will be improved.

A co-operative store should be opened from where the *Bharewas* can get the required metals for making the desired articles. The wares made of the alloy should be deposited in the stock and the worker can be paid three quarters of the difference between the cost of raw materials and the estimated selling price. There should be a clearing day once every month when the *Bharewas* will get the remaining part of their payment on whatever goods have been sold during the period since the last clearing day.

This arrangement will create an impasse during the rainy season when the sale of bell-metal ware declines very much. The capital required therefore should be such that this slack period can be successfully tided over.

The *Bharewas* should be divided into groups of four or five families each so that every member of a group is liable for the delinquency of the other.

Process of making bell metal ware.—Clay is mixed with dried, powdered, and well-shifted horsedung and made into a working paste with water. A mould is made of this. It is dried and turned on a lathe to give it the requisite shape.

Resin from *sal* tree and any cheap vegetable oil are heated together for nearly two hours, the mixture is filtered through a gauze cloth, and then poured into water. This gives a wax-like substance which is boiled with water and then placed on a wooden plank and made into a uniformly thick thread. This thread is rolled carefully on to the mould till it is completely covered with it. The waxed surface is smoothed with a heated flat iron.

The waxed mould is then covered with *garan* which is made from a mixture of well-powered burnt clay (obtained from previous operations) and cowdung. This is dried and covered with a layer of yellow earth. This process is known as earthening or *matiyana*.

Then follow the processes of attaching a projection (*khunt lagana*), attaching a wax seal (*mohariya lagana*) which melts off and allows the molten alloy to flow down into the space occupied by the wax.

Gharia is a cylindrical vessel which is made of clay and paddy husk. Before attaching it by means of clay, to the projection mentioned above, weighed quantities of the ingredients are placed in it.

The whole thing, i.e., the mould with the *gharia* below, is placed in a furnace and fired with firewood and cowdung cakes. When the metals constituting the alloy are melted—and it takes usually two hours to do so—the flames assume a greenish tinge. Each mould is taken out with pincers one at a time, the *gharia* is well-shaken to make sure that the alloy is in a fluid state, and the molten metal is poured into the mould through the cavity (*mohariya*) into the hollow space previously occupied by the wax.

After cooling overnight, the baked earth is removed from the inside of the moulded utensil. It is made red hot in a furnace and quenched in cold water. This process is called tempering or *pani chaddhana*. The ware is mounted on the lathe and turned and shaped as desired. Finally, it is polished on the lathe with a piece of cloth.

Instead of using copper, tin and lead in the proportions of 16:4:1, which turns out to be an expensive alloy, economic pressure has forced the *Bharewas* to use the following alloys as substitutes, against their will:—

- (1) Gun metal or *kalpa*, the name by which it is locally known.

- (2) 'Bela' or an inferior bronze which is imported from Gujrat side:
 (3) A mixture of gun metal and bela bronze, approximately 50:50.

The utensils made from these alloys are inferior looking and are sold as those made from second grade bell metal.

These utensils are sold by weight and their respective rates are given below:—

Name of metal	Cost of metal	Cost of raw materials (i.e. metal and mould)	From producer to middleman	From middleman to consumer
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
Gun metal	0 10 0	0 13 0	1 2 0	1 6 0
'Bela' metal	0 12 0	0 15 10	1 5 0	1 8 0
Gun metal and 'bela bronze' (50:50)	0 11 0	0 15 0	1 3 6	1 10 0
True 'kansa' or bell metal	1 2 6 (See below)	1 6 0	1 7 0	1 14 0

	Seers	Price per seer	Cost of alloy
		Rs. a. p.	Rs. a. p.
Copper	16	0 10 0	10 0 0
Tin	4	3 4 0	13 0 0
Lead	1	0 4 0	0 4 0
Total	21 (less 20 chhataks as working losses)		23 4 0

The cost of alloy per seer is approximately Rs. 1-2-6.

On an average one skilled worker can produce articles (large and small) weighing about five seers.

In years gone by, bell metal wares were sold at Rs. 3 to Rs. 4 per seer.

Now the price has fallen to Rs. 1-14-0 for the true bell metal ware and still lower for the substitute.

COST OF PRODUCTION

(1) For 150 clay moulds.—

	Rs. a. p.
Clay (one boatful)	0 8 0
Horse-dung dried (three bags)	0 6 0
Work of reducing it to fine powder	0 4 0*
10 pots of water from the river	0 1 0
Mixing (half day)	0 3 0*
Making of 150 moulds from the above clay—2 days. One skilled man 12 annas per day. One unskilled man 6 annas per day.	2 4 0*
Preliminary preparatory cost	3 10 0
Turning the dried clay mould on the lathe to give it shape	
40 pieces per day for four days. One skilled worker at 12 annas and one unskilled at 6 annas (per day).	4 8 0
30 seers of resin at four seers a rupee.	7 8 0
Eight seers of oil for making wax with resin.	2 0 0

	Rs. a. p.
One yard of cloth (for seven batches)	0 4 0
Fire wood	0 8 0
For making threads (skilled work) rolling it on the moulds (unskilled work), ironing the threads to make the surface smooth (<i>chiknana</i>).	1 8 0
Applying 'garan' on the wax ('garan' is a preparation from powdered burnt clay and cow-dung.)	8 7 0
Yellow earth, two boatful at annas 8 per boatful Re. 1. Three bags paddy husk at 2 annas per bag (6 annas).	1 6 0
One day for one unskilled worker to mix (6 annas).	0 6 0*
To put covering— one skilled worker takes two days at 12 annas per day.	1 8 0*
To attach projection half day.	0 3 0*
To attach the wax seal (unskilled labour) one day.	0 6 0*
To attach the pot containing the alloy one day.	0 6 0*
Total	28 14 0
Preliminary preparatory cost (see above).	3 10 0
Total cost of 150 moulds	32 8 0

	Rs. a. p.
The cost of one mould ..	0 3 6
The furnace is worked for seven moulds only.	
Cost of seven moulds at 3 annas 6 pies per mould (see above).	1 8 6
Fuel for furnace ..	0 6 0
One unskilled labourer for half a day attending to the furnace.	0 3 0*
One and a half day's unskilled labour for removing earth from inside the pot, making the pot red hot and quenching it in water (tempering).	0 3 0*
One day (turning on lathe) for one skilled and one unskilled worker.	1 2 0*
	3 6 6
Depreciation of tools ..	0 4 0
Total working cost of seven ..	3 10 6
But generally two get broken hence only five remain.	
Therefore, the charge per <i>lota</i> ..	0 11 9
One seer pure metal ' <i>kansa</i> ' ..	1 2 6
Total price per <i>lota</i> ..	1 14 3
Producer's selling price ..	1 7 0
Shopkeeper's selling price ..	1 14 0

N. B.—Labour charges marked '*' are for the time being not taken into account. The total cost of 150 moulds would then be Rs. 12-9-0.

Then the cost of seven moulds would be nine annas four pies.

Again excluding the labour charges at the furnace we get a total expenditure of (Rs. 0-9-4—0-6-0—0-2-0)—Rs. 1-1-4.

Thus Rs. 1-1-4 comes to be the charge on five *lotas* two being broken.

	Rs. a. p.
The cost of making one <i>lota</i> (excluding the cost of metal).	0 3 6
One seer of metal used ..	1 2 6
Producer's cost price ..	1 6 0
Producer's selling price ..	1 7 0

CHAPTER XXI.—TOY MAKING

(See Part I, Vol. I, Page 27.)

(Submitted by one of the Schools of Handicrafts, Central Provinces and Berar.)

Toy-making as a cottage industry has great possibilities in this province. A large number of earthenware toys and a small number of wooden toys are produced by the village potters and carpenters respectively. These find a ready sale in the village markets, specially during fairs. Tastes are changing even among children, and earthenware toys

are being discarded in favour of better finished articles, such as the imported toys made of celluloid, etc.

In the Wardha district wooden toys are made at Rasulabad and Deoli by carpenters and *chitris* who bring the wood required, which is available locally, free of cost and taxes. Very few families are engaged in this occupation at present. As the articles prepared by them are not attractive, they are little in demand on account of the severe competition with imported Japanese toys. The little that is sold is mostly at the *jatras* of Chincholi, Mangrul, Sonegaon, Kapsi, Virul, etc.

In the Mandla district, a few toys are made by hawkers and sold in fairs called *jatras*. Years ago, carpenters used to make a large number of toys of a limited variety but such toys are no longer to be seen.

In the Jubbulpore district, wooden toys are mostly made at Katni, Murwara and Katangi. Katangi is noted for its skilled wood carvers and Katni for its expert lacquer ware makers. The toys made at the Marble Rocks, Bheraghat, from soap stone are exported to distant places.

The extensive wooden toy-making industry at Ratanpur in the Bilaspur district is now in a moribund state. The *Kalam and Salat* wood which is the raw material required in this industry, is available tax-free from the nearest forest.

During the last few years a beginning has been made with encouraging results, in imparting some little training to the students of the carpentry section of the schools of handicrafts in the making of toys. The sale proceeds of toys show a good margin of profit.

Last year, instruction in toy-making and lacquer work was introduced in a separate section of the Cottage Industries Institutes at Jubbulpore and Akola and, as a result, the students could make beautiful toys.

The tools and appliances used for making toys are simple and can be had locally in every district for a few rupees.

One great difficulty in the successful working of the toy making industry is that the cottage worker is not able to realize enough money to meet his current requirements, as he has no facilities to dispose of his goods readily. The only remedy seems to be to provide the villagers who follow this industry with the services of a convenient marketing organisation for these articles.

Suggestions for improvements.—Wooden toys can be easily manufactured by any carpenter, if he is supplied with suitable models. Cranks required to impart the various kinds of motion in the models of different animals can be easily made. Toys with arrangements for locomotion appeal most to the children. Mechanical toys are, therefore, in increasing demand.

The making of toys from wood, cement, lac and papier mâché as a cottage industry deserves notice and consideration, as the necessary raw materials are easily available in plenty in the province. The finish must be attractive to obtain ready sales. Manufacture of clay dolls with dresses made from waste pieces of cloth dyed in bright colours can be successfully undertaken where good

clay is available. The districts of Saugor, Hoshangabad, Chhindwara and Jubbulpore seem to be best suited to this cottage industry. Lac toys and such articles as flowers, fruits, animals and paper weights are made in attractive colour and designs in appreciable quantities from the impure lac called *kiri* left in the tubular bags during the process of preparing shellac in factories. These toys are artistically painted and find a ready sale in the market. Such toys are being made in fair numbers at a few centres of shellac manufacture in Bengal and this can be profitably emulated at centres, such as Gondia and Bilaspur, in this province. The papier-mâché toys made from waste

paper, repulped and then moulded into shape after mixing it with some binding material such as a strong size of glue and paste. They are then beautifully painted and finished so as to give them a realistic appearance. Such toys are made at Jaipur and other places in northern India and are sold all over the country and also exported to Europe because of their attractive finish and beauty. Clever artisans can easily turn out such toys in this province, with a little training.

This is a good subsidiary industry for the carpenters in their off season during the rains. The fairs where toys have a brisk sale start soon after the rainy season.

Statement showing the Imports and Exports of Toys from the 1st April to 31st March.

Imports

Articles	1935-36	1936-37	1938-39
Toys and requisites for games and sports (including fishing tackle).	37,50,794	43,52,689	44,05,159

Exports

Articles	1935-36	1936-37	1938-39
Toys and requisites for games and sports including fishing tackle (other than firearms).	7,55,036	9,56,272	13,83,361

Figures taken from the 'Accounts relating to the Sea-borne Trade and Navigation of British India'.

CHAPTER XXII.—PAPER-MAKING AS A COTTAGE INDUSTRY

(See Part I, Vol. I, Page 28.)

(Submitted by the All-India Village Industries Association, Wardha.)

It was towards the tenth century that Mahmud of Ghazni introduced paper-making in India and as the art needs clean and soft water in plenty, it found its first footing in Kashmir, and later at Sialkot in the Punjab. During the Moghul period the art spread throughout the length and breadth of the country. Later, the Peshwas gave an impetus to it and at one time, therefore, the country was spotted all over with paper factories working full blast and employing labour by the thousands. There was a suitable division of labour in each unit and this enabled the artisan to gain special skill and speed in his part of the process. Ideological and sentimental differences did not encourage Hindus to take to this art which, therefore, remained confined to the Muslims only. Even today, it is the monopoly of the Muslims as one finds in Jaipur, in Hyderabad State, in Bengal and other places.

Up to the middle of the nineteenth century the paper requirements of India in excess of the local supply were imported from China. During Sir Charles Wood's tenure of office as Secretary of State for India, however, all Government supplies were ordered to be bought from Great Britain. In the meanwhile, the Industrial Revolution in the West had made great chemical and mechanical strides eventually mechanising all productive

activities. Paper, too, began to be made with power machinery. It was produced cheap, in great variety and on a large scale. This production needed consumers, and India, already a vassal of Britain, was readily made one on account of its large consumption.

This British policy dealt a death blow to this cottage industry. One by one the factories fell. The *Kagzis* had perforce to give up the industry. The existing remains of factories tell a woeful tale.

Paper mills made their appearance in this country in due course and finished the work of destruction. The machinery in the Indian factories, the chemicals needed for the industry and the experts to run the concerns, were all imported from foreign countries. Yet the paper made in Indian mills had the support of the sponsors of the Swadeshi movement.

It is the 'Sahukar' who, in spite of all his other faults continues to use hand-made paper for his account books. His patronage is in fact the last leg on which the industry has been resting, though it is said that some States like Hyderabad, Jaipur, Nepal and others supply raw material such as old Government records to the *Kagzis* and offer to buy back the finished product. At the present time, the art of making paper from fibrous materials is well-nigh dead. Paper is made from waste mill paper, i.e., paper itself and this is the raw material used by the *Kagzis* these days.

The *Kagzis* have no organized marketing arrangements. They are conservative, and being the holders of a monopoly, do great harm to the industry by their reluctance to teach their craft to others who might help them to produce paper of better quality. As the production is restricted, the prices are high. As a result of this, people take to the use of mill or foreign paper. Hand-made paper is superior to that made in the mill in that it lasts longer and is stronger. Even in advanced countries they use hand-made paper for documents of importance. Such foreign hand-made paper, however, is only hand-lifted because the pulp is made with machinery.

The manufacture of paper consists of a series of operations each of which plays an important part in the production of the desired properties in any particular kind of paper. The general principles underlying these operations are the same irrespective of the original material or of the nature and quality of the finished paper.

The essentials of paper-making consist of two processes:—

- (1) The disruptive or splitting process which consists in separating cellulose in a greater or less degree of purity.
- (2) The formative or cohesive process in which the small fibres are brought together to form a web or sheet.

These are considered separately in detail below:—

The paper-making material, technically known as cellulose, forms the basis of the solid framework or plants together with gummy and resinous substances. The splitting operation consists in freeing the material from the extraneous substances by the use of chemicals which can dissolve out the incrustants. Since the inertness of cellulose is only relative to the concentration of these chemicals, it is of importance that great care be taken in the different processes through which the raw material must pass to ensure that none of the chemicals employed affect it adversely.

Any fibrous material can serve as a raw material for paper-making. The following considerations, however, limit the choice from amongst the many:—

- (a) The difficulty of reducing the material to pulp.
- (b) Quality and quantity of the fibre or cellulose that can be obtained from the raw material after subjecting it to the prescribed chemical treatment.
- (c) Resistance of the material to chemical or other treatments.
- (d) The relative quantities of the incrusting noncellulose matter.
- (e) Availability and abundance of the raw material.
- (f) The cost of the process.

While the above considerations determine the choice of the raw materials, they do not necessarily restrict the paper-maker to the raw products of the vegetable kingdom. Textile goods such as rags or other forms of fibrous material going to waste, e.g., ropes, may also be employed.

The waste materials from which paper has been successfully prepared at the headquarters of the All-India Village Industries Association, Wardha, comprise of rags, gunny bags, sann-hemp (in its raw state and the old articles made therefrom), the various grasses, straws of wheat, rice, etc., linseed stalk, plaintain tree bark, palas bark, bagasse, cotton stalk, *bhendi* (*Hibiscus esculentus*) stalk, leaves of the coconut and date-palms, etc.

To convert the raw material into pulp, it is first sorted out and freed from dust. It is then cut into pieces of uniform length, washed and retted or boiled with water to remove starches and other soluble matter and to make the material soft. After washing, the material is treated with alkalis, in hot or cold, to remove the residual non-cellulose matter, and then passed on to the *dhenki* (or stamping lever) where it is beaten till the individual fibres separate out. During the alkali treatment, care should be taken to see that the container is closed, as otherwise the cellulose may get oxidised and lose some of its desirable qualities. The pulpy mass from the *dhenki* is thoroughly washed and bleached, usually with bleaching powder, to make it white. Sometimes it may not be possible to bleach the pulp completely. In such cases, a large quantity of bleaching powder should not be used, as it tends to impair the strength of the fibres. After bleaching, the pulp is washed free from chlorine. The residual chlorine in the pulp is harmful and therefore it is better to use a 0.1 per cent. solution of "hypo" or sodium sulphite to eliminate the last traces of the bleach. Towards the end it is advantageous to give a "soaping" to the pulp. The fibres are thereby rendered softer and possess greater felting power. As the quality, the feel, the look and the strength of paper depends upon the successful carrying out of the different processes through which the material must pass before it is converted into pulp, it is well to emphasise that the greatest care must be taken in the discharge of the above operations, if the best results are to be obtained.

