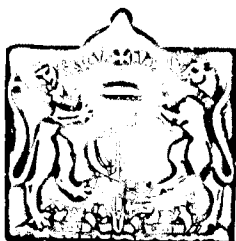


C.P. and Berar Reports: 1935-39.

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| 1 | { | 1. Agriculture, 1935-36. J.271r 1937. G7 1-20p. |
| | | 2. dto. 1936-37. J.271r 1938. G8 21-42p. |
| 2 | 3. | Season and Crop, 1936-37. 1938. G8 43-63p.
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REPORT
ON THE WORKING OF THE
DEPARTMENT OF AGRICULTURE
IN THE
CENTRAL PROVINCES
FOR THE YEAR ENDING THE
31ST MARCH 1936

NAGPUR
GOVERNMENT PRINTING, C. P.
1937

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GOVERNMENT OF THE CENTRAL PROVINCES
AGRICULTURE DEPARTMENT

Nagpur, the 14th December 1936.

READ—

Report on the working of the Department of Agriculture
for the year ending the 31st March 1936.

RESOLUTION

The year 1935-36 recorded further progress in the principal activities of the Department of Agriculture. It is satisfactory to note that expansion continued in the opening of seed farms, sale of improved implements and practical demonstrations carried out by the staff. The approximate value of the enhanced outturn resulting from the use of improved seed is estimated at Rs. 56 [54.08] lakhs. The response of the agriculturists to the practical demonstrations of the department continued to be encouraging.

2. The research work on all the important crops of the province proceeded on well-established lines. Government is pleased to note that a strain of cotton has been evolved in V-434 which has not only proved successful in adverse seasons and conditions but is also quite satisfactory from the commercial point of view. The verum marketing scheme had another successful year but Government regrets to note the absence of private enterprise in this business, the success of which has been demonstrated by the department. The rice research scheme has begun to bear fruit and valuable data have been obtained concerning the relations between soil conditions and plant. It is gratifying to note that the department is now in a position to distribute more productive varieties of paddy.

3. Government has noted with satisfaction that good progress was made in the marketing surveys initiated in the previous year and in implementing the schemes financed out of the Government of India's grant for rural

development. One of the most promising of the latter is that for the improvement of live-stock in the province. Pedigree bulls are now being distributed on a large scale to approved organizations under certain specified conditions. The recent appeal of His Excellency the Viceroy has evoked a very keen public interest in the matter and Government hopes that this will lead to an expansion of cattle-breeding operations to an extent more commensurate with the needs of the province than has been possible hitherto.

Government acknowledges once more with gratitude the generous financial assistance received from the Government of India, the Imperial Council of Agricultural Research and the Indian Central Cotton Committee without which it would have been unable to maintain the present level of activity and efficiency in the demonstration and research work.

4. Government lost a capable officer in Mr. Ritchie whose services were placed at the disposal of the Government of the United Provinces during the year. Government's thanks are due to him for the many improvements effected in the department during the two years he held charge of it. Government also records its appreciation of the zeal and thoroughness with which Mr. McDougall has set about his duties.

ORDER.—Ordered that a copy of this resolution, together with the enclosure, be submitted to the Government of India in the Department of Education, Health and Lands (Agriculture), that copies be forwarded to the Director of Agriculture and to all Commissioners of Divisions and Deputy Commissioners for information and guidance; and that it be published in Part I of the *Central Provinces Gazette*.

By order of the Government
(Ministry of Agriculture),

C. J. W. LILLIE,

*Revenue Secretary to Government,
Central Provinces.*

No. 2888-A

GOVERNMENT OF THE CENTRAL PROVINCES
AGRICULTURE DEPARTMENT

FROM

J. C. McDOUGALL, ESQ., I.A.S.,

OFFG. DIRECTOR OF AGRICULTURE,

Central Provinces,

TO

THE REVENUE SECRETARY TO
GOVERNMENT,

Central Provinces.

Nagpur, the 20th June 1936.

SIR,

I have the honour to submit, herewith, the report on the working of the Department of Agriculture, Central Provinces, for the year ending the 31st March 1936.

I have the honour to be,

SIR,

Your most obedient servant,

J. C. McDOUGALL,

Offg. Director of Agriculture,

Central Provinces.

**REPORT ON THE WORKING OF THE DEPARTMENT
OF AGRICULTURE, CENTRAL PROVINCES,
FOR THE YEAR ENDING THE 31ST MARCH 1936**

PART I.—ADMINISTRATION

Mr. J. H. Ritchie held charge of the department from the 1st April 1935 to the 11th October 1935 when he was transferred to the United Provinces. I took over from Mr. Ritchie on the 12th October 1935 and held charge for the remaining period of the year.

Mr. E. A. H. Churchill was appointed officiating Principal of the College of Agriculture from the 28th December 1935.

Mr. Govind Prasad was appointed to officiate in the Provincial Agricultural Service, Class I, and took over charge of the office of Deputy Director of Agriculture, Northern Circle, on the 25th November 1935.

Mr. R. H. Hill proceeded on leave for 7 months and 15 days with effect from the 23rd April 1935 and Mr. G. D. Mehta, Assistant Marketing Officer, was appointed to hold charge of the office of the Deputy Director of Agriculture, Economics and Marketing, in addition to his own duties.

Mr. D. N. Mahta proceeded on leave for 8 months with effect from the 14th November 1935 and Mr. S. C. Roy was appointed to officiate as Economic Botanist for Cotton.

Mr. D. V. Bal proceeded on leave for 8 months with effect from the 8th April 1935 and Mr. A. R. P. Aiyer, Extra-Assistant Director of Agriculture, attached to the Chemical Section, was placed in charge of the current duties of the Agricultural Chemist in addition to his own duties.

Mr. J. F. Dastur proceeded on leave for 1 month and 17 days with effect from the 23rd April 1935 and Mr. K. P. Shrivastav, Second Economic Botanist, held charge of the office of the Mycologist in addition to his own duties.

2. Expenditure on the department during the year amounted to Rs. 10,30,196 which included Rs. 65,718 on Botanical and other Gardens, Rs. 18,882 on the Rice

Research Scheme, Rs. 14,378 on a Cotton Cost Enquiry Scheme, Rs. 18,785 on the Agricultural Marketing Scheme, and Rs. 2,500 for the construction of tobacco curing barns. Receipts amounted to Rs. 2,18,020. The net expenditure on all branches of the department's activities thus amounted to Rs. 8,12,176. Out of this, Rs. 54,545 were contributed by the Imperial Council of Agricultural Research, and Rs. 80,128 by the Indian Central Cotton Committee for research schemes in progress. The net cost to the province was, therefore, Rs. 6,77,503 (6,43,348).