After the splitting process is over and the pulp has been obtained pure, there remains the actual paper-making, which consists in mechanically fabricating or felting together the ultimate or small units of the vegetable fibres, which have been reduced to a suitable condition and suspended in water, into a continuous web or sheet which is described here briefly. The operation is a skilled one. The concentration of the fibres in the pulp is maintained at a half to one per cent. so that the mixture is sufficiently fluid. The pulp is then well stirred to break the lumps in order to separate the individual fibres and to distribute them uniformly in the water. The sheet is fabricated on a mat, made of knotless grass woven with horse hair. While dipping the frame vertically into the vat, and turning it horizontally in the hands to bring it to the surface, the worker has to give simultaneously a to-and-fro and vibrating or shaking motion. At the same time, his thumb must be gently tapping the two detachable marginal strips of wood which keep the mat taut. The vibration helps the felting of the fibres in the sheet formation.

After the sheets are removed with or without the use of a napkin, the excess water is pressed out and they are dried on walls or as is convenient, and then sized. There are three ways of sizing the paper:—

- (a) Glue sizing,
- (b) Starch sizing, and
- (c) Rosin sizing.

The last of these is introduced in the vat before the paper is made, whereas the others are applied separately after the sheets are dry. The object of sizing is mainly to minimise the absorbent quality of the paper in order to prevent the spreading of ink when the paper is used for writing and to make the paper strong. Some germicides are added to keep off fungi, moulds, etc. The sized paper is polished with a conch or a hard smooth stone suitably embedded in a wooden handle. Lastly, the paper is cut to the required size and is ready for use.

Amongst the various paper-making materials available in the Central Provinces forests, the *salai* wood is very suitable for the making of straw-boards. The process of manufacture is essentially simple. The wood is first chipped into small pieces, which are then treated with freshly slaked lime, the resultant fibrous mass is beaten in a rotary beater or by hand to reduce it to a pulp, and finally the required board is moulded from the pulp and pressed either in a hand or hydraulic press, as the case may be. The estimated cost for a large scale plant to produce ten tons a day is given as three lakhs of rupees. The large amount of grass that is also obtainable in the forest is useful as an admixture with '*salai*' wood for the manufacture of straw-boards. Sabai grass (*Pollinidium binatum*), with long blades of remarkable smooth silky texture, grows wild over miles and miles of the area stretching from Nowegaon across Hirdagarh, Jaini and Parasia right up to Tamia. The present use of this grass is to make ordinary rope for local village needs. This large source may be suitable for the manufacture of paper.

Paper-making, as has been said so often, is both an art and an industry. A glance at the technique will show that the various items are of such a nature that they give work not only to men but also to women and children. There is scope for both skilled and unskilled labour as well as for heavy and light work. The dusting, sorting and cutting can be done by women. The operations of washing, beating, drawing water, etc., need men to do them. Lifting is work for a skilled person either a man or a woman. Sizing is again a suitable work for a woman. Mat-making, though light work, is an important item which needs a woman with an artistic taste to do it. The operations of glazing and cutting form men's work while those of drying and removing the dried paper may be entrusted to children. Envelope-making, etc., is left to women and children and so on. In short, the industry can draw forth the best in every individual skilled or unskilled, old or young, strong or weak, man or woman and provide gainful employment to many an indigent family. The annual earnings of the skilled workman

amount to about Rs. 180 and those of the unskilled to Rs. 100.

For one working unit five persons are required out of whom two will be skilled and the rest unskilled. The capital required for the unit is about Rs. 100. The equipment is not at all complicated and can easily be made locally. The margin of profit is ten per cent. Nearly two-thirds of the working expenses are labour charges.

It may be asked if the industry can be so widely distributed as to find employment for a large number. As a reply to this one can only say that paper meets a need which is growing every day. The *per capita* consumption in our country is about 1½ lb. which, when compared with the 20 lbs. or more in other countries, is appallingly low and if the standard of civilization is at all to be measured by the amount of paper that a nation uses, India is very backward. With the increase in literacy, villages are likely to require increasing quantities of paper. At present, the use of paper is limited to towns or other business centres. For documental, drawing, art, stationery and other purposes, hand-made paper will always be in demand.

In spite of what has been said above, the big factory has come in to produce paper for a great variety of purposes. It may not be possible for one to curtail one's needs. To cite only one example, newspapers have become almost indispensable to many. It is not, however, necessary that the paper used for printing newspapers be of fine quality. It may be of the cheapest kind, as it need not be lasting. Likewise, a good deal of wrapping paper need not be of good quality and so on. Such demands may be met by mills working under State control. It is true that paper of all varieties can be made on a large scale by employing machinery but to the cottages should always be reserved the privilege of making those varieties that are special, strong and durable.

At present the industry employs a number of chemicals imported from outside such as caustic soda, soda ash, bleaching powder, glue and so on. Since any industry that employs imported articles has merely a precarious existence, the All-India Village Industries Association is experimenting to see which of these can be made locally. Caustic soda and soda ash can be made from the indigenous alkaline resources like '*sajji matti*', etc., and lime. It is expected that these can be used as satisfactorily as the imported products. The *Kagzis* are making paper without using chemicals. They use only soap which can be made easily from the caustic soda lye which could be prepared in the villages. Investigations are in progress to find out if it is possible to bleach the pulps without using any chemicals, in which case the bleaching powder will not be required. Glue can very well be made from fleshings as is done at the Gosewa Charamalaya, Nalwadi, Wardha. In fact this forms one of the items in the scheme for the disposal of the carcasses. If these and similar problems are solved—and there is good reason to believe they can be—the industry will become completely indigenous and self-supporting.

In olden times, paper was made at Pan-cham Nagar in Damoh district, Jainabad in Nimar district and at Chanda. In the whole province at present there are only two paper-making centres. The one is at Maganwadi, Wardha the Headquarters of the All-India Village Industries Association and the other at Anji in Wardha district run under the auspices of the Association. An old student of the training school attached to the All-India Village Industries Association is in charge of the centre at Anji where paper is made out of tailor cuttings. Nine villagers are employed in the unit and 60 per cent. of the cost is towards labour charges. Students coming from the different provinces are trained at Maganwadi in this industry.

The two centres above named have proved the feasibility of establishing more such units in all the districts of the province. The students who had been deputed by the Government for training at Maganwadi may be placed in charge of the centres. The Government should grant them a subsidy till they are able to manage the centre independently or the Government may run them under its control. It will be well to appoint a few inspectors who will visit the centres from time to time and help those in charge by suggesting improvements in technique. They may further co-ordinate the efforts of the various centres. The Government should carry on research in regard to processes and appliances involved in the industry. In addition to this, the Government should supply the centres with raw material like press cuttings, waste paper and other forest fibres. It goes without saying that a Government anxious to revive this industry will use only hand-made paper for all its requirements. If this is done, several centres can spring up immediately to meet the demand.

In addition to these efforts, educational institutions should be encouraged to have this industry in their syllabus so that the "industrial sense" that is latent in the nation today may find expression from childhood. Such an arrangement will be of great educative and economic value both in villages and in urban areas.

During the year 1936-37, 18,500 tons of paper were produced by the Indian mills and 165,000 tons were imported from abroad. A cottage unit yielding two reams of paper daily will produce approximately four tons of paper per annum. This employs at least a dozen men. Even supposing that the mills under State control produce the imported quantity of 165,000 tons of paper that are meant for news reels and other special purposes, the other 48,500 tons—now produced by the Indian mills—which are used for documental and writing purposes can be made on a cottage scale. Thus there is room for 12,125 such units which can employ on the whole about 145,500 workmen under existing conditions of consumption and it is likely to be increased in the future. It is, therefore, easily seen that the paper industry alone can employ a large number of the unemployed in the country. At present, all the chances of employment on this account are being exported abroad.

An important factor contributing to the success of an industry is the quality of goods

produced by it. If the paper-making industry is to cover the length and breadth of the country, it is imperative to ensure that the quality should conform to definite specifications. If these are not enforced by a Central Board, there is bound to be unhealthy competition amongst the paper-makers which will result in the creation of false and arbitrary local standards based on merely the finish of the paper. For example, the ideal paper is not one which merely serves a purpose but that which possesses chemical and physical constants of a high order. Such constants make for permanence and utility. In some cases, tensile strength comes first, the other qualities such as durability, appearance and finish being of minor importance. In the case of bank notes, etc., there must be high resistance to wear and tear. Usually, such resistance is found in paper possessing great tensile strength. With printing, ordinary bill, and writing paper the chief requisite is opacity so that the writing or printing is not visible on the reverse side. In the case of such paper as parchment, the most important consideration is that of resistance to air and water. With art-paper the only quality which is particularly needed refers almost exclusively to the surface and finish of the paper and so on. These examples prove the case for separate standards of specifications for the different kinds of paper.

This province abounds in paper-making raw materials of a varied kind and a list of these is given at the end of this note.

Caustic soda, one important raw material required in paper-making, can be made by treatment with lime from the immense salt deposits and *sajji matti*, the former available at the Lonar lake and the latter in certain parts of this province, e.g., near Wardha, Gondia, etc. The industry can, therefore, be self-sufficient so far as this province is concerned.

In conclusion it must be stated that in order to safeguard the durability of documents, one of the strongest points in favour of hand-made paper, it is not enough to use quality papers alone. The inks which are used for writing on such papers must also possess desirable qualities, i.e., they should be proof against spreading, washing and fading.

The introduction during recent years of many varieties of coloured inks, particularly those advertised as non-corrupting, has created a danger which cannot be ignored. The fugitive colours that are often used without any permanent base are adversely affected by exposure to light and moisture with the result that the writings get dimmed with time. Hand-made paper, therefore, requires the use of harmless indelible inks for the desired effect. The All-India Village Industries Association has taken note of the fact and conducted initial investigation on the subject. Its findings are published in a recent bulletin. It is desirable that public opinion be created in this regard so that ink-making, a very important domestic occupation, may be restored to its former place and importance. Apart from this, paper manufacture in cottages leads to a number of other occupations some of which are artistic. Instances of these are, mat making, card-board work, designing on paper, envelope-making and

manufacture of *papier-mâché* articles, such as, toys, trays, small boxes, hand satchels, and many other useful things. It is hoped that the Government of our province would organize this industry on a wide basis and open up avenues of employment to its people and retain the wealth in its many villages.

CHAPTER XXIII.—LAC INDUSTRY

(See Part I, Vol. I, Page 29.)

(Submitted by Dr. R. S. Thakur.)

This note is based on the information supplied by the Deputy Commissioners in reply to a Questionnaire (Appendix A) appended at the end of the note, and on that collected from books and papers given in the bibliography (Appendix B). There are excellent bibliographies at the end of the two books, viz., Parry's "Shellac" and Glover's "Lac Cultivation in India". No attempt has been made in this note to cull all the relevant information from these books and papers, as it would amount to producing a large volume. The reader is, therefore, referred to the books and papers for detailed information.

What is lac?—Lac is a resinous exudation* from the insect *Laccifer lacca* which feeds on the sap of certain trees referred to as host trees.

Host Trees and their occurrence in the Province.—The following are the main host trees in Central Provinces and Berar:—

Butea frondosa (*palas*), *Schleichera trijuga* (*kusum*), *Zizyphus xylopyra* (*ghont*).

Less important host trees are *Zizyphus jujuba* (*ber*), *Acacia catechu* (*khair*), *Acacia arabica* (*babul*), *Ficus religiosa* (*pipal*).

Kusum tree is very common throughout the district of Raipur and in the Feudatory States of Kanker, Bastar and Kalahandi, all of which supply lac to the markets at Rajim, Dhamtari and Arang. *Kusum* lac is also grown in Hoshangabad and Narsinghpur districts. In Bhandara district, *palas* tree is the principal host tree, while *ghont* trees occur in large numbers in the Saugor district.

Of the Berar districts, only the Melghat forest division in Amraoti district produces a small quantity of lac. The following districts are of very minor importance as regards lac cultivation in the Central Provinces:—

Nagpur, Wardha, Chhindwara, Nimar, Betul and Berar districts.

For lac-producing areas in Central Provinces and Berar, reference may be made to the map annexed at the end of the Report on "Lac and Shellac" by Lindsay and Harlow, Indian Forest Records, 1921.

Method of Cultivation.—Sticks of brood lac†—in bundles or as single twigs—are tied by means of bark, say, that of *Mahua* tree, on the branches of pruned host trees during the proper season. Swarming takes place by the emergence of larvae from the brood lac. The larvae settle themselves on tender shoots

*Lac is not a gum from trees as is usually erroneously believed: it is a product from an insect.

†Incrustation from which swarming is about to occur.

and twigs and in time exude a resinous substance, which is really a protective coating and is termed "lac". A few weeks later, the males leave the crust, fertilize the females and die. The females continue to secrete lac. The eggs from the females serve for the next infection with brood lac.

It is only from the Bilaspur district that it is reported that lac insects are put in pieces of cloth which are then tied to the trees to be inoculated.

On account of the low prices prevailing at present, some malguzars do not think it worth their while to spend money on inoculation of host trees by employing labourers. Otherwise, persons paid at the rate of Rs. 8 to Rs. 10 per month used to be employed to inoculate the trees, to protect the insects from their enemies, and to collect the lac. In some places, therefore, some lac growers do not care to tie brood lac to host trees but leave some lac on the parent trees as "seed". By adopting this method, which is not to be recommended as it causes further strain on the vitality of the host tree, the yield is small but it saves the expense of tying "seed" to twigs.

The infection or inoculation may also be carried out by natural means, e.g., by birds removing the insects from one tree to another or by the wind blowing the insects from one host tree to another. This is also not satisfactory and hence when a good yield is desired, recourse is always taken to artificial propagation by employing labourers. In view of the low prices at present, no plantation of lac host trees is carried out nor are the cultivation and collection done systematically, or with care.

Lac culture is a science in itself. Unfortunately, on account of the slump in the price of lac, this is not the time to make suggestions for making improvements in cultivation. The lac growers do not know many of the fundamental principles and use only rule of thumb methods. Some very useful work in this direction has been conducted by the Lac Research Institute, Namkum, and when the prices of lac do improve, it would be necessary to have a few demonstrators going round villages to instruct the people in the proper method of growing lac.

Up till 1938, the Government used to carry on the inoculation of host trees and collection of lac therefrom through the Forest Department. This lac used to be sold by public auction. On account of the fall in price of lac, the Government have now decided to give the lease of lac-producing areas to contractors who would carry on the inoculation as well as do the collection. There is one great danger in this method. In spite of the provision of special clauses to safeguard proper cultivation for the continued good output of the lac and the condition of the host trees, the contractor may use the same host tree year after year, thus ruining it for future use. The sole concern of the contractor is to get as much lac as he can with the least investment before his lease expires.

Lac is grown in Government forests as well as in malguzari forests and a few tenants grow it on some trees on the "bunds" of their fields. There is ample scope for increasing the production of lac in Central Provinces. At the present time, however, it would be

inadvisable to take any steps in this direction, as the price of stick lac is so low (3 to 4 rupees per maund) that it scarcely covers the cost of propagation and collection. In fact, in certain districts its collection is being neglected or done only perfunctorily because of the prevailing low prices. Unless and until some new uses or extension of the present uses or great demand from foreign coun-

tries are found, there is little incentive for increased production of lac.

The Four Crops of Lac.—There are four crops of lac known by the names of *Baisakhi*, *Jethwi*, *Katiki* and *Aghni* according to the month in which they are collected.

The following table* gives the life cycles of the insect and the seasons of cropping:—

*"Shellac" by Parry, 1934, page 20.

	Grown on	
	Schle ichera trijuga (<i>kusum</i>)	All other hosts
(1)		
Name of crop	.. Kusumi (Aghani:Nagoli)	.. Katki (Rangeen).
Date of infection	.. June-July	.. June-July.
Males emerge	.. August-September	.. August-September.
Larvae emerge and swarm	.. January-February	.. October-November.
(2)		
Name of crop	.. Jethwi	.. Baisakhi (Hari).
Date of infection	.. January-February	.. October-November.
Males emerge	.. March-April	.. February-March.
Larvae emerge and swarm	.. June-July	.. June-July.

Enemies of the lac insect.—Apart from inclement weather, the lac insect has many enemies:—(1) direct, *i.e.*, parasites and predators which attack the lac insect, and (2) indirect, *i.e.*, those which attack the host tree and thereby adversely affect the food supply of the lac insect. For these, reference may be made either to "Lac Cultivation in India", by P. M. Glover, or to "Shellac" by E. J. Parry.

Yield of lac.—The quantity of lac yielded by a tree depends on the following factors:—

1. Size of the tree and its capacity to provide sap for the lac insects.
2. Climatic conditions such as temperature and rainfall during the crop.
3. Enemies, direct and indirect, of the lac insect.
4. The quantity of brood lac used.

For an average crop it is estimated that the amount of lac (on stick) produced is nearly $2\frac{1}{2}$ to 3 times the quantity of brood lac used and that in a good crop this may be as much as seven times or more.

The yield of scraped lac called stick lac from lac on the stick is estimated to be approximately 33 per cent. in the case of non-Kusumi lacs and 50 per cent. in the case of Kusumi lac.

Grades of Lac.—The best quality of lac is obtained from the *kusum* tree and is known as Kusumi lac. It fetches a higher price on account of its lighter colour, than the lac produced on other host trees. The following is the descending order of the grades of lac from various host trees in the two seasons:—

1. *Kusum*—Aghni.
2. *Kusum*—Jethwi.
3. *Pipal*—Baisakhi and Katki.
4. *Khair* and *Ber*—Baisakhi.
5. *Ghont*—Baisakhi.
6. *Palas*—Katki.
7. *Ghont*—Katki.
8. *Palas*—Baisakhi.

Collection of Lac and its Disposal.—Lac may be collected either before swarming takes place (*i.e.*, before Diwali) in which case it is known as *Ari* and contains the living insects, or it may be collected after swarming when it is known as *Phunki*, so that no live insects remain in it. The *Ari* lac is considered to be immature and is collected either by thieves or when the price is high. In some districts *Katiki* is the main crop (*i.e.*, for sale), whereas the *Baisakhi* crop is utilised mostly for brood (seed) purposes. In the latter case, it is collected a few days before swarming.

As the stick lac suffers a loss of weight on storage on account of dryage and various other factors and deteriorates in quality, it should be sold off to manufacturers soon after collection.

Twigs bearing the lac incrustation are collected by the cultivators or labourers and dried in the sun to facilitate the removal of the lac resin which comes off either by twisting with the hand—as in the case of *Kusum* and *Palas*—or by scraping with the knife. The small cultivators sell it to the petty dealers who visit the villages for the purpose of buying lac. At the present time, it is stated that the rate of stick lac at which it is purchased from the villagers is about an anna or even less per seer, in contrast to Re. 1-8-0, per seer nearly a decade ago. Petty cultivators dispose of their produce during the season. On the other hand, the big cultivators sell their lac in instalments in the hope of securing better prices. Some lac growers sell their produce to the manufacturers directly, while others sell it to commission agents. Large growers store up lac, while the prices are low or when they expect a rise in the price. The practice of storing lac for a long period is a harmful one because the lac deteriorates in quality as stated above, particularly when stored under bad conditions. It tends to become insoluble in spirit and in alkali. It, therefore, loses much of its value. Accordingly, the practice

which is followed at some places of mixing the old with the new crop is to be deprecated and discouraged. Agents from the Mirzapur and Calcutta factories also come to the lac-producing areas and buy it for their factories. Sometimes the contractors form a ring and buy the leases in lac-producing areas at very low prices when these are auctioned.

Centres of Lac Trade.—The following are the important centres of lac trade situated in the midst of lac-producing areas in the Central Provinces :—

1. *Gondia.*—The most important centre for making seed lac and shellac. It gets the lac, mostly *palas* lac, grown in the Bhandara, Balaghat and Chanda districts, Khairagarh and Rajnandgaon. It has 13 factories and the estimated production of shellac is 40,000 maunds a year.

2. *Rajim and Dhamtari.*—These get *palas* and *Kusum* lac grown in the Raipur district by the *Gonds*, *Kamars* and *Binjhars*, and also in the adjoining States.

3. *Kota and Pendra.*—These get the *palas* and *kusum* lac grown in Bilaspur district and neighbouring Native States, such as, Surguja, Udaipur and Sarangarh. A shellac factory has recently been started in a village in Katghora tahsil in the Bilaspur district. Contractors from Raipur and Mirzapur come to Janjgir tahsil which is an important area for lac production.

4. *Katni and Damoh.*—They get the *palas* and *ghont* lac grown in Jubbulpore and Saugor districts.

5. Other but smaller centres are Bankhedi in the Sohagpur tahsil of Hoshangabad district; Harpalpur, in Saugor district; Deokar in Bemetara tahsil of Drug; Champa in Janjgir tahsil and Rajnandgaon.

There are two factories now in Janjgir tahsil for the manufacture of shellac, and these work all the year round.

There is one shellac factory in Seoni which produces on an average 500 maunds of shellac and 400 maunds of seed lac annually. The excess of stick lac is exported to places outside the province. At Bankhedi, the stick lac is converted into seed lac and there is no manufacture of shellac.

Position of Central Provinces in India as regards lac production.—The present annual production of lac is estimated by Glover in his book called "The Lac Cultivation of India", to be 1½ lakhs of maunds per annum, of which about 30,000 maunds are accounted for by *kusumi* lac.

Next to Bihar, Central Provinces is the second most important lac-producing area in India. Following is the estimated relative production of lac in India according to provinces :—

1. Bihar.—65 per cent.
2. Central Provinces.—15 per cent.
3. Bengal and Assam.—10 per cent.
4. Rest including Native States.—10 per cent.

As regards the manufacture of finished products, such as shellac, button lac, etc. from lac, Bihar comes first, Bengal second

United Provinces third and Central Provinces fourth.

Statements showing the quantities of lac—

- (1) Produced in the four recognized lac-producing areas, in the whole of the province, and in the whole of India, according to crop, and according to the total production for the year.
- (2) Imported in the province from, and exported from the province to, the various provinces and ports,
- (3) Total imports and exports from India, are given in the Appendices C, D, and E, respectively.

Constituents of Lac.—Stick lac contains :—

1. Resin, about 74.5 per cent.
2. Wax, 4 to 6 per cent.
3. Red colouring matter known as the lac dye* 6.5 per cent.
- (4) Protein, minerals, impurities, such as, insect residue, wood, etc.—9.5 per cent.
- (5) Water—3.5 per cent.
- (6) A yellow colouring substance called Erithrolactin, which gives yellow colour to shellac—1 per cent.

When the lac resin is treated with ether, part of it is dissolved (ether soluble 35 per cent.) and most of it (65 per cent.) is left undissolved. The latter is known as the resin and it has better properties than shellac. The wax is only partly soluble in hot alcohol. This is observed when shellac is dissolved in methylated spirit to produce a varnish. A sediment of wax is noticed at the bottom, or when the mixture is shaken, a turbid liquid results.

Lac dye used to be the main product for which lac was cultivated in the early days. It used to be exported in cake form. In 1868-69, 24,850 maunds of lac dye were exported to Europe at a value of eight lakhs of rupees. Even so late as during the last War when synthetic dyes were not procurable, 6,095 maunds of this dye (at Rs. 15 per maund) were exported to Europe for use as a substitute for cochineal. It gives a colour as fast as that obtained from the cochineal insect but not so brilliant or gay. A fatal blow was dealt to this industry by the introduction of synthetic dyes, and, consequently the value of trade in lac dye has almost vanished. Today resin is the chief product, whereas the dye is discarded as a waste by-product. (For further information about this dye, refer to the Note on "Indigenous Dyes".)

Method of Making Shellac.—The scraped lac known as stick lac is passed through a screen—six mesh in the case of *Kusumi* and *Katki* lac or through 8 mesh in the case of others. The part which passes through is sifted through a 20-mesh screen. What remains on the screen known as *Phal* is sent away for washing. The finer grains which have passed are placed on a 60-mesh screen. The part which passes through the screen is dust and is rejected, whereas the residue on the screen which is of an inferior

*This should not be confused with the colouring principle of the lac dye, which is known as laccaic acid. It forms only two per cent. of the bulk of the dye of commerce.

quality is sent to the wash-house and is known as *chudair* as it is used by bangle makers (*chudiwalas*) for making bangles.

The residue on the 6 or 8-mesh screen is passed through a crushing mill worked by two men. The crushed material is again placed on a 6 or 8-mesh screen. The part which passes through is sent for washing and then the process of crushing and sifting through a 6 or 8-mesh screen is repeated—usually three times—till the residue, consisting of pieces of wood, no longer contains grains of lac. These pieces of wood are used as part of the fuel for heating dilute solution of soda for cleaning bags in a subsequent operation.

In the grinding room, the dust nuisance is very acute and the manufacturers should be directed to take proper precautions for the health of their workers.

About one maund of the above sifted material is placed in a vessel called *nand* made either of stone in which case it used to be imported from Mirzapur or of cement when it is made locally. The *nand* is usually four feet high and three feet in diameter. Enough water is added to the lac to make it into a working paste which is trampled under feet by a *Ghasandar* who presses the lac against the sides and bottom of the vessel by moving his body alternately to the right and to the left. In this operation, the soluble impurities pass in water and the dead bodies of insects, the colouring matter, the fibrous material, pieces of wood, etc., are disengaged. After trampling for three-quarters of an hour, the pot is filled to the brim with water and the surface is skimmed off and strained. The residue is dried, and any lac contained in it is recovered. This is known as *ghonghi*. The residual lac in the vessel is stirred with an iron pan, the larger grains are allowed to settle and the water containing smaller ones is strained off to separate them. These recovered small grains are used for making inferior qualities of shellac such as that which is sold as "12 per cent."

When almost all the water on the surface has been emptied, the excess water contained in the lac is removed by scoping the lac from the centre and straining it in bamboo baskets. This is then replaced in the pot and the process of washing is repeated usually twice more, for three quarters of an hour each time, to remove the colouring matter. This is finished when the wash-water is no longer much coloured. One *Ghasandar* usually does two to three batches in a day.

When high quality seed lac or shellac is required, the third washing is carried out by mixing one to four chhataks of soda ash to the lac magma in the pot during the process of trampling. After the third washing is over, the pot is filled to the brim and the *Ghasandars* are so skillful in their work that in this process they succeed in removing a large part of the sand by the floatation method, by stirring the washed lac. In all cases the washed lac is strained in bamboo baskets and a few more buckets of water are

poured through to wash away any residual colouring matter sticking to the surface of the grains.

On an average, the yield of washed lac is 30 seers from one maund of *kusumi* lac, 27 seers from *ghont* lac and 26 seers from *palas* lac.

The wash-water is allowed to settle in vats and was at one time used to make the lac dye. These days, however, the same dirty water is used repeatedly to wash more than one charge of stick lac. The dead bodies of the insects and the debris undergo decomposition and emit a foul smell. Hence the present process of washing as practised everywhere in Gondia, except at two factories, is very unhygienic and unhealthy.

In some factories the wash-water is led away into fields. The manurial value of this is questionable, as it is low in nitrogen, phosphorus and potash contents. This waste water causes nuisance to the neighbourhood, of factories on account of its putrid odour, because it collects in stagnant pools near the factories.

The washed lac known as *seed lac* or *chauri* is inspected by the foreman and has to be passed by him before it is spread on a stone slab floor for drying in the sun.

The dried material is then winnowed by women in *supas* to separate sand and dust from the grains. The larger grains are known as *thurra*, the smaller as *karola* or *kuni* and the fine dust as *mulamma*. The last is not used in the manufacture of superfine shellac but for making either T. N. shellac or the 12 per cent shellac.

Washed *kusum* lac has a beautiful golden appearance, whereas lac from other host trees has an orange brown colour. The seed lac thus obtained is now ready for the manufacture of *chapra* or shellac, i.e., lac in the form of thin shells or flakes.

There are various qualities of shellac and their grade depends on the quality of seed lac, the amount of orpiment or *hartal* and of resin used in their manufacture. The following are the recognized grades:—

1. *Ultra-fine*.—This is made from large grains (*thurras*) of *kusumi* lac or *palas* or *ber* lac which have been well cleaned during the process of washing, by the addition of soda ash. In this case no orpiment is used.

2. *Superfine*.—The seed lac used in manufacture has not such a light colour as the ultra-fine. In this case, 3 to 16 chhataks of orpiment per maund of lac is used to give it a good colour, the amount of orpiment depending upon the colour required by the Calcutta shippers.

3. *Standard*.—This is made from *thurra* and *chauri* not finer than 16-mesh. Three to 4 chhataks of orpiment is also used.

4. *T.N.*.—It is the general practice to use inferior qualities of lac for making this grade and hence *thurra* and grain lac above 16-mesh are not used. *Karoli* and *mulamma*, *ghonghi*, *bahta* (residue recovered from the water used in washing lac) and *passewa*, together with 4 chhataks of orpiment per maund of lac are generally used.

5. *12 p. c. shellac*.—This is also made from fine particles of lac as in the case of the T. N. grade, and it contains, in addition,

about 12 per cent rosin which is broken to the size of peas before mixing. The amount of the mixture will contain 3 to 4½ seers of resin and 37 to 35½ seers of inferior lac. Orpiment is also added to this mixture.

For use in a shellac factory, the orpiment is finely crushed and ground to a thin paste on flat stones by women and sieved through a cloth. The process is repeated till all of it passes through the cloth. The seed lac placed in a heap is sprinkled with this strong suspension of orpiment, the quantity of the latter depending upon the quality of the chapra desired. The whole is then mixed thoroughly with the hand. Generally three *chhataks* to one seer of *hartal* is added per maund of lac.

The mixture thus obtained is then introduced through an iron funnel into long tubular bags made from Jalgaon *lattha*. These are three inches in diameter and vary in length from 15 to 25 feet according to the accommodation allowed for the *bhatta* (charcoal fire) in the *bhattaghar* (melting or furnace-room). One end of the bag is held by a skilled workman known as *karigar* who sits close to the charcoal fire or *bhatta*. The bag rests lengthwise on low wooden or bamboo props about 6 inches high and is given a circular motion with the help of a *charkhi* turned by a person called *firwaiya*; from the other end. The end near the *karigar* is held in front of the fire. The lac melts but it does not fall down on account of the rotatory motion the tube is receiving. When the melted lac becomes homogenous by the uniform mixing of the *hartal* added, it assumes a definite colour and fluidity, which are judged and controlled by the skilled workman (*karigar*). It is scraped out with the help of an iron blade and placed on a porcelain cylinder kept filled with hot water in a horizontal position. The squeezed lac is pressed on the sides of the porcelain cylinder with a palm leaf. A thick sheet of lac is thus obtained. The workman (sheet-drawer) known as *bhilwaya*, removes the sheet from the porcelain jar, stands at a distance in front of the charcoal fire and exposes the sheet to the heat emanating from there. The workman then draws out the thick sheet into a thin one, nearly five feet long by 3 feet wide. After the sheet cools down, it is broken into pieces. The thin pieces are known as shellac and are exported. The thick pieces and blemishes such as dirt, knots, debris in the stretched lac, etc., are sorted out and remelted for the manufacture of shellac.

In order to avoid possible loss of material in the *bhattaghar* on account of the melted material falling on the ground, a layer of water is kept on the stone slab in front of the fire above which the tubular bag rotates. The water prevents the lac from sticking to the stone from where it can easily be picked up with an iron blade and used again in the melting operation. Further details and photographs of the way in which shellac is prepared can be seen in the books on shellac manufacture given in the Bibliography.

In order to prevent draught and thereby undesirable chilling, the furnace-rooms are ill-ventilated and the foul atmosphere inside the rooms is injurious to the workmen.

On an average, one maund of *kusum seed lac* yields 34 to 35 seers of shellac, that from other kinds being 32 to 33 seers.

Kiri Lac.—When the *karigar* notices that the colour of the squeezed material is dark and that he is not getting enough molten lac in view of the impurities having accumulated near his end, he makes an elongated cut along a short portion of the bag, this short portion having been shut out from the rest of the tube by means of a knot tied with a spare piece of cloth. The impurities which are squeezed out, have a dark colour. This squeezed material is pressed into plates and is known as *kiri*.

When all the lac and *kiri* have been squeezed out from the bags, the latter are boiled in water containing a little soda in an iron cauldron. The residual lac contained in the bags is thus loosened and comes to the surface. It is collected and made into large cakes, and is known as *passewa*. This work is carried out in a separate shed near the factory. It has already been stated that *passewa* is used in the manufacture of T. N. shellac.

The object of adding orpiment to lac before melting is to improve the colour of the shellac. It is believed that it gives a light yellow colour with a translucent finish. Unfortunately, through ignorance or on purpose, appreciable quantities of this chemical—three-fourth of a seer to one seer per one maund of lac, which works out to about 2 to 2.5 per cent.—are being utilized in the manufacture, to the inconvenience and annoyance of the consumers. In certain trades even 0.5 per cent. of orpiment is considered undesirable. The maximum is considered to be 1 per cent. whereas 0.2 per cent. is considered normal or tolerable.

The addition of orpiment cannot be termed adulteration in its true sense except as an unfair means to get a better price through improved colour, as its present price is Rs. 22 per maund or almost twice that of T. N. shellac.