PART II.—AGRICULTURAL EDUCATION

3. Eighty-nine applications for admission to the College of Agriculture were received. Sixty candidates were selected for interview and 48 were admitted. The number on the roll of the first year class at the end of the year was 46, of whom 33 were promoted. Forty-four students, including 4 compartmental candidates, appeared for the Intermediate examination. Three passed in the first division, 13 in the second, 3 in the third, and 10 in the 'pass' division. Two secured compartmental passes. There were 21 students in the third year class and all were promoted. Of the 24 students who went up for the Degree examination, 10 passed in the second division, 7 in the third and 3 in the 'pass' division, while 2 secured compartmental passes.

The fourth year students toured in Chhattisgarh and Berar, visiting the Raipur, Chandkhuri, Ellichpur and Akola farms. The third year students were taken to the Chhindwara, Powarkheda, Adhartal and Jubbulpore Military Dairy and Grass farms; and the second year class visited Betul farm.

The health of the students was very satisfactory and the usual medical inspections brought no cases of a serious nature to light. Twenty-six students are members of the University Training Corps.

A College Council was constituted during the year in conformity with the system in other Government colleges.

4. Attendance at the Robertson Anglo-Vernacular Middle School, Powarkheda, was not so satisfactory as in previous years. The number on the roll at the commencement of the session was 67 and 18 new boys were admitted. There was, however, a serious leakage during

the session particularly from the sixth and eighth classes, which reduced the number at the end of the year to 68 (85). All the boys are sons of malguzars and cultivators in almost equal proportions. Fifty-eight of them belong to Hoshangabad district. Fourteen boys were sent up for the High School Entrance Examination and 9 passed. Produce of the value of Rs. 261 was obtained from the 6.5 acres cultivated by the boys. Exhibits from the school were entered at Bandra-bhan Fair and the Village Uplift Agricultural Exhibition and won two prizes. Three messes were run, one on a cash basis, while in the other two the boys supplied their own rations. The charges in the cash mess were the same as last year, namely, Rs. 4 to Rs. 4-4-0 per month. Consequent on the drop in attendance, receipts fell to Rs. 2,507 (Rs. 3,251), while there was an increase of Rs. 469 in expenditure. As a result, the net cost per head has risen sharply to Rs. 82 (Rs. 51-5-0). It is hoped that this set-back is only temporary, and attributable only to depressed conditions.

5. The Peace Memorial Agricultural School at Buldana received 50 applications for admission but only 16 were finally accepted of whom one subsequently left. Ten boys appeared for the final examination at the end of the second year and 15 for promotion to the second year. Seven of the former and 10 of the latter were successful.

6. Arrangements have been made under which the Betul Bazar Agricultural Anglo-Vernacular Middle School will be taken over from the district council by the Department of Agriculture from the 1st July 1936.

PART III.—RESEARCH AND EXPERIMENTAL WORK

7. Cotton Botanist's section.—*Cotton*.—Cotton is the chief concern of this section but it is also engaged in work on juar and groundnut which are important crops grown in rotation with cotton. Bajra and the lesser millets are receiving attention.

The work done in past years in the direction of evolving selected strains of Verum and other cottons suited to the requirements of different local conditions has been described in previous reports. In this connection, the outstanding feature of the past season has

been the success achieved by the strain V-434, which was grown extensively under varying conditions of soil and climate and gave consistently good results in spite of an unfavourable season. It is now certain that the older strains of V-262 will be replaced ultimately by V-434, the rate of substitution being governed solely by the quantity of seed of the latter available for distribution. Late Verum, a very excellent cotton from the spinners' point of view, has been selected specially for areas in which the monsoon is normally expected to continue late in the season. Unfortunately the character of the past season put late-maturing cotton at a grave disadvantage, for the reason that the monsoon disappeared abruptly in general in the middle of September. Late Verum is therefore likely to fall into some degree of disfavour in the coming season, but it is hoped that cultivators will not lay undue stress on the results of one season only. On the Nagpur farm, where a stray thunder-shower fell in the middle of October, Late Verum gave a record yield of 944 lbs. per acre. This, in itself, indicates the unwisdom of a too hasty discarding of Late Verum in areas where rain normally falls in October. The selection V-438 is reported to have done well in several areas on the lighter descriptions of soil. Its lint is considered to be as good as that of V-434. Two new Verum strains, AK-766 and AK-773, have given very good results both in the field and in spinning tests. The latter has been reported to be suitable for spinning 52's, highest standard warp counts. Selection work is continuing in the direction of securing still higher yield and higher ginning percentage.

Among cottons other than Verum, six new types of Bani 306 and E. B. 31 have been isolated which appear to be highly promising. Hirsutum cotton (Buri AK-Special and No. 107) have again done well and are becoming popular in Nimar and parts of Berar. Buri AK-Special has given the highest yield on the Akola farm for the second year in succession. A number of Cambodia strains have been obtained from Madras and are being tried under local conditions both at Nagpur and Akola.

Hybridization work is in progress with the object of producing new forms of economic value. About 140 strains of Bani-into-Cernum crosses were under observation in small blocks, and some of the more promising of them were grown in larger blocks. These hybrids have

a very fine, silky staple measuring $\frac{7}{8}$ " to fully 1". The study of inheritance of certain characters was continued, and all the important types of cotton produced in India were grown in pure culture.

Physiological work included daily observations on growth, flowering, bud and boll shedding and boll opening, in a study of the effect of climatic and other factors on the development of the plant; root studies were further developed with the object of gaining knowledge of the underground factors on which aerial growth depends. Experiments dealing with various cultural and manurial treatments and the optimum time for sowing were continued.

Groundnut.—AK-10 and AK-12-24 have now become fairly well established. The new strain AK-8-11 has given good results on Akola farm. It is very similar to AK-10 in habit of growth, size of pod and oil content, but gives a higher outturn per acre. It lifts more easily and yields 4 to 6 per cent more seed on shelling.

Juar.—Eighty-two strains of the more desirable types were grown in single-plant cultures. The new strains 123-A and E. B. 1 have again given very good results. Improved Ramkel continues to be very popular. The majority of the varieties imported from America were found to be unsuited to local conditions, but three which are remarkably early in maturing are being used for hybridization work.

Bajra.—A large number of single lines of different strains were under test for purity and yield. Five of the selections which were grown in bulk showed promise. These will be tested on a field scale in the coming season.

Kodon and kutki.—Work on these was continued. Six selections have been sent for trial in the Southern Circle.

8. Rice Research Scheme.—A survey of the main rice soils of the Central Provinces has been started during the year under report and an examination of the data so far available regarding the mechanical and chemical composition at different depths of some of the soils has shown that they can mainly be grouped as a climatic type. These soils possess some important common characteristics although they are developed from different rocks. A comparison of the two methods of mechanical

analysis of soils, namely, (1) International method and (2) Puri's method, has shown that, on the whole, the former is more suitable than the latter.

The conclusions arrived at in the previous year, regarding the close relationship existing between the texture of the soil and the types of paddy grown thereon and their yields, have in general been borne out by further data obtained during the year under report.

Results of chemical analysis have shown that a high percentage of total phosphoric acid P_2O_5 in the soil does not necessarily lead to a high yield of rice, and that there appears to be an inverse relationship between the lime content of the soils of a particular tract and the yields of paddy obtained.

Determinations of soil acidity have shown that in the case of most of the soils examined, the acidity decreases with depth and, as reported in the past, high yields of fine varieties of paddy can be obtained only from neutral or slightly acidic soils.

Most of the soils examined showed a lack of *humus* even in spite of moderate applications of organic manure, and that the percentage of *humus* is highest within the top 6 inches. No particular relationship appears to exist between the *humus* content and the carbon-nitrogen ratios of the soils. The carbon-nitrogen ratio varies very widely in different soil groups and is generally lower at a depth of 6 to 12 inches than in the top 6 inches of the soil.

Pot-culture experiments carried out to test the effect on rice of synthetic manures prepared from *karanja* (*Pongamia*) leaves and rice straw, and of ordinary farmyard manure have shown that although the former are not quite so effective as the latter, they bring about a very marked increase in yield.

The Botanical Section aims at obtaining by selection or by hybridization (1) high yielding types suitable for the three main rice tracts of the province, and (2) strains which can be easily distinguished from wild rice in the seedling stage. Preliminary trials on rices suitable for the Chhattisgarh tract are carried out at Raipur; and for the two remaining tracts, namely, the Wain-ganga valley and the north of the Province, at Waraseoni and Jubbulpore respectively.

At Raipur 356 existing varieties, grouped according to their times of ripening and quality, were tested

for yield and 123 varieties have been retained for further tests. At Waraseoni, 260 varieties similarly grouped were under trial, and 82 were retained; while at Jubbulpore 187 varieties were tried, out of which 63 were retained. Work done previously by the Department has made it possible to place improved strains of well-known varieties in the hands of the cultivators without waiting for the final results of those very extensive trials.

Hybridization work is being carried out with the double object of securing heavy-yielding types, and types which can be easily distinguished from wild rice (*karga*). The hybrid strains evolved so far possess dark-purple auricles or a blackish-purple leaf sheath which introduce a measure of distinction. The most successful crosses evolved so far are Bhondu-into-Parewa, Bhondu-into-Gurmatia, and Budhiabako-into-Parewa. All three are high yielders and are distinguishable from *karga*, and can be definitely recommended for growing in fields infested with wild rice. Efforts are being made to evolve strains which are still more distinct by using *Naghesar*, a variety in which the vegetative parts are entirely purple, as one of the parents.

9. Second Economic Botanist's section.—This section is responsible for research on wheat, oilseeds, pulses and fodder grasses, and also for the teaching of botany in the College of Agriculture.

Wheat.—The improvements aimed at in this crop are to produce (a) high-yielding, rust-resistant types suitable for the main wheat area in the north of the province, and (b) early-maturing, hard awned types for the plains of the south. Three of the strains from hybrids obtained by crossing A115 into foreign wheats are again reported to have shown a higher degree of resistance to rust than A115 on Government farms in the Northern Circle. Seed of these is now available for extending the trials to cultivators' fields. Work has continued on another set of hybrids of the early-maturing, awned types suitable for the plateau districts and three strains of those appear to be hopeful. Selection work on hawra with the object of evolving an early, awned, hard wheat suitable for the Southern Circle again indicates that of the three most-promising strains, No. 116 is the best.

Research work in connection with rust-resistance is made all the more complex in that there are several physiological forms of rust and that, although a particular

wheat may possess resistance to a particular set of forms, it may be susceptible to other forms. Hybridization with a view to securing resistance to more than one form is in progress. Concurrently with this economic work, a study is being made of the inheritance of the chief characters and their correlation with yield in the crosses.

Linseed.—The object of research on this crop is the production of high-yielding types which combine early maturity with resistance to rust. Two strains evolved from crosses between E. B. 3 and a Punjab linseed are reported to have yielded about 40 per cent more than the local small-seeded variety on the Raipur farm. It is hoped that these strains will meet a long-standing need in Chhattisgarh. The three strains evolved from crosses between E. B. 3 and Russian flaxes continue to show resistance to rust. Twenty-seven fixed strains of crosses between E. B. 3, and Pusa rust-resistant linseed and European flaxes, respectively, were tested on several farms. Four of them have produced hopeful results. The main difficulty in regard to these crosses is that the bold seed of the E. B. 3 parent does not appear in the progeny. This problem is being studied.

All the unit types of linseed have been isolated and fixed. A description of the morphological characters of these types will be compiled in a separate paper.

Til.—Work was continued on the lines indicated in the previous report. Eight early-maturing selections were grown in randomized blocks on the College farm, and it is satisfactory that high yield and good oil percentage appear to be combined in Nos. 80, 87 and 92. Twelve late selections were grown in a similar manner; of these, No. 21 has again done well, followed by No. 341. A systematic classification of the types grown in the province has been completed. The results have been compiled in a separate paper.

Castor.—Forty-five unit types have been isolated from last year's 200 single-plant selections. Some of the types appear to be promising. They will be tested for yield next season.

Gram.—The classification of types is nearly complete; about 50 types have been isolated and will be tested for yield next year. A description of those types will be published separately. Of the selected strains under yield trials, No. 352 did not suffer from wilt at all and

gave the highest outturn, and No. 62 was again prominent. Seed of both of them is now available for distribution. Work on the hybrids referred to in the previous report was continued. New crosses were made between Malida gram which has a very attractive grain and is in great demand in the north of the province, and No. 28 and Cawnpore grams.

Tur.—Seed of wilt-resistant No. 38 was distributed in those parts of Berar where wilt causes severe damage. Selection No. 3, which is the best all-round strain at present, was grown on all the farms. The demand for it is steadily increasing and is not confined only to this province.

Mung and urad.—Forty-six types of *mung* and twenty-six of *urad* have been isolated. Four selections of *mung* appear to be promising as regards colour of seed, yield and early maturity, and three selections of *urad* show promise of heavy yield. Seed will be multiplied for distribution. A description of the morphological characters of all the types is under preparation.