The percentage of rosin which is used for adulterating lac was at one time reported by foreign consumers to be considerable in certain samples, in some cases to the extent of 50 per cent. This is hardly true now on account of the fall in prices.

During the boom period when shellac was sold at Rs. 150 to Rs. 250 per maund, a few unscrupulous manufacturers adulterated it with sugar, molasses and flour, and they also produced "artificial *kiri*" from factory refuse when the price of *kiri* was high.

The number of shellac factories is not less than 25 in the Central Provinces. In Gondia alone, there are 13 factories. These factories have grown near railway stations in lac-producing areas. It is estimated that this industry gives employment to more than 40,000 persons in the province. Of these, 7,000* are employed in inoculation and in collection, whereas 3,000 are employed in working stick lac into seed lac and shellac. Gondia alone employs about 2,000 persons in its factories. The grinding and sieving of lac is carried on mostly by women, whereas the washing is carried on by men. For skilled work, men used to be imported from

*In view of the slump in the prices of lac and shellac, this number may not be as high at present.

Mirzapur. With the setting in of the depression, however, a few of the local men have been trained. Men from Mirzapur still continue to work in the factories. During the months of July and August, the work is very slack in the lac factories on account of the weather, and the unskilled workers go to work on the fields.

Wages.—The workmen except a few are paid on a piece wage system which works out to the following daily rates:—

1. *Men grinding and sieving the lac.*—They get annas 4 per day in Gondia and annas 3 in Chhattisgarh.

2. *Men doing the washing of lac.*—Two annas per basket of 25 seers. The daily wage comes to about annas 4 to annas 6. In the Chhattisgarh districts the rate is annas 1½ for a basket of 25 seers of washed lac and the daily wage would be annas 3 to annas 4½.

3. *Women doing winnowing of lac.*—They get annas 3 per day in Gondia, and annas 2½ in Chhattisgarh.

4. *Women grinding the orpiment for making the suspension.*—They are paid annas 3 for grinding three seers of dry orpiment to a thin paste. This is the work which they can just do in a day.

5. The *Karigar*, *bhilwaya* (sheet-stretcher) and *Firwaiya* (the person who gives circular motion to the tube with the *charkhi*) form a unit. If one of them falls ill or is unable to attend to the work, the whole unit has to remain idle. The unit is paid Rs. 1-12-0 per maund of shellac prepared by it. This amount is distributed amongst the three in the following way:—

Karigar—annas 13½.

Bhilwaya—annas 10½.

Firwaiya—annas 4.

In Chhattisgarh, at Champa, Pendra, Kota, etc., the rate is much lower, it being Rs. 1-4-0 per maund which is distributed as follows:—

Karigar—annas 10½.

Bhilwaya—annas 7.

Firwaiya—anna 2½.

Grading.—Shellac is graded according to colour and according to the percentage of rosin. The lighter the colour the better the grade. These grades have already been mentioned under the method of manufacture. The one common trade mark T. N., of which the origin is still uncertain, when marked "pure" shows that it contains no rosin; otherwise it usually does.

Shellac is in a very convenient form for the consumers because when it is to be dissolved in spirit, it offers a large thin surface for solution. If it is not stirred properly, it forms a ball which presents difficulty in dissolving.

Shellac—also button lac to a small extent—is the final product of manufacture in this province. A good proportion of stick lac and seed lac are also exported without passing through the process of manufacture into shellac which gives employment to at least a few persons. The export of seed lac is increasing to an alarming extent and its unfortunate repercussion is that more than 50 per cent. of the furnaces in Gondia and other factories are lying idle and a corresponding number of workmen are out of

employment. All the shellac that is produced in Central Provinces is by the hand-process and no mechanical methods of production are employed in any factory.

Prices.—At the time of enquiry the following were the current prices per maund of 40 seers at Gondia:—

(1) *raw lac*—Rs. 2 to Rs. 4-4-0.

(2) *seed lac*—Rs. 6-8-0 to Rs. 7.

(3) *kiri lac*.—(i) from T. N.,—Rs. 2 to Rs. 2-4-0; (ii) from ultra fine, superfine and standard—Rs. 3 to Rs. 3-6-0.

(4) *12 per cent. chapra*—Rs. 9-12-0 to Rs. 10.

(5) *T. N. Shellac*—Rs. 10-8-0.

(6) *Standard lac*—Rs. 11-8-0.

(7) *Superfine lac*—Rs. 12-8-0.

(8) *Ultra fine*—Rs. 13.

The exporter has to pay a terminal tax at the rate of two annas per maund irrespective of the grade of the lac. Accordingly, the incidence on low qualities such as *kiri* is very heavy.

The price of raw lac in the various districts varies from Rs. 3 to Rs. 4-8-0 per maund. Higher prices are paid for *kusum lac* on account of its better quality.

It is considered by Glover that the price of stick lac is one-third the price of T. N. lac and that of *kusum lac* is one-third the price of superfine lac.

Apart from stick lac, seed lac and shellac, the other forms in which lac enters commerce are—

Button lac, garnet lac, dewaxed lac, bleached lac, and refined bleached lac.

Button lac.—So called on account of its method of preparation and appearance. It is prepared from stick lac in the same way as shellac except that instead of being drawn out in sheets, the squeezed lac is dropped on tin sheets about 16" square and allowed to harden in discs 2 to 3 inches in diameter, and a quarter of an inch in thickness. These large flat round pieces when hard enough on cooling, are stamped with the name of the maker and are known as button lac. When held to light they are transparent and often orange-red in colour. This is the purest form of lac, as no orpiment or rosin is added and only the best quality lac is used in its preparation. Though it is shellac which is mostly prepared at Gondia, button lac is also produced to some extent.

Garnet lac.—This is prepared from waste lac such as that contained in *khud*, *mulamma*, *kiri*, *passewa*, etc., by treating these with alcohol and recovering the solvent by distillation. The molten residue is run on a table or metal slab and is the garnet lac of commerce.

Both, button lac and garnet lac, can be and are, adulterated with rosin.

Dewaxed lac.—In shellac spirit varnishes intended for high class work, the presence of wax tends to reduce the gloss or to give a matt surface. It is, therefore, found necessary to remove the wax from the shellac for certain types of work. Seed lac or rosin-free shellac from which wax has already been removed by one of the many processes, is known as dewaxed lac. It gives a clear solution when dissolved in alcohol. Lac wax

which has a fairly high melting point (80 to 82°C.) is a by-product of this industry.

Bleached shellac.—The colour of lac or rosin free shellac is removed by bleaching with chemicals. The product is almost colourless and contains water (5 to 25 per cent.). It should be used promptly after making, because it does not keep well, tending to become insoluble in alcohol and alkalis on standing. The bleached lac solution in alcohol is milky white on account of the presence of wax.

Refined bleached shellac.—This is bleached shellac from which wax has been removed prior to bleaching. It gives a colourless solution when dissolved in alcohol.

Properties of shellac*.—The melting point of shellac is indefinite. It commences to soften at 40°C. and gradually becomes more fluid as the temperature rises. It cannot be melted to a thin fluid without decomposition.

Shellac is insoluble in acids but dissolves in alkalis and alkaline salts, e.g., in ammonia, soda and borax solutions. The solutions thus obtained are turbid on account of the presence of wax. Use is made of this solubility in the hat and paper varnishing trades.

Shellac is readily soluble in alcohol, 85 to 98 per cent. by weight; in ether, 10 to 25 per cent.; in chloroform, 5 to 15 per cent. and in benzene, 10 to 20 per cent. It is insoluble in petroleum ether and vegetable oils.

Lac does not keep well for long. It tends to become insoluble on standing; hence it should not be stored for long unless proper precautions are taken.

Uses.—Shellac finds its principal application and uses in the following:—

(1) **In making varnishes.**—Shellac is soluble in methylated spirit (denatured alcohol) and its solution, without the separation of wax, is used by cabinet makers to polish furniture. The cabinet makers in this province add one or more other gums such as manilla to the solution. When the polish is made from bleached refined shellac or from dewaxed shellac or when the wax from the solution is removed by filtration, it is known as French polish. There is an art in using this polish, for an uninitiated worker cannot get the high class finish characteristic of French polish. The shellac varnish gives a hard smooth film which takes a high polish. This film, however, is not resistant to moisture. Coloured varnishes are obtained by the use of appropriate dyes.

The proportion of shellac in these varnishes varies according to the use (e.g., whether for polish or for "knotting").

(2) **In the making of bleached shellac:** which is used to prepare colourless (transparent) lacquers for light coloured wood and metals. Bleached shellac cannot be kept for long and has to be used promptly, as it becomes insoluble on standing.

(3) **As electrical insulating agent:** chiefly for special insulators having paper or mica (micanite) as a basis, and for making insulating varnishes.

*Rosin can be detected in lac by the Halphen-Hicks or by the modified Storch-Motawski reaction or by determining its Iodine Value.

It is estimated that this industry together with that of polishes, utilises in all consuming countries about 30 per cent. of the annual output.

(4) **As a plastic material in the making of gramophone records.**—The consumption in this industry was estimated at one time to be 60 per cent. of the total output of lac. It is now 30 to 40 per cent.

(5) **For stiffening felt hats.**—For this purpose shellac is dissolved in an aqueous solution of borax giving a watery varnish (3 *chhataks* shellac, $\frac{1}{4}$ *chhataks* borax in 10 *chhataks* water). It is estimated that this industry consumes nearly 10 per cent. of the annual output.

(6) **As an adhesive material:** in special cements and for making sealing wax, grinding stones, etc.

(7) **In jewellery.**—Chapra lac of inferior grade was used for stuffing hollow ornaments of gold and silver, but now the consumption of lac in this art has considerably declined.

(8) **In making bangles, beads covered with tinsel, toys and lacquer work.**—Those engaged in the making of lac bangles are known as *lakheras*. They also stock the cotton-wool soaked in lac-dye known as *mahawar* which is used for making coloured designs on the feet of ladies on festive or ceremonial occasions.

The lacquered wood work of Jaipur, Benares, Chennapatna in the Mysore State, is famous for its delicate workmanship. It is stated that coloured ornamentations are made on copper and brasswares, as also on ivory, with the use of lac.

(9) It is stated that shellac is used in the manufacture of munitions and fire-works on account of its water-proofing qualities. It is, therefore, considered a very important war material.

(10) An interesting use of lac is in the coating of electrodes employed for electric arc welding under water. Spirit shellac was found indispensable for preventing electrolysis which otherwise made experiments impossible.

(11) A process recalling the well-known anodic deposition of rubber consists in electrolysing alkaline solutions of shellac preferably with a platinum electrode. The hard films thereby deposited on the anodes are of a highly resistant character.

(12) Advances have been reported in the combination of shellac with many glycerides and fatty acids to yield varnishes. The technical value of such products is yet to be established.

(13) Investigations have been carried out on the oil solubility of lac (R. W. Aldis, I.L.R.I., Bulletin No. 12, 1933). Instead of using other resins, it is suggested that shellac may be incorporated with linseed oil or tung oil. These two important varnish-making oils need very carefully controlled conditions. The trade or commercial value of these results is doubtful, as the prices of the other resins are lower than those of shellac. Besides, no mention has been made of the quality of the varnishes thus produced.

(14) Pure lac resin, that is, shellac from which ether soluble components and wax have been removed, has superior adhesion, flexibility, ease of thermohardening and resistivity to water compared with ordinary shellac, and its industrial possibilities, for wire enamelling, lacquering of cans and moulding are great.

Present trend of research.—There are the following three research institutions financed by the contributions from the Lac Cess Committee which carry out investigations on the further uses of lac and on its chemistry:—

1. The Indian Lac Research Institute, at Namkum near Ranchi, Bihar.
2. The London Shellac Research Bureau, London.
3. The Shellac Research Bureau, New York, U.S.A.

In addition, work on the chemistry of lac is being carried out by some German workers in Germany.

The present trend of work is on the following lines:—

1. Preparation of moulding powders from shellac similar to bakelite.
2. Finding out plasticising materials for shellac in spirit varnishes.
3. Extending the uses of bleached shellac and study of the factors which affect the bleaching of seed lac and its keeping quality.
4. Preparation by physical or chemical methods, or isolation, of the resin from shellac which will have superior qualities.
5. Making of oil-drying varnishes from shellac, linseed oil and tung oil.
6. Determining the chemical constitution of shellac in order to make it combine with other chemicals to give products possessing superior qualities.
7. Finding new uses for shellac.

Prospects for the Lac Industry in the Central Provinces.—According to Glover, the present production of lac is estimated to be one lakh and fifty thousand maunds per year (see also Appendix A). Of this, a part is exported as stick lac to factories outside the province, the remainder being worked in the province either into seed lac or into shellac.

The seed lac and shellac so prepared and the by-products of the industry such as *mulamma*, *kiri*, etc., are exported to Calcutta for recovery of the lac therefrom. A certain amount of *kiri* is used in the province in the manufacture of lac bangles. A very small quantity of shellac is used by the cabinet-makers for making polishes for wood.

Apart from these uses, lac does not find other applications in the province. It is obvious that the consumption of lac in the province is negligible, say, not more than one per cent. of the total production.

The problem, therefore, of consuming an increasing proportion of lac produced in the province is not an easy one to solve. The

starting of such industries—and it may be emphasised that this must be done without delay—as the manufacture of sealing wax and special cements lacquered wares and toys, French polish and dewaxed shellac polish, transparent lacquer from refined bleached lac, grinding wheels, etc., cannot consume more than a few thousand maunds of shellac every year. The industry of making lac bangles and tinsel beads, which utilises the waste product (*kiri*) from the lac factory obtained during the manufacture of shellac, should be further encouraged and better qualities should be produced.

The main outlet for the consumption of lac seems to be in the production of moulding powders, which can be utilised for producing articles similar to those made from bakelite. In U. S. A., the production of moulding powders of the bakelite type of resin amounted to nearly four lakhs and twenty-five thousand maunds, and in England to one lakh and twenty-five thousand maunds annually, only a few years ago. But before one can think of establishing this plastic industry based on the use of shellac, a great deal of work has to be done in order to find out the ingredients constituting the moulding powder and their proportions. It has, however, been reported that shellac when combined with urea and other substances gives a product similar to and cheaper than bakelite. Similarly, the manufacture of insulators (of the micanite type) and insulating varnishes in the province will require considerable investigation before it can be safely undertaken.

While investigations on the above two larger issues are being carried out, the interim period should be utilised to start and encourage such smaller industries as the manufacture of sealing wax, lacquered wares, toys, grinding wheels, etc.

Besides, if the raw lac*, which is exported to Calcutta, United Provinces and Bihar, in the form of stick and seed-lac, could be worked into shellac, button lac, etc., it will give employment to some more people, particularly villagers or for a longer period to those already engaged in the industry. The foreign demand for seed lac is increasing on account of the marketing of adulterated shellac. Thus, the U. S. A. which is the largest consumer of Indian lac uses a large part of the imported lac in the manufacture of bleached lac. It has, however, been forced to import seed-lac instead of the semi-finished product—shellac—because of the difficulty experienced in bleaching the shellac adulterated with appreciable quantities of orpiment. There is little doubt that it would order shellac instead of seed lac, if the standard of purity could be guaranteed.

*No estimate of the quantity exported in the raw state from this province is available. However, as Bihar and the United Provinces are not large consumers of shellac—in fact the former produces nearly 65 per cent of the total Indian output—it would not be incorrect to infer that the large exports of lac from this province consist mostly of stick lac which is required in the shellac factories of those provinces for conversion into shellac. It would be seen from Appendix D that the total export of lac to Bihar and United Provinces amounts to more than one hundred thousand maunds every year. The export of seed lac from India is appreciable and amounts on an average to 25 per cent. of the total lac export. The figures for the last few years are given in the Appendix E.

It may be suggested in passing that a scientific assistant should be appointed in the office of the Director of Industries and his pay should be met from the Lac Cess Committee. His work will be to keep in touch with the state of the lac industry in the province, to suggest improved methods of propagation and collection to the growers, to keep them informed of the prices, and to make known any work of immediate application done by the Lac Cess Committee. It is only right that the lac producers who have all these years (since 1922), been paying the cess* (this is now from annas 5 to annas 7 per maund) should be acquainted with the present trends of work which may turn out useful to them.

The present difficulties and depression in the lac business are due to the fluctuations in prices of the lac, to the adulteration of the shellac, and to the competition from synthetic substitutes.

As a general rule the price of a commodity depends to a great extent on the demand for it. In the case of lac, as our home consumption is very small, the question of an increased demand in the province or in the country as a whole does not arise. At present, the demand is really created by the foreign consumers who, however, do not order their requirements directly from the producers of seed-lac and manufacturers of shellac and button lac, but from the shippers who form well organized business houses in Calcutta. Seed-lac, shellac etc., produced in the factories are sold to these shippers at their own rates through the Calcutta brokers. They then supply to the foreign consumers at rates depending on the extent of the existing and prospective demands. The producers of stick-lac and the manufacturers of shellac and button lac get little share of the profits resulting from an increase in price. The shippers hold stocks of lac only to such an extent—and they manage their purchases and sales in such a way—that they seldom lose in their transactions.

It is believed by the Lac Cess Committee that the demand for shellac is expanding, yet it cannot be explained how and why the prices are being kept so low. The price of shellac used to reach from Rs. 80 to Rs. 266** per maund. It has now fallen to the very low-level of Rs. 12 to Rs. 15 per maund. Stick-lac, which at one time brought Rs. 80 per maund, is being sold to-day at Rs. 3 to Rs. 4 per maund. On account of this fall in prices, neither the cultivation nor the collection nor the manufacture of shellac nor its indigenous trade is well-organised.

As stated above, India enjoys a virtual monopoly of lac resin. This incited consumers in foreign countries to look for effective substitutes for this resin to displace it from the arts and manufactures in which it was indispensable to them. In 1908, Baekeland, a Belgian Chemist, domiciled in U. S. A., patented the method*** of making

†When the demand for lac increases resulting in an upward trend in its price.

*This varied from two to four annas per maund during the period 1922—36 August.

**This is the highest price recorded for standard lac and ruled on 8th and 9th July 1920.

***This was really first found by Professor Baeyer in Germany in 1872.

a moulding composition from phenol-formaldehyde, which is known after his name as bakelite. This discovery led to the introduction of other types of synthetic resins and today a very well-developed plastic industry is thriving in Europe, America and Japan.

The consumption of lac has been adversely affected by the introduction of the following two classes of substitutes:—

- (i) Those which displace lac directly, e.g., in moulding compositions and in insulating varnishes, and
- (ii) those which displace lac indirectly, e.g., cellulose nitrate.

It was estimated at one time that 60 per cent. of the total lac output of India was consumed in the manufacture of gramophone records. Now there is a material decline in this industry on account of the advent of the radio and of the displacement of part of the shellac used in the moulding composition of the records by synthetic substitutes of the bakelite type. This is one of the important reasons which has led to a decline in the value and trade of shellac.

Similarly, in the manufacture of insulating varnishes glyptal resins (manufactured from glycerine and other chemicals) have to a great extent replaced shellac. There are other synthetic resins which are being used in place of natural gums for making oil-varnishes, thus affecting the consumption of these natural products.

After the war, the demand for cellulose nitrate known as gun-cotton, which used to be employed in the manufacture of explosives, ceased. This industry, however, found a peace-time use for it in the preparation of cellulose lacquers* which are used in place of French polish.

Thus, shellac is facing formidable competition which is made more acute on account of the marketing of adulterated shellac, by the increasing use of the direct and indirect substitutes which do not require the help of *laccifer lacca* to produce them, as in the case of lac. These synthetic substitutes, though they have not succeeded in driving shellac from its pride of place, have certainly displaced it to an appreciable extent on account of the present policy of economic nationalism stalking in foreign countries and their superior properties which commend their use in preference to shellac for many purposes.

The Government of Bihar had appointed a Committee a few months ago to examine the question of the increased utilisation of lac and the regulation of its prices.

The Committee has already submitted its report and the Government of Bihar has introduced a bill in the Assembly to implement the recommendations of the Committee. The provisions of the bill are so framed as to be applicable *mutatis mutandis* to other lac producing areas. I believe it is proposed to organise the lac growers, manufacturers and distributors, and to open a godown for the storage of lac, and a routine laboratory to analyse samples as Calcutta.

*The cellulose nitrate which is used for making these lacquers is known as nitro-cotton; it contains less nitrogen than is present in gun-cotton and does not, therefore, explode.

APPENDIX A

Questionnaire on Lac Industry

1. What are the methods adopted for lac culture in your district and what are the host trees used for the purpose?
2. How many crops are available and at what times of the year are they collected? What is the total estimated yield of each crop? Is it the general custom to collect the lac before it is mature? If this is not so, when is this practice followed?
3. Is lac grown both in malguzari and Government forests? If so, what are their respective yields?
4. At what rate is stick-lac sold? Is it worked up in your district into seed-lac, button lac, shellac, garnet, etc.? Please give details of the processes employed in your district. Is the product adulterated and, if so, what are the adulterants and their quantities used?
5. What happens to the lac-dye, lac-dust and *kiri*, which are the by-products in this industry? Is the dye used for dyeing silk, or is it recovered for sale?
6. Is the work in the lac factories seasonal? If so, during what period do they work? Are the skilled workmen local men or do they come from outside the province? To how many persons does the lac industry (lac culture, collection and manufacture) provide employment and for what periods?
7. What is the local consumption of lac and what use does it find in the district? Is coloured lac made locally to polish wooden articles on the lathe? Is sealing wax manufactured in the district?
8. What is the system of marketing lac in your district and what are the weights used? In what form is lac exported from the district? What is the approximate quantity exported every year? What are the local prices of the various forms of lac?
9. On account of the considerable fall in the price of lac, are there any stocks of lac left over each season? If not, does the demand keep up with the production? Is it true that the collection of lac is neglected or carried out only perfunctorily, as the present low price leaves no margin of profit?
10. Have the growers of lac any suggestions to make in connection with improvements in the demand and trade of lac? Do they get any help from the Lac Research Institute, Namkum?

APPENDIX B

Bibliography

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- (4) "Lac Cultivation in India" by P. M. Glover, 1937.
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- (8) Shellac Drying Oil Combination— I.L.R.I. Bulletin No. 32. 1933.
- (9) Commercial Products of India—by Sir George Watt.
- (10) "The Uses of Lac." By H. K. Sen and Ranganathan, 1939. (Since writing this note, the publication of this book has been announced).

APPENDIX C

Statement showing the quantity of lac, according to crop, produced in the four recognised areas of lac production, in the whole province and in the whole of India.

Kota-Pendra					
Name of crop	1934	1935	1936	1937	1938
Baisakhi ..	27,500	30,000	33,000	35,000	38,000
Jethwi ..	500	..	..	..	..
Katki ..	16,000	15,000	20,000	22,000	35,000
Kusmi ..	750	1,250	1,000	1,000	500
Total ..	44,750	46,250	54,000	58,000	73,500

APPENDIX C—concl'd.

Name of crop	1934	1935	1936	1937	1938
Rajim-Dhamtari					
Baisakhi ..	5,500	6,000	6,000	9,000	5,500
Jethwi ..	3,500	8,000	7,000	6,000	7,500
Katki ..	7,500	5,000	4,000	4,000	7,000
Kusmi ..	23,000	16,000	16,000	17,000	15,000
Total ..	39,500	35,000	33,000	37,000	35,000
Gondia					
Biasakhi ..	34,000	30,000	31,000	45,000	30,000
Jethwi ..	..	..	..	..	..
Katki ..	30,000	26,000	40,000	42,000	55,000
Kusmi ..	250	250	250	125	250
Total ..	64,250	56,250	71,250	87,125	85,250
Katni-Damoh					
Baisakhi ..	11,000	8,000	8,000	15,000	14,500
Jethwi ..	..	..	..	..	..
Katki ..	9,500	12,000	13,500	17,500	35,000
Kusmi ..	..	..	..	..	..
Total ..	19,500	20,000	21,500	32,500	49,500
Central Provinces and Berar					
Baisakhi ..	78,000	74,000	78,000	104,000	79,500
Jethwi ..	4,000	8,000	7,000	6,000	7,000
Katki ..	63,000	46,000	77,500	85,500	132,000
Kusmi ..	24,000	17,500	17,250	52,725	20,750
Total ..	169,000	145,500	179,750	148,225	239,250
India					
Baisakhi ..	637,000	640,000	760,000	798,000	814,500
Jethwi ..	22,500	30,000	100,000	35,000	45,000
Katki ..	262,000	230,500	380,250	342,200	479,000
Kusmi ..	102,000	204,500	382,250	89,375	104,500
Total ..	1,026,500	1,105,000	1,622,300	1,264,875	14,43,000

APPENDIX D

Statistics of lac and shellac exported from, and imported into, Central Provinces and Berar during the last three (For 12 months from April to March).

(Figures compiled from the Monthly Reports of Inland Rail and River Borne Trade of India)

[Figures in mounds of 82½ lb.]

Name of the province	Exported from Central Provinces			Imported into Central Provinces		
	1936-37	1937-38	1938-39	1936-37	1937-38	1938-39
(1) Assam .. ..	...	...	...	...	...	...
(2) Bengal and Bihar .. ..	...	Bihar 61,168	Bihar 53,196	...	Bihar 6	Bihar 293
(3) Bihar and Orissa	43,772	Orissa 223	Orissa 1,329	2,830	Orissa 1,856	Orissa 61
(4) United Provinces, of Agra and Oudh.	77,216	56,694	58,861	365	652	170
(5) Punjab	3,310	2,893	3,209	21	...	...
(5) (a) Delhi Province .. ..	...	233	182	...	3	...
(6) Sindh and British Baluchistan.	...	...	8	...	...	...
(7) Bombay	200	210	342	1	85	3
(8) Madras	302	637	546	1	...	...
(9) Rajputana	722	860	1,219	...	14	...
(10) Central India	3,939	2,428	7,543	3,462	4,400	7,411
(11) Nizam's territory	62	77	93	...	...	3
(12) Mysore .. ..	...	1	...	...	...	...
(13) Kashmir .. ..	...	...	...	...	...	...
(14) Calcutta	77,198	112,929	131,987	7	1	19
(15) Bombay Port	550	1,426	1,671	...	2	1
(16) Karachi .. ..	...	...	8	...	...	...
(17) Madras Port	318	425	306	23	...	7
(18) .. ..	...	52	971	...	...	...
(19) Madras excluding chief ports.	...	...	...	...	111	...
Total*	207,589	240,256	261,508	6,710	7,130	7,970

*C. f. the figures of total lac production in Central Provinces and Berar given in Appendix C. There is great discrepancy in the figures of the corresponding years, particularly for 1937.

APPENDIX E.

I.—Imports of lac (in cwt.) into India and their value in Rupees

Principal articles	Quantity (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Lac	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Stick and seed	51,385	123,208	80,712	117,850	67,846	101,846
Shell and button	9	5	87	1,862	5	7
Other kinds (excluding lac dye)	10	2	4	2	..	..
Total	51,404	123,215	80,803	119,714	67,851	101,853

Principal articles	Value (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Lac	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Stick and seed	11,39,968	27,09,206	12,94,179	15,49,314	7,34,825	7,76,712
Shell and button	648	564	5,179	26,803	427	225
Other kinds (excluding lac dye)	151	173	322	247	15	7
Total	11,40,467	27,09,943	12,99,680	15,76,364	7,35,267	7,76,944

APPENDIX E—contd.

II.—Exports of lac (in cwt.) from India and their value in Rupees

Principal articles Lac	Quantity (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
Stick lac ..	6,872	5,081	7,270	4,667	508	2,885
Seed lac ..	152,214	88,635	125,842	261,822	187,484	206,051
Shellac ..	529,075	431,937	284,532	496,940	409,226	382,680
Button lac ..	19,100	15,722	29,373	33,275	24,012	20,002
Other kinds (excluding lac dye) ..	23,727	44,627	40,564	37,320	43,441	30,636
Total ..	730,988	586,002	487,801	833,964	664,671	642,254

Principal articles Lac	Value (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Stick lac ..	1,54,105	1,69,777	1,86,858	78,453	10,380	45,818
Seed lac ..	41,64,710	46,51,336	38,31,413	67,13,375	40,27,430	32,96,899
Shellac ..	1,94,24,939	2,66,93,974	1,03,51,106	1,52,58,814	1,10,87,248	85,18,615
Button lac ..	6,90,655	10,77,693	11,47,421	10,82,458	7,28,534	5,08,047
Other kinds (excluding lac dye) ..	2,09,268	4,03,424	3,19,534	2,86,968	3,64,408	2,58,168
Total ..	2,46,43,677	3,29,96,204	1,58,46,355	2,34,21,268	1,62,18,000	1,26,27,547

III.—Exports of various forms of lac (in cwt.) from India to U.S. A., U. K., and Japan and their value in Rupees

I

(a) Exports of seed lac	Quantity (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
To United States of America ..	117,834	67,248	80,223	205,865	135,924	147,409
To United Kingdom ..	11,638	8,288	15,501	17,405	14,209	16,878

Value (Twelve months, 1st April to 31st March)

Exports of seed lac	Value (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
To United States of America ..	30,86,948	35,53,882	23,77,162	52,06,493	23,49,352	22,49,710
To United Kingdom ..	3,31,267	4,15,103	5,29,795	4,94,242	3,34,311	3,02,329

II

(b) Exports of shellac	Quantity (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
To United Kingdom ..	309,277	2,229,154	44,452	144,942	104,977	120,887
To United States of America ..	94,492	81,671	86,562	156,288	140,912	126,857
To Japan ..	31,454	47,720	54,101	67,443	36,982	25,068

APPENDIX E—*concl.*

Exports of shellac	Value (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
To United Kingdom	1,23,42,451	1,43,74,070	16,79,853	42,35,100	26,80,069	27,06,819
To United States of America	31,49,357	48,67,825	30,69,771	48,92,342	38,08,099	26,87,661
To Japan	9,94,828	28,67,935	18,71,513	20,63,035	10,62,608	5,89,175

III

(a) Export of button lac	Quantity (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
To United Kingdom	13,050	10,485	18,173	19,921	12,643	11,963

Export of button lac	Value (Twelve months, 1st April to 31st March)					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
To United Kingdom	4,72,672	7,33,819	7,14,926	6,39,178	3,64,532	2,98,693

Figures taken from "Accounts relating to the Sea-borne Trade and Navigation of British India."

CHAPTER XXIV.—INDIGENOUS DRUGS

(Submitted by Dr. R. S. Thakur.)

Though the subject of indigenous drugs has no direct relation with that of nutrition, it is the inadequate supply of nutritive food which is responsible for the high rate of mortality and poor health occasioned by the attacks of diseases in the country. The use of drugs is rendered necessary to minimise this suffering and to improve the health of the people.

More than half the population of the country is living on partial starvation. The vitality of the present generation and its resistance to infection and disease have been considerably reduced on account of their poor and insufficient diet. The problem, therefore, is not merely that of mal-nutrition but is principally one of under-nutrition. Though the country exports large quantities of grain to foreign countries, these are really required in the country itself and more need to be produced to feed adequately the entire population.

To maintain the health of the nation, two things are absolutely essential. Firstly, the means to get adequate supply of nutritious and fresh food should be available to every individual, and secondly the environments of the individual should be sanitary. Medicines, whether indigenous or foreign, are no substitutes for food; they act merely as an aid to the organs and to the system to function normally.

How can the people be physically fit if they do not get enough to eat to maintain the body temperature and to make up for the wear and tear of the body caused even in normal life, more so in a hard worked one? The best planned schemes of physical welfare for the people can be of little avail so long as the people are unable to get enough of even ordinary food.

There are certain undesirable traditions and habits which also lead to ill health of our people. Among these may be mentioned those of the methods of cooking and eating what little they have and of living in unclean surroundings. People will have to be educated to change these. In the Mandla district, during the village survey one could not fail to notice the pot bellies of young boys and girls, which are presumably due to enlarged spleens resulting from feeding boys and girls at an early hour in the morning on cold and at times decomposing cereal food cooked the night before. In some cases the children do not feel satisfied till the stomach is fully distended. This is no doubt due to the very poor quality of the food taken by them.

Another bad practice is that in many homes the housewives separate the water in which rice has been boiled and give it either to the cattle or use it for sizing, the latter being done by weavers as a direct consequence of their economic distress since they cannot afford to buy sizing material separately. It is needless to mention that a large part of the nutritive value of rice such as vitamins, mineral salts, etc., are by this process lost and on account of the lack of these, they and their children suffer from deficiency diseases.

The utilization of the indigenous drugs and the supply of medical relief are so closely connected with each other that a discussion of one involves the other. A mere list of indigenous drugs (*i.e.*, drugs of native or foreign origin grown in the province) with a detailed account of their uses will serve little purpose. A list of medicinal plants* grown in the forests of Central Provinces and Berar

*The Sanskrit, Hindi, Marathi and Latin names of these are given in a number of appendices in the Report of the Indigenous Systems of Medicine Committee of Central Provinces and Berar 1939.

has been kindly supplied by the Forest Department and is printed at the end of the note (Appendix B). There are many publications dealing with the drugs* grown or produced in India, though not exclusively in Central Provinces, and which fulfil this function and, therefore, reference must be made to them (see Appendix A). What are wanted are concrete suggestions by which the use of the indigenous drugs can be extended.

There will certainly be many difficulties in their proper utilization, but means should be devised to overcome them. This subject can be approached from various different angles—

1. The indigenous drugs may be used to relieve suffering according to the Indian systems of medicine.

For this purpose, a list of the principal diseases to which people are commonly subjected should be made and it should be ascertained how far the indigenous drugs can be utilized to alleviate the suffering caused by such diseases. The remedies prescribed should be tried ones and not merely based on hearsay or the printed word. Such drugs should be available in the form of preparations and supplied to patients at charges commensurate with their means or even *gratis* in exceptional cases. Apart from the recovery of a part of the money spent on the manufacture and distribution of the medicines, the charges will cause the people to be careful and to avoid the waste of medicines.