Soya beans.—The four selections referred to in the previous report were grown on a field scale on the College farm and gave an average yield of 780 lbs. per acre. Seed is now available for distribution.

Fodder grasses.—The botanical composition of the herbage of Telankheri and Richai farms was determined. The effect of different fertilizers on its growth is being investigated in collaboration with the Agricultural Chemist. Selected varieties of grasses were grown for seed distribution purposes.

A selection of indigenous medicinal plants was added to the Botanical garden.

10. Chemical section.—*General Analytical Work.*—Nearly 300 analyses of fodders and feeding-stuffs, dairy products, manures and fertilizers, oilseeds, etc., were carried out. The work on fodders was done mainly on behalf of the Forest Department. A sample of Sunflower from Telankheri farm was found to contain a very high proportion of phosphoric acid and lime (0.64 per cent and 2.11 per cent respectively) in comparison with ordinary grass or grass silage. Samples of farmyard manure received from Ellichpur Dairy Farm showed, as in a previous investigation, that a large proportion of the phosphate fed artificially is voided in the dung. Analyses of samples of Soya bean, *mung* and *urad* proved that Soya

bean contains about 40 per cent protein as against 20 to 25 per cent in *mung* and *urad*, and that Soya bean contains about 163 total food units compared with approximately 120 in *mung* and *urad*. Periodical analyses of sugarcane varieties were carried out for various farms.

On a suggestion from the Imperial Council of Agricultural Research, a number of fodder samples were sent to Nagpur by the Agricultural Chemist of the Punjab Government to be analysed according to the methods followed in the Nagpur Laboratory. The results will be compared with those arrived at by the methods in use in other laboratories, the object being to arrive at a standard method for future adoption in all laboratories.

Other investigations.—Work on the effect of manuring and state of maturity on the yield and mineral composition of pasture grass was continued.

At the instance of the Director of Public Health, the effect of different types of waste products from shellac factories on plant growth was investigated. His information was that that waste applied in large quantities completely destroys plant growth, but that moderate quantities lead to increased crop growth combined with sterility. An analysis of three samples of waste materials did not reveal the presence of any injurious principle in sufficient quantity to cause destruction. It did, however, show a very large proportion of carbonaceous material (50 to 60 per cent) which, when present in that proportion in manure applied in excessive quantities just before sowing, might cause partial destruction owing to the lack of available nitrogen, the latter being taken up by soil organisms during the process of decomposition of the carbonaceous material. Pot culture experiments to test the effect of the waste materials on wheat showed that when applied at the rate of two tons per acre, an increase in yield of from 40 to 100 per cent was obtained, and that seed formation was normal.

An investigation into the best methods of preparing *gur* with a view to ensuring its 'keeping' quality has recently been undertaken, and will be carried forward into the next season. Cultures of specific nodule bacteria were isolated and supplied to Deputy Directors for treating legume crops.

Educational.—In addition to the usual undergraduate teaching work in the College of Agriculture, post-graduate training in research work was provided for two men.

11. Entomological section.—The whole work of this Section, both teaching and economic, continues to fall on one officer. The provision of additional staff is an urgent necessity.

Attention was concentrated on the insect pest *Indarbela* which does considerable damage to fruit trees. Effective help in controlling the pest was given to all who asked for it. Cactus bushes in certain villages of Bemertara tahsil were successfully inoculated with a parasitic insect, and complete destruction of the bushes is anticipated.

Research work has shown that aphids are responsible for the type of *moorda* disease in chillies in which the leaves curl upwards along the edges. Observations and experiments connected with cotton bollworms have indicated that the problem in this province is the spotted bollworm (*Earias fabia*) and not the pink bollworm (*Platyedra gossypiella*). A simple mechanical remedial method of controlling the former has been evolved and has given very satisfactory results on a half-acre plot. It will be tested on a field scale in the next season. "Apterite" has been found very effective in destroying the cockchafer grub in gardens and a new proprietary fumigant "*Chlorasol*" has given good results in protecting stored grain against insect damage.

In addition to the ordinary College teaching work, lectures were delivered in connection with the refresher course at Chandkhuri, and practical training in eri-silk-worm rearing was given to two students, one of whom is a malguzar who intends to introduce the industry in his villages. Arrangements have been made to supply him with eggs.

12. Mycological section.—A "vernalization" experiment on cotton did not produce the expected results. Experiments for the control and seedling blight were continued. The greatest number of casualties from anthracnose was found in the late sown plots. Among the various treatments tried, the best results were obtained from a plot sown with seed delinted with sulphuric acid. The other treatments showed no marked superiority over the "control" plots. In regard to final outturn, however, three of the treatments gave distinctly better results than the controls. These were (a) manuring with neem-cake, (b) seed delinted with sulphuric acid, and (c) linted seed soaked in water prior to sowing.

For the control of juar smut, seeds dusted with Agrosan G gave the highest yield of grain. Applications at the rate of one ounce of the fungicide per 10, 20 and 30 lbs. of seed gave practically the same outturn, namely, about 2,000 lbs. per acre. In the control plot sown with smut-coated seed the yield was 1,000 lbs. while smut-coated seed dusted with copper carbonate and sulphur yielded 1,500 lbs.

Canker of lemon fruits caused by *Pseudomonas citri* has again proved to be controllable by spraying with Bordeaux mixture. For the control of striga in sugarcane, sprinkling the soil around the infected plants with powdered copper sulphate continues to be effective.

Tikka disease on groundnut was not serious. Control consists in timely spraying with Bordeaux mixture to which linseed oil or Agral I is added. Two sprayings—one in the beginning of August and the other a month later—are generally enough. A third may be necessary if September is very wet.

A study of the incidence of sterility in early varieties of paddy in Chhattisgarh shows that this condition is due to attack by an eelworm *Aphelanchoides* sp. The worm does not seem to attack the inflorescence except under conditions of high humidity such as may exist at the time of flowering of early varieties. Typical symptoms of sterility were reproduced in paddy grown in pots in Nagpur by keeping the unopened inflorescence covered with chimneys, the ends of which were plugged with cotton wool which was kept moist. The nematode was found under those conditions also.

A portion of a *pan* garden at Lanji has been under treatment for foot-rot since January 1935. The treated lines are so far free from disease, whereas the untreated part is badly affected. A new garden at Ellichpur has been treated from October 1935 and is so far free from disease. Gardens under treatment at Ramtek are similarly free from disease, although others planted at the same time and not treated are already infected.

Damping off in tobacco seedlings caused by *Phytophthora* sp. at Nagpur was checked completely by removing the diseased seedlings and irrigating the beds with Bordeaux mixture.

13. Agricultural Engineering section.—The staff carried out repairs to power plants and machinery on eight of the Government farms and for two malguzars. The

departmental lorries were opened out and overhauled. The cinema demonstration lorry covered a distance of 1,314 miles and gave 76 shows. Requisites like poultry-houses, trap nests and chicken coops were built for the new poultry scheme at Telankheri. A new pattern of Akola hoe was designed and constructed for use in Berar. The usual oil-engine class was held from July till October. Eleven students were admitted of whom nine passed the final test.

PART IV.—ANIMAL HUSBANDRY SECTION

14. The combined strength of the female stock of breeding age on the eight Government cattle-breeding farms is 475 cows and 57 buffaloes.

The Telankheri farm carries a stock of 39 pure Sahiwal cows and 27 buffaloes. The average production of milk per cow was 3,573 lbs. and per buffalo 3,325 lbs. The best performance was by a cow which gave 8,673 lbs. or an average of 24 lbs. per day throughout the year. The total quantity of milk produced by both herds was 171,212 (153,622) lbs. A number of the young stock was transferred to Garhi on account of the very high cost of rearing them in the vicinity of Nagpur.

The Telankheri Co-operative Dairy Society had another successful year. The milk produced by this society and by the Government farm is retailed by the Byramji Dairy which also did very well and earned a net profit of Rs. 5,617 (Rs. 5,049). The amount of milk handled by the latter was 7.45 lakhs of pounds.

The stock at Garhi farm consists of 110 cows of the Gaolao breed, which is the only breed indigenous to the province that has any claim to distinctiveness of type. This herd has been developed mainly in the direction of improving the draught qualities and it is only very recently that attention has been directed towards the production of better milking strains. A few selected cows are now being milked with this object in view.

The herd at Ellichpur consists of 34 pure-bred Hissar cows of medium size. It was founded in 1928 with the object of producing bulls suitable for breeding purposes in Berar. The herd is entirely stall-fed and all the cows are milked.

The foundation stock of Bod farm consisted of a collection of cross-bred cows produced originally on the Khandwa and Borgaon farms and of local cows. These

are being bred to pure Hissar bulls and the process will be continued through successive generations until the local blood has been practically eliminated in the progeny. The number of cows is 123. The male progeny are not yet sufficiently pure to issue for breeding purposes and are sold as bullocks.

At Pakaria farm in Bilaspur district the stock has been graded up by the use of pure-bred Malvi bulls, the object being to evolve a type suitable to the conditions in the tract. Bulls are now being issued for stud purposes. The number of cows is 68.

Two small pure-bred Malvi herds are maintained, one at Powarkheda and the other at Saugor. The strength of both herds combined is 71 cows. The other herds consist of 30 Malvi-Montgomery crosses at Richai and 23 cows which are being bred up to the pure Hissar at the College dairy. The latter herd is maintained purely for instructional purposes, and the male calves are given away before they reach maturity.

The above brief analysis brings into prominence the very limited scale on which cattle-breeding operations are being conducted. Bod farm may be left out of account for some years to come as the stock it produces is not yet suitable for stud purposes, and therefore the number of cows suitable for producing stud bulls is only 352 for the whole province. Of the latter 69 are either pure-bred or half-bred Montgomery stock. The cows are good milkers but the males are indifferent work animals, and Montgomery bulls can therefore be used only for the improvement of the milk supply in urban areas. Thus for the production of bulls which can be used for improving the cultivators' cattle only 283 cows are available. Allowing for casualties up to the age of maturity and for rejection of animals unfit for breeding purposes, there is little prospect of the output of bulls from Government farms exceeding about 50 per annum on the present scale of operations. It is obvious that this small number will not have much effect on the three million cows which the province contains. For the past few years indeed the department has been forced, through lack of demand for breeding bulls, to curtail rather than expand the strength of the herds. It is this lack of demand which has led to the development of the new scheme, which is being financed by a grant from the Government of India, for the issue of bulls free of charge

to such organizations as will agree to meet the expenses of feeding and maintaining them. But the potentialities for improvement inherent in the new scheme cannot be developed unless and until steps are taken which will lead to a substantial increase in the Government herds. There is an urgent need, also, for strengthening the staff of the Animal Husbandry Section.

Thirty-three new premia were awarded under the Premium Bull Scheme and 51 old premia were renewed.

Experimental poultry flocks were established on Telankheri and Borgaon farms during the year with the aid of a grant from the Government of India. The object of the scheme is to supply pure-bred cocks of good laying breeds to poultry keepers, free of charge, with a view to grading up the country stock.

PART V.—ECONOMICS AND MARKETING

15. The post of Deputy Director of Agriculture, Economics and Marketing, was revived in August 1934. The section was strengthened in February 1935 by the addition of three assistants and an office staff, who have been appointed for a period of five years, as part of an All-India scheme to develop marketing facilities for agricultural and animal products. The entire expenses of the Section, excluding the pay and travelling allowance of the Deputy Director, are being met by the Government of India.

The earlier part of the five-year programme is being devoted to an intensive survey of the existing methods by which the various commodities are marketed, according to a programme laid down by the Government of India. Surveys in respect of wheat, rice, linseed, groundnut, eggs, cattle, milk, hides and skins, tobacco and certain fruits were completed during the year; and a further list of commodities will be investigated next year. These surveys are designed to furnish such information as will permit of an accurate picture being drawn regarding current market practices, trends of production and prices, and ebb and flow of supplies. The investigators are required to follow each commodity along the recognized channels from the producer to the consumer or until it has passed out of the province, and to keep in close touch with the different links in the whole chain of distribution. Reports on wheat and tobacco have been forwarded to the Government of India, and the other reports are

under preparation. The next step will be the analysis and co-ordination of the provincial reports by the Central Marketing Staff of the Government of India, after which it is hoped that it will be possible to formulate an ordered policy of development.

The Deputy Director who was on leave for part of the year attached himself for a time to the Markets division of the British Ministry of Agriculture and attended the Ministry's demonstrations at the Imperial Fruit and Dairy Shows. He also made enquiries in London, Paris and Marseilles concerning the possibilities of opening up a foreign market for Nagpur oranges.

The section co-operated with the district authorities in initiating the Nagpur Orange Growers' Association, and especially in finding a market for the fruit. Cold storage experiments carried out at Poona with the kind co-operation of the Horticulturist to the Government of Bombay show that ripe oranges can be stored in good condition for three months at 40° F.

16. Marketing of verum cotton.—The special staff provided from funds supplied by the Indian Central Cotton Committee was again available for verum marketing operations. The number of bales sold through the pool was 6,788 (5,744).