As a predominant part of our population is too poor to afford any medicine, whether cheap or expensive, it is the function of the State to look after them in this respect. The State draws a large part of its income from the poor people and it would not be doing anything beyond what is fair, if it were to supply them with free treatment in its own interests. In view of the finances of the province, medical relief on an extensive scale with the use of Western medicines, which are tried remedies, is not feasible. One has, therefore, naturally to look to the indigenous drugs, the efficacy of which is looked upon with not a little air of scepticism by the town people. Hence, if effective substitutes for medicines manufactured in the West could be found, this province could give a lead to other provinces.

The scheme should be somewhat on the lines indicated below:—

- (1) A list of diseases, endemic, epidemic and casual, should be made.
- (2) Tried remedies available from indigenous drugs for the diseases in (1) and their methods of use according to the Indian systems of medicine, should be ascertained.
- (3) Preparations from indigenous materials and drugs should be manufactured and

*It is not the purpose of this note to reproduce or discuss here the various medicinal uses of drugs an excellent account of which is given in "The Indigenous Drugs of India" by Lt.-Col. R. N. Chopra and in other books mentioned in Appendix A.

stored in a Central dépôt. In other words, an emporium* of all drug preparations should be created. Besides, a guide book which shall give the uses of the medicines supplied and specify the directions of their use, should be published.

- (4) The preparations should be distributed to all the hospitals and dispensaries in the province. Medicines for common ailments, First Aid materials and copies of the above guide book should be supplied to each village, whereas the remedies for the less common ailments and the expensive preparations should be stocked for dispensing at each sub-depot which should be in a village selected out of a group of 20 or more villages on account of its easily accessible situation.

The mortality** from malaria alone during the year 1937-38 was 2,67,588 and is stated to have been responsible for 53 per cent. of the total mortality from all causes. A much larger number which survives the attack is incapacitated, on account of even the little vitality they had being sapped by this disease and the poor means of subsistence. It is a scourge which ranges in almost all the parts of the province, particularly after the summer. Which are the specifics amongst our indigenous drugs which are tried remedies against it?

Then there are epidemics such as cholera and influenza. Effective cures against them made from the indigenous resources would be extremely helpful to people and will save a considerable amount of our money from going abroad. The main question, however, is to find such effective cures from indigenous sources.

2. India should have its own Pharmacopoeia.—Almost every country has its own pharmacopoeia, so that they can utilize their own drug resources and manufactures. Thus there are the German, the British, the U. S. A., the French, the Italian and various other pharmacopoeias, but there is no

*In this connection it may be pointed out that the Provincial Government maintains a Vaccine Institute at Nagpur which prepares glycerinated lymph used in the vaccinations against smallpox. In the Report of the Public Health Department (1937-38,) the lymph manufactured is stated to be of a standard quality and potency and is enough to meet the demand in the whole province. The cost of production is given as 5 pies (as against 4 pies in the year 1936-37) per dose. The lymph is distributed throughout the province by the Public Health Department.

This is an emulative instance of how relief could be given to the masses staying even in remote villages. A drug emporium for manufacture and distribution may be started at Nagpur and in the early years, the organisation of the Department of Public Health may be strengthened and utilised for rendering medical aid in simple cases.

It may also be mentioned that the Government of Mysore maintains an Industrial Laboratory at Bangalore, where in addition to routine analyses, etc., pharmaceutical preparations are made for distribution to all the State dispensaries in the State. It is learnt that the Government incurs a loss in running this establishment. Though the Government intended to close this institution on grounds of economy (?), it is still continued, wiser counsels having prevailed.

**Annual Report of the Public Health Department in the Central Provinces and Berar, for the year 1937.

Indian pharmacopoeia. India is following the British pharmacopoeia which is primarily meant for England. As, in the Western system of treatment available in this country, the medicines prescribed are preparations from the British pharmacopoeia, India where this system of treatment is getting more and more popular, particularly in towns, has to import these preparations from foreign countries. (For figures of imports and exports of drugs and medicines, see Appendix B). In the early days, even British people wished that the indigenous drug resources of this country should be developed and preparations should be made from them which could be used as effective but cheap substitutes for the more expensive preparations. It must be emphasised that they must not be indifferent substitutes but must be of at least as high a therapeutic value and usefulness as the foreign preparations. There will not be great difficulty in introducing drugs of proved efficacy to the medical profession.

There is no doubt that an extended substitution of the foreign preparations with those made in the country from indigenous drugs would cheapen the cost of treatment and open out avenues of employment. It is, however, very necessary that these preparations should be standardised. Their therapeutic value and pharmacological action should not vary either on account of adulteration or storage. There is no surer way of getting the medical profession to use indigenous drugs than by supplying them with absolutely reliable preparations.

The practice of prescribing patent medicines and foreign preparations to their patients is increasing rapidly among the allopathic doctors with the result that the imports of patent medicines and of pharmaceutical preparations from foreign countries are rising (see Appendix B),

It is very unfortunate that the use of indigenous drugs of proved value in place of foreign preparations is not given its due emphasis in the training of doctors. If for some reason such as war or when the medical man is working in the interior far away from medical stores, etc., the supply of foreign drugs were cut off, the doctors as well as the poor patients would be helpless. It is, therefore, very necessary that the use of indigenous preparations should be encouraged by teaching and providing facilities for research in them.

The one great advantage of indigenous drugs is that they are easily available and are cheap. On the other hand, there are many difficulties in getting the correct and fresh drugs. Ignorant shop-keepers stock them in addition to their more important grocery articles. They cannot be sure of their identity, purity and sources for a number of reasons: firstly, the villager or labourer who collects them may be ignorant of the correct species, he may have collected in the wrong season, he may have collected the less useful parts, he may have adulterated, deliberately or through ignorance, by adding or collecting a herb of a similar appearance. At the grocer's shop, it may have been exposed for months and years and he may still sell it as an effective drug.

The above difficulties may partly account for the failure of practitioners in our country to prescribe Indian medicines and make greater use of them.

The making of standard preparations from indigenous sources is not as easy a task as many would imagine. The first difficulty is the proper identification. It is not very easy to collect herbs, etc., of definite botanical order through labourers employed for the purpose. In olden days, there used to be professional castes who were very skilful in identifying and collecting herbs, etc. Now-a-days one is never sure of getting what one wants in view of the ignorance of those who collect and sell these articles. Medical men are not to be expected to identify these. Their function is to employ them. Before any establishment can be started for making preparations for use in the country, the first essential thing is to make sure of a good supply of the needed medicinal plants, herbs, etc., in the neighbourhood.

The efficacy of the drug varies on account of the variability of the active principle (or principles) in it, not only according to the part of the tree from which it is collected, but also according to the time of the day and the year. Again, every preparation should be standardised and experiments should be conducted to find out whether its potency changes on storage.

Up till now mention has been made of plants growing in a state of nature. If this supply is not adequate, we should supplement it by regular cultivation. In addition, we must try to cultivate also those plants which are required, and which are likely to become acclimatized in this province.

For this purpose, gardens of medicinal plants should be started. So far as I know, very little is being done, not only in this province but also outside, regarding the proper cultivation of plants of medicinal value, quinine being a notable exception.

As far as possible, drugs should not be exported in their crude state and the practice of substitution and adulteration should be stopped (A list of drugs exported from this province together with their quantities is not available. For quantities of drugs exported from India and their values, see Appendix B).

It is popularly believed that the hill tribes such as Gonds and Bhils know a number of drugs which are used effectively to cure their ailments. Attempts should certainly be made to find out these before the alleged knowledge is lost for good. The efficacy of such herbs should be verified in every case by a qualified man and the drugs may be adopted or discarded according to the results of clinical experiments.

3. Finding and making new preparations, which would be accepted and included in the pharmacopoeias of other countries is too much to aim at with our present means and at a time when even the fringe of the more important problem of cheapening the means of treatment and cure for the sufferings and diseases of the masses, is not touched.

As with indigenous dyes, so it is with drugs. The indigenous dyes of this country have been supplanted by products of foreign manufacture. A country which used to supply dyes to the rest of the world is now depending for its supply on the very countries, whom it supplied till a few decades ago. Drugs are now being manufactured synthetically and hence it is no longer necessary to depend solely on plants for our supply of medicines. In many cases, new drugs have been discovered which have proved a boon to humanity. In a few cases, synthetic substitutes have been found which are cheaper to manufacture and are equally or more efficacious than the natural product. There are a few cases of medicines of a complicated structure which are not being synthesised, a well-known example being quinine. Many preparations from the bodies of animals are used for curative purposes. The chemist has succeeded in determining the structure of a few of these and in making them in the laboratory in such quantities as are required, without the aid of any plants or living beings and at a cheaper rate than the natural product. We must note this advance and should not remain satisfied with the hope that our country can produce all that we need. The synthetic drug industry is correlated to the synthetic dye-stuffs industry and if the latter comes into existence—and this is feasible only on an all-India basis—the other will follow.

APPENDIX A.

List of books on the Indigenous Drugs of India.

	Year of publication
1. Ainslie—Materia Medica of Hindustan	1826
2. O' Shaughnessy—Bengal Dispensatory or Pharmacopœia	1844
3. Waring—Pharmacopœia of India	1868
4. Supplement to the above by Moodeen Sheriff	1869
5. U. C. Datta—Hindu Materia Medica.	1877
6. K. L. Dey—Indigenous Drugs of India	1867 & 1896

	Year of publication
7. Dymock, Warden and Hooper—Pharmacographia Indica	1883
8. Nadkarni—Indian Plants and Drugs with their medicinal properties and uses	1910
9. Nadkarni—Indian Materia Medica	1927
10. Watt—Dictionary of Economic Products of India.	
11. Basu and Kirtikar—Indian Medicinal Plants.	
12. Birdwood—Practical Bazar Medicines	1920
13. Watt—Commercial Products of India.	1908
14. Khory—Materia Medica of India	1903
15. E. Roberts—Vegetable Drugs of India and Ceylon	1932
16. Dutt—Commercial Drugs of India	1928
17. R. N. Chopra—A Handbook of Tropical Therapeutics.	
18. Indigenous Drugs of India by R. N. Chopra	1933

Reports on the use of Indigenous Drugs

	Year of publication
1. Report of the Indigenous Drugs Committee of Madras, Parts I and II	1924
[A very comprehensive and useful list of works extant (both printed and manuscript) of Indian medicine—Ayurveda, Siddha and Unani—in Sanskrit, and other languages, together with such details as regards their having been translated in other languages, the whereabouts of their availability, etc., are given in an appendix in Part I of this report—Pages 135—153]	
2. Reports of the Drugs Inquiry Committee under the Chairmanship of R. N. Chopra, Government of India publication	1931
3. Report of the Committee appointed to examine the Indigenous Systems of Medicine practised in the Central Provinces and Berar (Price Rs. 1-8-0.)	1939

APPENDIX B

I.—IMPORTS

Drugs and Medicines including chemicals and narcotics. (Statistics from the "Accounts relating to the Sea Borne Trade Navigation of British India").

Principal articles	Quantity					
	Twelve months, (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Lba.	Lba.	Lba.	Lba.	Lba.	Lba.
Quinine salts ..	127,572	107,628	103,610	99,049	105,329	98,135
Preparations of opium and morphia ..	..	..	..	..	..	..
Codliver oil ..	115,521	99,106	106,431	196,351	164,924	280,516
Camphor ..	1,785,942	2,018,933	2,207,386	1,868,011	1,771,471	1,868,694
Proprietary and patent medicines ..	..	..	..	..	..	..
Saccharin ..	34,962	35,418	91,141	23,241	25,721	27,528
Other sorts ..	..	..	..	..	..	..
Grand Total ..	..	..	..	..	..	..

Principal articles	Value					
	Twelve months, (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Quinine salts ..	31,74,199	25,89,966	26,17,842	23,19,610	26,28,578	25,37,102
Preparations of opium and morphia ..	80,277	92,650	1,21,880	1,62,423	1,73,969	1,93,479
Codliver oil ..	57,561	45,349	45,435	85,704	92,717	1,33,654
Camphor ..	23,13,372	21,62,936	22,41,510	21,24,856	22,33,243	21,88,036
Proprietary and patent medicines ..	30,97,635	39,26,150	64,20,669	67,76,845	73,77,559	60,74,672
Saccharin ..	2,42,858	2,42,447	3,81,548	73,782	86,481	83,210
Other sorts ..	1,03,76,252	1,01,30,538	92,87,654	91,40,249	1,10,28,780	1,08,42,997
Grand Total ..	1,93,42,154	1,91,90,036	2,11,16,538	2,06,83,469	2,36,23,327	2,20,53,230

II.—EXPORTS

	Quantity					
	Twelve months (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Cinchona bark (lbs.) ..	94,841	141,798	24,118	52,231	28,222	32,452
Nux Vomica (Strychnia) cwt. ..	59,058	65,041	17,093	32,803	29,373	26,566
Senna cwt. ..	59,179	51,141	67,118	65,688	63,434	49,395
Other sorts of drugs and medicines ..	..	..	..	..	..	..
Total ..	..	..	..	..	..	..

	Value					
	Twelve months (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Cinchona bark ..	29,589	42,371	6,302	16,026	9,820	11,117
Nux vomica (Strychnia) ..	2,98,667	3,60,771	94,176	1,55,829	1,42,866	1,06,813
Senna ..	9,58,262	8,33,443	10,12,665	8,98,292	8,45,412	5,88,728
Other sorts of drugs and medicines ..	3,10,94,131	13,58,803	14,31,11	16,64,176	17,52,911	20,75,664
Total ..	280,649	25,95,393	25,44,256	27,34,326	27,51,009	27,82,332

APPENDIX C

List of plants having medicinal uses.

Names	Uses
1. <i>Abrus precatorius</i> , Gunja or Gumchi	Seeds used to poison cattle. Powdered root is used for coughs.
2. <i>Acacia arabica</i> (Babul)	.. Tender leaves useful in diarrhoea. Bark is a powerful astringent and demulcent.
3. <i>Acacia Catechu</i> (Khair)	.. Used as an astringent and cooling application to ulcers, boils and eruptions.
4. <i>Acacia leucophloea</i> (Hiwar)	.. The bark partakes more or less of the astringent properties of <i>Acacia arabica</i> .
5. <i>Aegle marmelos</i> (Bel)	.. The fruit is a well-known remedy for dysentery. A cooling 'Sherbet' is also made from the pulp of ripe fruits.
6. <i>Ailanthus excelsa</i> (Maharukh)	.. The leaves and bark are in great repute as a tonic in Bombay.
7. <i>Alangium lamarkii</i> (Akol)	.. The root bark is used in native medicine and has a reputation in leprosy and skin diseases.
8. <i>Albizzia lebbek</i> (Kala-siris)	.. Seeds used in ophthalmic diseases. Oil extracted from them is useful in leprosy.
9. <i>Andropogon schoenanthus</i> , (Rusa or Tikhadi).	Oil used for application in rheumatism.
10. <i>Anogeissus latifolia</i> (Dhaora)	.. The tree yields a valuable gum.
11. <i>Asparagus racemosus</i> (Shatawari, Narbodh).	The root is used medicinally as a stimulant.
12. <i>Azadirachta indica</i> (Neem)	.. The bark is used as a febrifuge, leaves useful in ulcers, fruit is also used medicinally, seeds kill insects and wash the hair.
13. <i>Balanites roxburghii</i> (Hingan)	.. The seeds, bark and leaves used in native medicine.
14. <i>Baliospermum axillare</i> (Hansiadafar or Boa).	The seeds, bark and leaves are used in native medicine and are purgative. Stems used as a remedy for toothache.
15. <i>Barleria cristata</i> (Korat or Koranti).	The seeds are supposed to be an antidote for snake bite. The roots and leaves are used to reduce swellings.
16. <i>Barleria prionitis</i> (Keoti)	.. The juice of the leaves is applied to the soles of the feet to harden them.
17. <i>Bassia latifolia</i> , (Mahua)	.. Spirit distilled from flowers is described as heating, astringent, tonic and appetising. Flowers are regarded as cooling, tonic and nutritive.
18. <i>Berberis asiatica</i> (Daruhalidi or Rasaunt).	Used in ophthalmia and sun blindness and is a valuable tonic and febrifuge.
19. <i>Bombax malabaricum</i> (Semal)	.. A gum called 'Mocharas' is collected from the tree and sold as medicine. The roots of young plants are the semal-musti of commerce, which is considered a very good tonic.
20. <i>Boswellia serrata</i> (Salai)	.. A resin obtained from cuts of the bark has medicinal properties.
21. <i>Buchanania latifolia</i> Syn. B. Lanza (Chironji, Achar, Char).	Fruit is sweet and laxative, used to relieve thirst, burning of body and fever. Roots and leaves useful in diarrhoea. Seed a valuable article in Indian confectionery and yields an oil.
22. <i>Butea frondosa</i> (Palas)	.. The seeds are used as a vermifuge.
23. <i>Caesalpinia bonducella</i> (Sagargoti)	The seeds are used as tonic and febrifuge.
24. <i>Calotropis gigantea</i> (Ak or Rui)	.. The milky juice and root used medicinally.
25. <i>Capparis horrida</i> (Afua, Waghote)	.. Leaves used medicinally as a counter-irritant.
26. <i>Cardiospermum halicacabum</i> (Kala-gunchi or Wasan).	Root is used as an emetic and laxative. The whole plant is used in rheumatism and lumbago.
27. <i>Carissa spinarum</i> (Karonda)	.. Unripe fruit is astringent and the ripe is cooling and useful in bilious complaints. Root a bitter stomachic. Makes an excellent jelly.
28. <i>Careya arborea</i> (Kumbhi)	.. Bark is applied to the wound in snake bite. Fruit is astringent and used as a decoction to promote digestion. Flowers given as a tonic after child birth.
29. <i>Casaria tomentosa</i> (Gilchi)	.. The fruit is used for poisoning fish.