The rates for ordinary cottons were satisfactory when the pool opened in November, Broach standing at Rs. 226 and Oomras at Rs. 208. Prices remained around that level until the beginning of the second week in December when Broach dropped to Rs. 217. A further sharp fall occurred on the 5th of January with Broach at Rs. 204, and by the beginning of February it had sagged to Rs. 194, and still further to Rs. 187 before the end of February. Thereafter a slight improvement was in evidence. The factors which brought about the fall were the silver crisis, the decision of the American Supreme Court that their processing tax was illegal, the progressive release of the five million bales held by the American Government and, finally, political trouble in Japan.

The downward trend of the market had its inevitable effect on the Verum pool. In the early stages very satisfactory prices were obtained, in consequence of which many of the pooling committees formed an exaggerated idea of the value of their cotton and refused to sell even at the comparatively high prices ruling before the serious drop in the market occurred on the 5th of January. For

the rest of that month business was practically at a standstill. Eventually accumulation of stocks forced the pooling committees to accept offers on a much reduced basis, and all except 170 bales were disposed of by the 5th March. The last lot was sold on the 30th March. The average quotations for Broach and Oomras during the period of sales, *i. e.*, between 29th November and 30th March, were Rs. 204-7-0 and Rs. 186-12-0 per khandi, respectively, while the average price which the Verum pool stocks fetched, *f. o. r.*, Bombay basis, was Rs. 247. Sales were therefore at a premium of Rs. 42-9-0 over Broach and Rs. 60-4-0 over Oomras. This is considerably less than the record premium obtained last year but it compares favourably with what was secured in most other years. Had the pooling committees agreed to part with their stocks as they arrived, instead of hanging on in the hope of a rising market, the average price would have been much higher. The tendency to delay sales is incomprehensible in view of the fact that experience has shown that Verum invariably sells best in December and January.

The new strain Verum 434 which, as has been stated elsewhere, stood up very well to the adverse season was equally satisfactory from the commercial point of view. All the mills which handled this cotton were entirely satisfied with its quality. Late Verum also continues to be popular with spinners. It appears, however, that the quality of Verum 262 was not quite up to the normal standard in some centres. The Marketing Officer rightly points out that a rigid insistence on quality on the part of those responsible for accepting cotton into the pool is more important than the number of bales pooled.

Statistics collected by the district staff show that, inclusive of pool stocks, Verum cotton equivalent to 18,075 bales was marketed up to the end of April.

PART VI.—DEMONSTRATION AND PROPAGANDA

17. Character of the season.—The onset of the monsoon was normal in all circles. Sowing of kharif crops was done in good time, generally speaking, and germination was satisfactory. The outstanding features thereafter were the extremely heavy rainfall in July and the early part of August in all circles, except Chhattisgarh where heavy rain would have been welcome for

paddy, and the abrupt cessation of the monsoon in September. In the cotton country the heavy rain in July and early August caused slow growth and excessive weediness, and the same conditions operated to the disadvantage of the kharif crops in the wheat tract, and of crops other than paddy in the rice tract. Conditions improved rapidly as a result of clear weather in the latter part of August and for a time it looked as if good yields might still be obtained. These hopes were finally removed by the sudden ending of the rains in September in most parts of the province, the excessive heat in October and the general absence of dew. All kharif crops gave rather poor outturns, and even paddy was somewhat below normal.

The early termination of the monsoon, combined with the lack of opportunity for cultural operations during the earlier stages, caused the rabi sowings to be hurried forward without adequate preparatory tillage. Winter showers were generally absent except for local precipitations in the north which caused a light incidence of rust in late-sown wheat. Fortunately, rust did no serious damage, but hailstorms did some harm in restricted areas. Rabi crops in general were below normal.

18. Northern Circle.—The most important work was extension of area under, and the pooling and marketing of Verum. The total certified area under Verum in Nimar district was nearly 21,000 acres. The produce of some 15,300 acres, amounting to 2,749 (1,622) bales, was sold through the pool. Sale proceeds totalled Rs. 3,21,174. A premium of over Rs. 77,000 over ordinary Oomras was secured by growers who took advantage of the pool, and a further Rs. 21,000 by growers who sold in the ordinary market. Buri cotton continues to be popular in the Burhanpur area.

In spite of the general depression, the demand for improved seed continued to be strong. The quantity of seed of the staple crops distributed is calculated to have been 221,015 (184,193) maunds; 12,43 lakhs (3.63) of whole canes, and 35,759 (18,082) fruit trees were given out. There was some falling off in the sales of implements and equipment, the value of which was Rs. 37,885 (Rs. 43,520). A notable feature is the growing demand for wire fencing, rahat water-lifts and fruit trees, which indicates an increasing tendency to adopt intensive methods of cultivation.

Six out of the seven Government demonstration plots were run at a substantial profit. The most successful was the Kham plot where the average yield of paddy was 2,265 lbs. per acre over ten acres. More private demonstration plots might with advantage be opened in this circle. Special efforts are being made to raise the standard of cultivation in areas commanded by tank irrigation by advocating double-cropping, transplantation of paddy, use of fertilizers and other improvements.

Village uplift work is in progress in all districts. Good work was done among the aborigines of Mandla district and still more rapid progress will be possible through the opening of the new farm at Dindori, for which funds have been provided out of the Government of India grant for rural development. Conservation of manure, introduction of new crops and implements, improved seed and line-sowing of kharif crops, and promotion of cleanliness are among the important items of propaganda. The Piparia Circle continues to be the chief centre of activities. A ten-day course of instruction in propaganda methods, organized by the Village Uplift Board, was held at Powarkheda farm in March and was attended by 70 teachers from the District Council schools and a few malguzars and cultivators. Officers of all departments concerned with village uplift co-operated in giving lectures and demonstrations.

The steam tackle ploughing outfit which lay almost idle for the past five years has again come into demand as a result of reducing the ploughing charges to Rs. 12 per acre. 140 acres were ploughed between 18th February and 31st March, and orders already in hand will keep the outfit busy until the rains break.

There has been a general collapse of the Barhi seed unions in Jubbulpore, Saugor and Mandla districts. Successive failures of crops have made it improbable that they will fulfil the purpose for which they were organized and steps are being taken to wind them up.

Sixty-three ocular demonstrations were conducted with fertilizers supplied free of cost by the Imperial Chemical Industries, Ltd. 1,532 (1,313) practical demonstrations of various kinds were given, and 163 (99) lantern lectures were delivered.

19. Southern Circle.—The demand for seed of improved varieties was met from 4,422 (3,891) private agencies such as seed farms and seed unions. The total quantity of seed distributed from all sources amounted to

101,418 (97,015) maunds. 14.93 (16.53) lakhs of whole canes were issued for planting.

Verum 434, a new strain introduced into the circle for the first time, gave encouraging results. Verum pooling centres were established in seven places. 798 (519) bales were sold and fetched a premium varying from Rs. 8 to Rs. 22 per khandy of kapas over C. P. No. 1 Oomras.

The demand for artificial manures, particularly for cane cultivation, is increasing rapidly. Distribution amounted to 5,438 (2,542) maunds, mostly sulphate of ammonia. The major portion went to Bhandara district. As in the Northern Circle there was some falling off in the sales of implements and equipment, the value of the sales being Rs. 61,874 (Rs. 64,665). Ploughs, cane mills, rahat lifts and wire fencing were in most demand. Two power cane-crushing plants were given out. Tac-cavi loans to the extent of Rs. 72,319 (Rs. 72,890) were recommended by the Department for the purchase of seeds, manures and implements.

Special efforts were made to increase the number of private demonstration plots which now number 31 (12). These plots are worked by the owners under the advice of the department. All except four showed a profit. This system of demonstration is very efficient provided the real interest and co-operation of the owners is secured. Of the four Government demonstration plots, two were worked at a profit. The other two are more in the nature of experimental plots, being mainly concerned with research work on potatoes, and did not pay their way.

A successful district agricultural show was held on the Government Farm, Waraseoni, after a lapse of eight years since the previous occasion. The gathering was very large and keen interest was shown in the exhibits and demonstrations.

"Farmers' Days" were held on the Seoni and Betul farms with the object of bringing the public into touch with what is being done by the department. The attendance at Seoni was particularly gratifying. Similar demonstrations on a smaller scale were held at five other centres.

Practical demonstrations were held at 1,690 (1,573) centres; demonstrations were also given at 34 religious

fairs ; lectures illustrated by lantern or by the cinema outfit were delivered at 54 centres, and 21 co-operative rallies were attended.

The Nagpur Orange Growers' Association was registered in the middle of February and has made a small beginning in marketing operations. Share capital to the extent of Rs. 2,900 has been raised. With the very substantial help provided by Government in the shape of taccavi loans to members, advances towards the initial marketing expenses and expert assistance, it is hoped that the association will make substantial progress in the coming season. Three new Tahsil Agricultural Associations were registered during the year. Generally speaking, associations of this type have not yet taken any very prominent part in development work. An effort has been made to improve the efficiency of some of them by revising the list of members. Village uplift work continued on the lines indicated in the previous report.

Two new wells were sunk on Seoni Seed and Demonstration farm with a view to increase the area under intensive cultivation, and the same objective was achieved to some extent on Betul farm by cultural methods involving a more economical use of water. The revenue account on both those farms showed a profit. The third Seed and Demonstration farm at Waraseoni is a seed and demonstration farm only in name on account of the rapidly increasing amount of experimental work which is required to be done at that station in connection with cane and paddy. There is a strong case for converting it into an experimental station. Departmental working of the Tharsa and Sindewahi farms is being resumed from 1st April 1936. Both farms have deteriorated considerably since they were leased out, and it will take some time to restore them to their former condition. Their resumption will be of very material advantage to the areas in which they are situated.

20. Eastern Circle.—The amount of seed distributed from Government farms and 3,368 (2,993) private farms during the year was 113,275 (91,343) maunds, and 9.68 (2.82) lakhs of canes for planting. Seed unions numbered 290 (265), with a membership of 5,891 (5,410) and a capital of 20,810 (16,499) maunds of paddy. A striking example of what can be done by co-operative effort is provided in the development of Baghmara village in Balod tahsil. The union not only meets the seed

requirements of the village in full but has sufficient surplus wherewith to run a co-operative farm to demonstrate sugarcane, groundnut and intensive paddy cultivation. This year's profits from the farm have been invested in the purchase of seven acres of land for establishing an orchard. Following the example of the co-operative farm, individual members have grown 83 acres of groundnut this year and planted 50 acres of sugarcane. The introduction of new crops is estimated to have increased the income of the village by at least Rs. 3,000, and the area under sugarcane alone will provide additional work for 100 men for five months and keep them employed in a season in which formerly there was little or nothing for them to do. This experiment in providing the village with resources for its own betterment has attracted the attention of eight other villages in the vicinity where work on similar lines is being started. A few unions in other parts of the circle are also following suit.

Rapid progress is being made in the extension of the area under orchards and garden crops. Orchards have been established in 202 villages and vegetable gardens in 116. There was a brisk demand for young fruit trees, of which 27,270 (12,347) were supplied from Government institutions or private sources. Nurseries have been put down on all Government farms to meet the increasing demand. Six small flower gardens were laid out on behalf of interested malguzars. These developments, together with the extension of cane cultivation, have led to an improved demand for implements and equipment, sales of which amounted to Rs. 16,727 (Rs. 10,138). The increase in the sale of fertilizers and oilcakes, which totalled 5,927 (1,320) maunds, was much more marked. Taccavi loans for the purchase of manures, seed and implements amounted to Rs. 19,318 (Rs. 10,663).

The general policy in this circle is to encourage private demonstration plots as far as possible, and to use Government plots only for specific purposes. Thirty private plots were located under the Kharung and Maniari reservoirs to demonstrate the effect of irrigating paddy. In heavy soils under the Maniari tank, irrigation gave an increase of 478 (83) lbs. of paddy per acre, while in the lighter soils commanded by the Kharung it was 304 (223) lbs. The more marked effect of irrigation, as compared with the previous year, was due to the early finish of the monsoon. The number of other private demonstration

plots was 27 (21). All of them yielded substantial profits, and they have been found of great use in convincing cultivators of the efficacy of the methods advocated. Of the 5 (6) Government demonstration plots, the most successful is the one at Lormi, under the Maniari tank, which has been instrumental in raising the area under cane from 2 to 256 acres within four years. Given the necessary irrigation facilities in that tract it would not be difficult to develop enough cane area to supply a sugar factory.

Practical demonstrations were conducted at 2,494 (1,371) centres; 160 (91) lectures illustrated by lantern or cinema were delivered and 23 co-operative rallies were attended. 469 books and bulletins were sold at those demonstrations. "Farmers' Days" were held on all the demonstration farms and on five demonstration plots, and were attended by large numbers of cultivators.

The curtailment of touring on account of financial stringency has led to propaganda being intensified in restricted areas. This resulted in greater attention being paid to village uplift work in villages within a short radius of the headquarters of the touring staff than would have been possible in more extensive touring. Intensive propaganda was undertaken in 528 (424) villages on lines suited to the particular need of each village.