Names	Uses
30. <i>Cassia auriculata</i> (Tarwar) ..	The twigs are used for cleaning teeth.
31. <i>Cassia fistula</i> (Amaltas or Bahava) ..	The pulp of the pods is a strong purgative and is considerably used in native medicine.
32. <i>Cassia tora</i> (Tarota or Panwar) ..	Both leaves and seeds constitute a valuable remedy for skin disease.
33. <i>Celastrus paniculata</i> (Malkangni) ..	An oil, known as <i>Oleum nigrum</i> , is extracted from the seeds by distillation and is used medicinally. Locally, yellow oil is extracted by compression and is used in gout and paralysis.
34. <i>Chloroxylon swietenia</i> (Bhirra or ghiria).	The astringent bark is sometimes prescribed. Leaves are applied to the wounds and useful in rheumatism.
35. <i>Cissampelos pareira</i> (Pahadmul, Safed-padh).	A decoction of the root and bark is used for stomach complaints and is applied externally in snake bite.
36. <i>Cleistanthus collinus</i> (Garari or karra).	Fruit and bark employed to poison fish.
37. <i>Coccinia indica</i> (Indravan or Dhor-kakri).	Gastro-intestinal irritant. The root is used in native medicine.
38. <i>Cochlospermum gossypium</i> (Gongal or Galgal).	Gum is used in coughs, also in gonorrhoea.
39. <i>Curculigo orchioides</i> (Kali-musli) ..	The tubers are used in medicine.
40. <i>Cuscuta reflexa</i> (Amarbel, Adharwel)	Seeds used medicinally in the Punjab as an alterative.
41. <i>Datura fastuosa</i> (Kala Dhatura (धस्तूर in Sanskrit).	Poison is extracted from the seeds.
42. <i>D. stramonium</i> . Safed-Dhatura.	A well known poison.
43. <i>Dendrocalamus strictus</i> (Bans) ..	The silicious matter found near the joints of certain culms and known as Banslochan or Tabashir ¹ is used as a cooling, tonic and astringent medicine. Leaves are given to animals during parturition.
44. <i>Dichrostachys cinerea</i> (Yelati, Sagunkanti).	The young shoots are bruised and applied to eyes in cases of ophthalmia.
45. <i>Dillenia pentagyna</i> (Rankela) ..	Used medicinally.
46. <i>Dioscorea daemonia</i> (Baichandi) ..	The tuberous root is edible after being soaked in running water.
47. <i>Dioscorea pentaphylla</i> (Masal-kand).	The tubers are sometimes used to disperse swellings. Also used as a tonic.
48. <i>Diospyros melanoxylon</i> (Tendu) ..	The bark possesses astringent properties and is used as decoction in diarrhoea and dyspepsia, as a tonic. In a dilute form it is used as an astringent lotion for eyes.
49. <i>Dolicandrone falcata</i> (Medsingh) ..	Decoction of fruit is used to procure abortion. Bark is used as a fish poison.
50. <i>Elaeodendron glaucum</i> (Jamrasi) ..	Leaves used for hysterical syncope. Root is believed to be a specific against snake-bite. Bark is used in native medicine and said to be a virulent poison.
51. <i>Embelia robusta</i> (Baibirang or Wao-ding).	The fruit is used in medicine as anthelmintic.
52. <i>Erythrina suberosa</i> (Pangra) ..	Used medicinally.
53. <i>Eugenia jambolana</i> (Jamun) ..	Juice of bark is used in diarrhoea. Juice of leaves used in dysentery. Roots and seeds are useful astringent.
54. <i>Euphorbia nerifolia</i> (Thuar) ..	The milky juice is considered as purgative, also said to be an antidote against snake-bite.
55. <i>Ficus bengalensis</i> (Bud or Bargad) ..	Milky juice externally applied for pains, bruises, etc. Infusion of bark is a powerful tonic and specific for diabetes. Seeds cooling.
56. <i>Ficus glomerata</i> (Gular or Umar) ..	Bark astringent, and used in dysentery. Seed cooling and alterative. Powder of bark is useful in fistula in anus.
57. <i>Ficus hispida</i> (Kat-umar) ..	The fruits, seeds and bark possess valuable emetic properties.
58. <i>Ficus religiosa</i> (Pipal) ..	Bark astringent and used in gonorrhoea. Seeds cooling and alterative.
59. <i>Flacourtia ramontchi</i> (Kakai) ..	Fruits are given in jaundice and enlarged spleen.
60. <i>Gardenia lucida</i> (Dikamali) ..	Used in native medicine for keeping off flies from sores and in the treatment of cutaneous diseases.
61. <i>Gardenia turgida</i> (Phetra) ..	Preparation from the root used as remedy for indigestion in children.

Names	Uses
62. <i>Garuga pinnata</i> (Ghogar or Kekad)	The juice of stem is useful for eye complaints. Fruit is a stomachic remedy.
63. <i>Gloriosa superba</i> (Bishnangul) Kallais or Kirkichigao or Karkari).	The tuberous root is believed in Madras to be a specific against snake bite and scorpion stings.
64. <i>Gmelina arborea</i> (Siwan or Khamer)	The root is used in native medicine.
65. <i>Gymnosporia montona</i> (Bharati) ..	Bark applied with other oils to the head for destroying pediculi.
66. <i>Helicteres isora</i> (Marorphal, Aithni)	The fruits are used medicinally for colic and intestinal complaints.
67. <i>Hemidesmus indicus</i> (Anantmul, Khoberwel).	The root is commonly used as a substitute for Sarsaparilla, as a tonic and alterative.
68. <i>Hibiscus cancellatus</i> (Kacheli, Bhojraj, Tezraj).	A decoction of the plant is used in conjunction with other medicines for debility and impotence.
69. <i>Holarrhena antidysenterica</i> (Kura, Indigo, Kudo).	The barks, leaves, fruits and seeds are well known remedies for dysentery.
70. <i>Hymenodictyon excelsum</i> (Bhourmal).	The inner bark is used in native medicine as a febrifuge.
71. <i>Ixora parviflora</i> (Lokhandi) ..	Flowers used in dysentery.
72. <i>Lantana aculeata</i> (Raimunia) ..	Leaves, boiled with barley, are given to women in child-birth.
73. <i>Leea macrophylla</i> (Hatikand, Hathi- pan).	The root is used medicinally in the cure of guinea-worm.
74. <i>Litsaea sebifera</i> (Maida-lakri, Lenja)	The mucilaginous bark is largely used in native medicine, as an astringent in diarrhoea.
75. <i>Mallotus philippinensis</i> (Kamela) Sirduri or Kunkuma.	Fruit powder as an anthelmintic, vermifuge and purgative medicine.
76. <i>Millettia auriculata</i> (Ganj or Nasbel)	Bark used to poison fish and infusion of root as an insecticide.
77. <i>Moringa pterygosperma</i> (Shewaga, Munga).	Root and seed stimulant. Root poultice reduces swelling. Decoction of root bark is used as fomentation to relieve spasm. Fruit used in affection of liver and spleen.
78. <i>Mucuna pruriens</i> (Kanchkuri or or Kewanch).	The hairs of the pods have long been used as a vermifuge in European medicine. The cowitch climber of the Anglo Indians.
79. <i>Murraya Koenigii</i> (Karipat) Mithi- neem.	The leaves, bark and root are used in native medicine as a tonic and stomachic.
80. <i>Nyctanthes arbor-tristis</i> (Harsingar) Parijatak.	Leaves useful in fever and rheumatism. Powdered seeds are used to cure scurvy affection of the scalp.
81. <i>Ocimum sanctum</i> (Tulsi) ..	The juice of the leaves is largely used in native medicines.
82. <i>Opuntia elatior</i> (Nagphani) ..	Used medicinally.
83. <i>Oroxylum indicum</i> (Sonpadar, Jai- mangal).	The root bark is used in native medicine as an astringent and tonic.
84. <i>Ougenia dalbergiodes</i> (Tiwas or Tinsa).	The bark is used as febrifuge.
85. <i>Pachystoma senile</i> (Safed Musli) ..	The rhizomes are collected and sold for medicinal purposes.
86. <i>Phyllanthus emblica</i> (Aonla) ..	The fruit is used medicinally.
87. <i>Pongamia glabra</i> (Karanji) ..	The oil extracted from seeds is useful in skin diseases.
88. <i>Plumbago zeylanica</i> (Chitawar or Chitrak).	The root is employed in medicine. It is made into a paste and applied in leprosy and skin diseases as well as in rheumatism.
89. <i>Polygala chinensis</i> (Bijnori) ..	Root used in cases of fever and dizziness.
90. <i>Pterocarpus marsupium</i> (Bija) ..	A red gum resin obtained from wounds in the bark used in medicine, as an astringent.
91. <i>Pueraria tuberosa</i> (Ghorbel) ..	The roots are used in medicine.
92. <i>Radia dumetorum</i> (Mainhar, Main- phal).	The unripe fruit is used to poison fish. Bark and fruit are used medicinally. Pulp of the fruit is a valuable and safe emetic.
93. <i>Santalum album</i> (Chandan or San- dal).	Oil from seed used in skin disease. Wood useful in biliousness and vomiting.
94. <i>Sapindus laurifolius</i> (Ritha) ..	Used in native medicine.
95. <i>Sesbania aculeata</i> (Savri) ..	Seeds used medicinally.
96. <i>S. Grandiflora</i> (Agasta Cultivated) ..	The juice of leaves and flowers a popular remedy for nasal catarrh and headache.

Names	Uses
97. <i>Semecarpus anacardium</i> (Bhilwa, Bibba).	The juice of pericarp is used in native medicine, in all kinds of skin diseases. It is a powerful vesicant.
98. <i>Smilax macrophylla</i> (Ramdaton) ..	The stems are used as tooth brushes. Roots used as Sarsaparilla.
99. <i>Solanum indicum</i> (Bhatkataia) ..	Root useful in cough, fever, colic, etc. Juices of leaves useful in stopping vomiting.
100. <i>Soyimida febrifuga</i> (Rohan) ..	Bark useful in intermittent fevers and debility.
101. <i>Sterculia urens</i> (Kulu) ..	Leaves and tender branches useful in pleuro-pneumonia in cattle. Gum useful in throat affection.
102. <i>Stereospermum xylocarpum</i> (Bhains-padar).	In Western India a resin is extracted from the wood which is used as a remedy for skin eruptions.
103. <i>Stereospermum suaveolens</i> (Padar)	Flowers useful to check hic cough.
104. <i>Strychnos nux-vomica</i> (Kuchla) ..	The wood is a useful remedy for dysentery, fever and dyspepsia. Seeds useful in colic. Leaves used as poultice. Poison.
105. <i>Strychnos potatorum</i> (Nirmali) ..	The seeds are used in cleaning muddy water and in medicine.
106. <i>Swertia angustifolia</i> (Chiretta) ..	An infusion of this plant is used for fever and as a stomachic.
107. <i>Tamarindus indica</i> (Imli) ..	The acid pulp in the pod is a laxative and is medicinally used. Poultices of the leaves are used for inflammatory swellings.
108. <i>Tectona grandis</i> (Sagwan) ..	Plaster of powdered wood useful in headache and in inflammatory swellings. Bark astringent. Oil of nuts removes itchiness of skin. Flowers diuretic.
109. <i>Terminalia Arjuna</i> (Koha or arjun) ..	Bark useful in bilious affections and antidote to poison, tonic and useful in head diseases. Juice of fresh leaves is remedy for ear ache.
110. <i>Terminalia belerica</i> (Bahera) ..	The seeds are used medicinally.
111. <i>Terminalia chebula</i> (Harra) ..	Used in fevers, cough, asthma and urinal diseases etc.
112. <i>Terminalia tomentosa</i> (Saj, Ain) ..	Decoction of bark is taken in diarrhoea.
113. <i>Thespesia lampas</i> (Jangli bhindi) ..	The root and fruits are said to be used medicinally in Chota Nagpur.
114. <i>Tinospora cordifolia</i> (Gulvel, Gurbel).	The root, stem and leaves are used in native medicine as a febrifuge and as a valuable alterative and tonic.
115. <i>Tribulus terrestris</i> (Gokru) ..	The fruit is used medicinally throughout India, as a tonic and aphrodisiac.
116. <i>Trichosanthes palmata</i> (Kahira or Kaundal).	The fruit and root are used in native medicine.
117. <i>Triumfetta rhomboidea</i> (Chirpat) ..	Used medicinally.
118. <i>Ventilago calyculata</i> (Papri, Keoti, Lal-bel).	Powdered root bark useful as a tonic for dyspepsia and debility.
119. <i>Vitexnegundo</i> (Nirgudi) ..	The leaves which are aromatic when bruised are employed in native medicine.
120. <i>Vitex quadrangularis</i> (Hadjuri) ..	The stunts are applied to assist healing of broken bones.
121. <i>Wrightia tomentosa</i> (Dudhi) ..	Seed produces medicinal oil. Bark is given in mensrual and renal complaints. Bark and root bark useful in snake bite and scorpion stings.
122. <i>Zehneria umbellata</i> (Gulakri) ..	The juice of the plant is used medicinally in Konkan.

APPENDIX B

I.—IMPORTS

Drugs and Medicines excluding chemicals and narcotics. (Statistics from the "Accounts relating to the Sea Borne Trade and Navigation of British India").

Principal articles	Quantity					
	Twelve months, (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Lba.	Lba.	Lba.	Lba.	Lba.	Lba.
Quinine salts ..	127,572	107,628	103,610	99,049	105,329	98,132
Preparations of opium and morphia ..	..	..	..	..	..	..
Codliver oil ..	115,521	99,106	106,431	196,351	164,924	280,516
Camphor ..	1,785,942	2,018,933	2,207,386	1,868,011	1,771,471	1,868,694
Proprietary and patent medicines ..	..	..	..	..	..	..
Saccharin ..	34,962	35,418	91,141	23,241	25,721	27,526
Other sorts ..	..	..	..	..	..	..
Grand Total ..	..	..	..	..	..	..

Principal articles	Value					
	Twelve months, (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Quinine salts ..	31,74,199	25,89,966	26,17,842	23,19,610	26,28,578	25,37,182
Preparations of opium and morphia ..	80,277	92,650	1,21,880	1,62,423	1,73,969	1,93,479
Codliver oil ..	57,561	45,349	45,435	85,704	92,717	1,33,654
Camphor ..	23,13,372	21,62,936	22,41,510	21,24,856	22,33,243	21,88,036
Proprietary and patent medicines ..	30,97,635	39,26,150	64,20,669	67,76,845	73,79,559	60,74,672
Saccharin ..	2,42,858	2,42,447	3,81,548	73,782	86,481	83,210
Other sorts ..	1,03,76,252	1,01,30,538	92,87,654	91,40,249	1,10,28,780	1,08,42,992
Grand Total ..	1,93,42,154	1,91,90,036	2,11,16,538	2,06,83,469	2,36,23,327	2,20,53,230

II.—EXPORTS

	Quantity					
	Twelve months (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Cinchona bark (lbs.) ..	94,841	141,798	24,118	52,231	28,222	32,452
Nux Vomica (Strychnia) cwt. ..	59,058	65,041	17,093	32,803	29,373	26,566
Senna cwt. ..	59,179	51,141	67,118	65,688	63,434	49,395
Other sorts of drugs and medicines ..	..	..	..	..	..	..
Total ..	..	..	..	..	..	..

	Value					
	Twelve months (1st April to 31st March).					
	1933-34	1934-35	1935-36	1936-37	1937-38	1938-39
Cinchona bark ..	29,589	42,371	6,302	16,026	9,820	11,117
Nux vomica (Strychnia) ..	2,98,667	3,60,771	94,176	1,55,829	1,42,866	1,06,813
Senna ..	9,58,262	8,33,443	10,12,665	8,98,292	8,45,412	5,88,728
Other sorts of drugs and medicines ..	3,10,94,131	13,58,803	14,31,11	16,64,176	17,52,911	20,75,664
Total ..	280,649	25,95,393	25,44,256	27,34,326	27,51,009	27,82,332

APPENDIX C

List of plants having medicinal uses.

Names	Uses
1. <i>Abrus precatorius</i> , Gunja or Gumchi	Seeds used to poison cattle. Powdered root is used for coughs.
2. <i>Acacia arabica</i> (Babul)	Tender leaves useful in diarrhoea. Bark is a powerful astringent and demulcent.
3. <i>Acacia Catechu</i> (Khair)	Used as an astringent and cooling application to ulcers, boils and eruptions.
4. <i>Acacia leucophloea</i> (Hiwar)	The bark partakes more or less of the astringent properties of <i>Acacia arabica</i> .
5. <i>Aegle marmelos</i> (Bel)	The fruit is a well-known remedy for dysentery. A cooling 'Sherbet' is also made from the pulp of ripe fruits.
6. <i>Ailanthus excelsa</i> (Maharukh)	The leaves and bark are in great repute as a tonic in Bombay.
7. <i>Alangium lamarkii</i> (Akol)	The root bark is used in native medicine and has a reputation in leprosy and skin diseases.
8. <i>Albizzia lebbek</i> (Kala-siris)	Seeds used in ophthalmic diseases. Oil extracted from them is useful in leprosy.
9. <i>Andropogon schoenanthus</i> , (Rusa or Tikhadi).	Oil used for application in rheumatism.
10. <i>Anogeissus latifolia</i> (Dhaora)	The tree yields a valuable gum.
11. <i>Asparagus racemosus</i> (Shatawari, Narbodh).	The root is used medicinally as a stimulant.
12. <i>Azadirachta indica</i> (Neem)	The bark is used as a febrifuge, leaves useful in ulcers, fruit is also used medicinally, seeds kill insects and wash the hair.
13. <i>Balanites roxburghii</i> (Hingan)	The seeds, bark and leaves used in native medicine.
14. <i>Baliospermum axillare</i> (Hansiadafar or Boa).	The seeds, bark and leaves are used in native medicine and are purgative. Stems used as a remedy for toothache.
15. <i>Barleria cristata</i> (Korat or Koranti).	The seeds are supposed to be an antidote for snake bite. The roots and leaves are used to reduce swellings.
16. <i>Barleria prionitis</i> (Keoti)	The juice of the leaves is applied to the soles of the feet to harden them.
17. <i>Bassia latifolia</i> , (Mahua)	Spirit distilled from flowers is described as heating, astringent, tonic and appetising. Flowers are regarded as cooling, tonic and nutritive.
18. <i>Berberis asiatica</i> (Daruhalidi or Rasaunt).	Used in ophthalmia and sun blindness and is a valuable tonic and febrifuge.
19. <i>Bombax malabaricum</i> (Semal)	A gum called 'Mocharas' is collected from the tree and sold as medicine. The roots of young plants are the semal-musti of commerce, which is considered a very good tonic.
20. <i>Boswellia serrata</i> (Salai)	A resin obtained from cuts of the bark has medicinal properties.
21. <i>Buchanania latifolia</i> Syn. B. Lanza (Chironji, Achar, Char).	Fruit is sweet and laxative, used to relieve thirst, burning of body and fever. Roots and leaves useful in diarrhoea. Seed a valuable article in Indian confectionery and yields an oil.
22. <i>Butea frondosa</i> (Palas)	The seeds are used as a vermifuge.
23. <i>Caesalpinia bonducella</i> (Sagargoti)	The seeds are used as tonic and febrifuge.
24. <i>Calotropis gigantea</i> (Ak or Rui)	The milky juice and root used medicinally.
25. <i>Capparis horrida</i> (Afta, Waghoti)	Leaves used medicinally as a counter-irritant.
26. <i>Cardiospermum halicacabum</i> (Kala-gunchi or Wasan).	Root is used as an emetic and laxative. The whole plant is used in rheumatism and lumbago.
27. <i>Carissa spinarum</i> (Karonda)	Unripe fruit is astringent and the ripe is cooling and useful in bilious complaints. Root a bitter stomachic. Makes an excellent jelly.
28. <i>Careya arborea</i> (Kumbhi)	Bark is applied to the wound in snake bite. Fruit is astringent and used as a decoction to promote digestion. Flowers given as a tonic after child birth.
29. <i>Casearia tomentosa</i> (Gilchi)	The fruit is used for poisoning fish.

Names	Uses
30. Cassiauriculata (Tarwar) ..	The twigs are used for cleaning teeth.
31. Cassia fistula (Amaltas or Bahava)..	The pulp of the pods is a strong purgative and is considerably used in native medicine.
32. Cassia tora (Tarota or Panwar) ..	Both leaves and seeds constitute a valuable remedy for skin disease.
33. Celastrus paniculata (Malkangni) ..	An oil, known as <i>Oleum nigrum</i> , is extracted from the seeds by distillation and is used medicinally. Locally, yellow oil is extracted by compression and is used in gout and paralysis.
34. Chloroxylon swietenia (Bhirra or ghiria).	The astringent bark is sometimes prescribed. Leaves are applied to the wounds and useful in rheumatism.
35. Cissampelos pareira (Pahadmul, Safed-padh).	A decoction of the root and bark is used for stomach complaints and is applied externally in snake bite.
36. Cleistanthus collinus (Garari or karra).	Fruit and bark employed to poison fish.
37. Coccinia indica (Indravan or Dhor-kakri).	Gastro-intestinal irritant. The root is used in native medicine.
38. Cochlospermum gossypium (Gongal or Galgal).	Gum is used in coughs, also in gonorrhoea.
39. Curculigo orchioides (Kali-musli)..	The tubers are used in medicine.
40. Cuscuta reflexa (Amarbel, Adharwel)	Seeds used medicinally in the Punjab as an alterative.
41. Datura fastuosa (Kala Dhatura (धतूर in Sanskrit).	Poison is extracted from the seeds.
42. D. stramonium. Safed-Dhatura.	A well known poison.
43. Dendrocalamus strictus (Bans) ..	The silicious matter found near the joints of certain culms and known as Banslochan or Tabashir is used as a cooling, tonic and astringent medicine. Leaves are given to animals during parturition.
44. Dichrostachys cinerea (Yelati, Sagunkanti).	The young shoots are bruised and applied to eyes in cases of ophthalmia.
45. Dillenia pentagyna (Rankela) ..	Used medicinally.
46. Dioscorea daemona (Baichandi) ..	The tuberous root is edible after being soaked in running water.
47. Dioscorea pentaphylla (Masal-kand).	The tubers are sometimes used to disperse swellings. Also used as a tonic.
48. Diospyros melanoxylon (Tendu) ..	The bark possesses astringent properties and is used as decoction in diarrhoea and dyspepsia, as a tonic. In a dilute form it is used as an astringent lotion for eyes.
49. Dolicanthone falcata (Medsingh) ..	Decoction of fruit is used to procure abortion. Bark is used as a fish poison.
50. Elaeodendron glaucum (Jamrasi) ..	Leaves used for hysterical syncope. Root is believed to be a specific against snake-bite. Bark is used in native medicine and said to be a virulent poison.
51. Embelia robusta (Baibirang or Wao-ding).	The fruit is used in medicine as anthelmintic.
52. Erythrina suberosa (Pangra) ..	Used medicinally.
53. Eugenia jambolana (Jamun) ..	Juice of bark is used in diarrhoea. Juice of leaves used in dysentery. Roots and seeds are useful astringent.
54. Euphorbia nerifolia (Thuar) ..	The milky juice is considered as purgative, also said to be an antidote against snake-bite.
55. Ficus bengalensis (Bud or Bargad)..	Milky juice externally applied for pains, bruises, etc. Infusion of bark is a powerful tonic and specific for diabetes. Seeds cooling.
56. Ficus glomerata (Gular or Umar) ..	Bark astringent, and used in dysentery. Seed cooling and alterative. Powder of bark is useful in fistula in anus.
57. Ficus hispida (Kat-umar) ..	The fruits, seeds and bark possess valuable emetic properties.
58. Ficus religiosa (Pipal) ..	Bark astringent and used in gonorrhoea. Seeds cooling and alterative.
59. Flacourtia ramontchi (Kakai) ..	Fruits are given in jaundice and enlarged spleen.
60. Gardenia lucida (Dikamali) ..	Used in native medicine for keeping off flies from sores and in the treatment of cutaneous diseases.
61. Gardenia turgida (Phetra) ..	Preparation from the root used as remedy for indigestion in children.

Names	Uses
62. <i>Garuga pinnata</i> (Ghogar or Kekad)	The juice of stem is useful for eye complaints. Fruit is a stomachic remedy.
63. <i>Gloriosa superba</i> (Bishnangul) Kallais or Kirkichigao or Karkari)	The tuberous root is believed in Madras to be a specific against snake bite and scorpion stings.
64. <i>Gmelina arborea</i> (Siwan or Khamer)	The root is used in native medicine.
65. <i>Gymnosporia montona</i> (Bharati)	Bark applied with other oils to the head for destroying pediculi.
66. <i>Helicteres isora</i> (Marorphal, Aithni)	The fruits are used medicinally for colic and intestinal complaints.
67. <i>Hemidesmus indicus</i> (Anantmul, Khaberwel)	The root is commonly used as a substitute for Sarsaparilla, as a tonic and alterative.
68. <i>Hibiscus cancellatus</i> (Kacheli, Bhojraj, Tezraj)	A decoction of the plant is used in conjunction with other medicines for debility and impotence.
69. <i>Holarrhena antidysenterica</i> (Kura, Indrajao, Kudo)	The barks, leaves, fruits and seeds are well known remedies for dysentery.
70. <i>Hymenodictyon excelsum</i> (Bhourmal)	The inner bark is used in native medicine as a febrifuge.
71. <i>Ixora parviflora</i> (Lokhandi)	Flowers used in dysentery.
72. <i>Lantana aculeata</i> (Raimunia)	Leaves, boiled with barley, are given to women in child-birth.
73. <i>Leea macrophylla</i> (Hatikand, Hathi-pan)	The root is used medicinally in the cure of guinea-worm.
74. <i>Litsaea sebifera</i> (Maida-lakri, Lenja)	The mucilaginous bark is largely used in native medicine, as an astringent in diarrhoea.
75. <i>Mallotus philippinensis</i> (Kamela) Sirduri or Kunkuma.	Fruit powder as an anthelmintic, vermifuge and purgative medicine.
76. <i>Millettia auriculata</i> (Ganj or Nasbel)	Bark used to poison fish and infusion of root as an insecticide.
77. <i>Moringa pterygosperma</i> (Shewaga, Munga)	Root and seed stimulant. Root poultice reduces swelling. Decoction of root bark is used as fomentation to relieve spasm. Fruit used in affection of liver and spleen.
78. <i>Mucuna pruriens</i> (Kanchkuri or Kewanch)	The hairs of the pods have long been used as a vermifuge in European medicine. The cowitch climber of the Anglo Indians.
79. <i>Murraya Koenigii</i> (Karipat) Mithineem.	The leaves, bark and root are used in native medicine as a tonic and stomachic.
80. <i>Nyctanthes arbor-tristis</i> (Harsingar) Parijatak.	Leaves useful in fever and rheumatism. Powdered seeds are used to cure scurvy affection of the scalp.
81. <i>Ocimum sanctum</i> (Tulsi)	The juice of the leaves is largely used in native medicines.
82. <i>Opuntia elatior</i> (Nagphani)	Used medicinally.
83. <i>Oroxylum indicum</i> (Sonpadar, Jaimangal)	The root bark is used in native medicine as an astringent and tonic.
84. <i>Ougenia dalbergiodes</i> (Tiwas or Tinsa)	The bark is used as febrifuge.
85. <i>Pachystoma senile</i> (Safed Musli)	The rhizomes are collected and sold for medicinal purposes.
86. <i>Phyllanthus emblica</i> (Aonla)	The fruit is used medicinally.
87. <i>Pongamia glabra</i> (Karanji)	The oil extracted from seeds is useful in skin diseases.
88. <i>Plumbago zeylanica</i> (Chitawar or Chitrak)	The root is employed in medicine. It is made into a paste and applied in leprosy and skin diseases as well as in rheumatism.
89. <i>Polygala chinensis</i> (Bijnori)	Root used in cases of fever and dizziness.
90. <i>Pterocarpus marsupium</i> (Bija)	A red gum resin obtained from wounds in the bark used in medicine, as an astringent.
91. <i>Pueraria tuberosa</i> (Ghorbel)	The roots are used in medicine.
92. <i>Radia dumetorum</i> (Mainhar, Mainphal)	The unripe fruit is used to poison fish. Bark and fruit are used medicinally. Pulp of the fruit is a valuable and safe emetic.
93. <i>Santalum album</i> (Chandan or Sandal)	Oil from seed used in skin disease. Wood useful in biliousness and vomiting.
94. <i>Sapindus laurifolius</i> (Ritha)	Used in native medicine.
95. <i>Sesbania aculeata</i> (Savri)	Seeds used medicinally.
96. <i>S. Grandiflora</i> (Agasta Cultivated)	The juice of leaves and flowers a popular remedy for nasal catarrh and headache.

Names	Uses
97. <i>Semecarpus anacardium</i> (Bhilwa, Bibba).	The juice of pericarp is used in native medicine, in all kinds of skin diseases. It is a powerful vesicant.
98. <i>Smilax macrophylla</i> (Ramdaton) ..	The stems are used as tooth brushes. Roots used as Sarsaparilla.
99. <i>Solanum indicum</i> (Bhatkataia) ..	Root useful in cough, fever, colic, etc. Juice of leaves useful in stopping vomiting.
100. <i>Soymida febrifuga</i> (Rohan) ..	Bark useful in intermittent fevers and debility.
101. <i>Sterculia urens</i> (Kulu) ..	Leaves and tender branches useful in pleuro-pneumonia in cattle. Gum useful in throat affection.
102. <i>Stereospermum xylocarpum</i> (Bhains-padar).	In Western India a resin is extracted from the wood which is used as a remedy for skin eruptions.
103. <i>Stereospermum suaveolens</i> (Padar)	Flowers useful to check hic cough.
104. <i>Strychnos nux-vomica</i> (Kuchla) ..	The wood is a useful remedy for dysentery, fever and dyspepsia. Seeds useful in colic. Leaves used as poultice. Poison.
105. <i>Strychnos potatorum</i> (Nirmaali) ..	The seeds are used in cleaning muddy water and in medicine.
106. <i>Swertia angustifolia</i> (Chiretta) ..	An infusion of this plant is used for fever and as a stomachic.
107. <i>Tamarindus indica</i> (Imli) ..	The acid pulp in the pod is a laxative and is medicinally used. Poultices of the leaves are used for inflammatory swellings.
108. <i>Tectona grandis</i> (Sagwan) ..	Plaster of powdered wood useful in headache and in inflammatory swellings. Bark astringent. Oil of nuts removes itchiness of skin. Flowers diuretic.
109. <i>Terminalia Arjuna</i> (Koha or arjun) ..	Bark useful in bilious affections and antidote to poison, tonic and useful in head diseases. Juice of fresh leaves is remedy for ear ache.
110. <i>Terminalia belerica</i> (Bahera) ..	The seeds are used medicinally.
111. <i>Terminalia chebula</i> (Harra) ..	Used in fevers, cough, asthma and urinal diseases etc.
112. <i>Terminalia tomentosa</i> (Saj, Ain) ..	Decoction of bark is taken in diarrhoea.
113. <i>Thespesia lampas</i> (Jangli bhindi) ..	The root and fruits are said to be used medicinally in Chota Nagpur.
114. <i>Tinospora cordifolia</i> (Gulvel, Gurbel).	The root, stem and leaves are used in native medicine as a febrifuge and as a valuable alterative and tonic.
115. <i>Tribulus terrestris</i> (Gokru) ..	The fruit is used medicinally throughout India, as a tonic and aphrodisiac.
116. <i>Trichosanthes palmata</i> (Kahira or Kaundal).	The fruit and root are used in native medicine.
117. <i>Triumfetta rhomboidea</i> (Chirpat) ..	Used medicinally.
118. <i>Ventilago calyculata</i> (Papri, Keoti, Lal-bel).	Powdered root bark useful as a tonic for dyspepsia and debility.
119. <i>Vitexnegundo</i> (Nirgudi) ..	The leaves which are aromatic when bruised are employed in native medicine.
120. <i>Vitex quadrangularis</i> (Hadjuri) ..	The stunts are applied to assist healing of broken bones.
121. <i>Wrightia tomentosa</i> (Dudhi) ..	Seed produces medicinal oil. Bark is given in mensrual and renal complaints. Bark and root bark useful in snake bite and scorpion stings.
122. <i>Zehneria umbellata</i> (Gulakri) ..	The juice of the plant is used medicinally in Konkan.