The re-organization of the Tahsil Agricultural Associations has made some of them more active; three of them have done a small business in the stocking of implements and manures for sale, and in hiring out implements.

21. Western Circle.—The amount of seed distributed from private seed farms was 46,797 (58,913) maunds. The marked fall in distribution as compared with the previous year is due to the fact that a large number of groundnut seed farmers sold their crop soon after harvest as they were in need of cash. Similarly, in the Dharni tract where the kharif crops of the previous season had failed, wheat seed farmers were unable to hold over their seed until the sowing season. Distribution of cotton and juar seed was practically the same as in the previous year. The demand for improved cotton seed far exceeded the supply, not because of any lack of seed but through want of proper co-operation on the part of seed farmers who disposed of their stocks through the ordinary market channels, instead of reserving it for distribution for seed purposes through Government or other accredited agencies.

Special arrangements for the supply of kharif seeds in the Dharni tract were made necessary by the failure of the kharif crops of the preceding season. 833 maunds of seed of various descriptions were collected at Ellichpur and sent up by motor lorry to be distributed among 1,852 cultivators. These arrangements entailed much heavy work for the local staff. Taccavi loans amounting to Rs. 2,989 were given for purchase of the seed.

Crop yields on Government farms and plots, though much below normal, were not unsatisfactory considering the season. The chief activity in this circle is concerned with cotton and it is satisfactory to note that the new strain V-434 has stood up very well to adverse conditions. It was largely grown on Government farms and seed sufficient to sow 4,000 acres was distributed. All first class seed from that area will be carefully preserved for issue in the coming season. Verum pooling operations were conducted at 26 centres. The total number of bales handled by the marketing organizations was 3,233 (3,570). The premium obtained for verum kapas over local jari worked out, on an average, to Rs. 7-14-7 per khandi, which was much less than the premium obtained in the previous year. The drop in the price of staple cotton accounted partly for this, but much of the responsibility for lower prices rests with those pooling committees which persisted in refusing reasonable offers in expectation of better ones, and lost heavily in the end by doing so.

The area under groundnut has fallen away from the maximum area of 136,341 acres recorded two years ago to 83,613 acres. It is a comparatively expensive crop to grow. Lifting charges are high and seed costs about Rs. 6 per acre, and the low prices current in the past two years have apparently made cultivators shy of incurring that expenditure. The new strains AK-10 and AK-12-24 continue to give much better outturns than the varieties commonly grown and will help in restoring confidence when conditions improve.

Among the juar varieties introduced by the department, the two that stand out prominently are Saoner and Ramkel. The treatment of seed for the prevention of smut is now widely practised and is likely to become general within the next few years. Nearly a ton of chemicals for this purpose was issued, sufficient to treat seed for almost two lakhs of acres.

There are three Government demonstration plots and 22 (17) private plots. While the owners of some of

the latter carry out instructions faithfully, most of them show little interest and hence the utility of the plots is largely lost. One of the plots taken on lease by the department has been improved to such an extent that the owner has reduced the rent from Rs. 350 to Rs. 200.

The number of shows held during the year was 43 (26), and 2,332 (1,970) practical demonstrations were given. Illustrated lectures were delivered at 266 (244) centres. "Farmers' Days" at the farms and plots were largely attended. Sales of books and bulletins numbered 1,039 (1,056). The value of implements and equipment sold in the circle was Rs. 52,23⁰ (Rs. 71,521).

Only a few of the shops run by the 23 Taluq Agricultural Associations played a prominent part in the distribution of manures, seed and implements. The total profit earned by these institutions was Rs. 12,487 (Rs. 10,645) on a capital of Rs. 65,215, which works out at 19.15 per cent. Iron ploughs given on hire numbered 942 (1,064) and earned Rs. 6,870 (Rs. 6,921).

Village uplift work was organized in 61 (46) villages selected by the Rural Uplift Committees. It is a healthy sign that villages are now coming forward of their own accord for inclusion in the scheme. Good progress has been made in carrying out an ordered programme of agricultural development.

PART VII.—HORTICULTURAL GARDENS AND ARBORICULTURE

22. The gardens under the management of the Horticultural Section in Nagpur maintained a good display during both seasons. Chrysanthemums and dahlias were the chief attraction in the Maharajbagh and Telinkheri. The Maharajbagh is becoming increasingly important as a source of supply of young fruit trees. The combined receipts of the Nagpur institutions fell slightly to Rs. 12,430 (Rs. 12,634). The expenditure, however, was correspondingly reduced, being Rs. 34,827 (Rs. 35,093).

Arboricultural operations were concerned with the maintenance of roadside trees, fresh plantings and the filling in of gaps. The number of trees planted was 139.

The Pachmarhi gardens suffered to some extent from an abnormally heavy precipitation in July and August which had an adverse effect on the short-season vegetable supply. The display of flowers in the hot weather was,

however, very attractive and commanded much admiration, as also did some consignments of sweet peas and carnations which were sold in Bombay. Flower and vegetable seeds were imported as usual. Several new varieties of flowers were tried but they tended to fade quickly when cut. Receipts from the Station Garden amounted to Rs. 7,072 (Rs. 7,666). The fall was mainly due to the very poor mango crop, and to the fact that the Military authorities discontinued the supply of vegetables to the British troops for some months and resumed it later at a reduced rate. The total expenditure was Rs. 7,388 (Rs. 6,808), the increase being due to the installing of two Persian wheels.

The re-orientation of policy in respect of district and divisional gardens, under which it is now possible to pay greater attention to the ornamental aspect, has had its effect in bringing those gardens into popular favour as public resorts. They are also performing a useful function in stimulating an interest in fruit and vegetable cultivation. In most of them some sort of capital expenditure had to be incurred, as a result of which none were worked at a profit. With two exceptions, however, expenditure was confined within the limits fixed by the Local Government, namely, Rs. 500 in excess of receipts in district gardens and Rs. 800 in divisional gardens. Receipts varied from 40 per cent to 95 per cent of expenditure.

23. Acknowledgments.—The department is again much indebted to the Indian Central Cotton Committee for generous assistance received during the year in contributing to the cotton botanical scheme, in financing the scheme for the extension and marketing of Verum cotton in continuing the investigation of the damage done to cotton by boll-worms, and in sharing with the Imperial Council of Agricultural Research the expenses of the enquiry into the cost of growing cotton and its rotation crops.

Grateful acknowledgment is also made to the Imperial Council of Agricultural Research for its continued support in financing the five-year rice research scheme, in making a grant for the construction of tobacco-curing barns, and for its contribution towards the expenses of the cost enquiry scheme referred to in the preceding subparagraph. The combined contributions received from Imperial Council of Agricultural Research and the Indian Central Cotton Committee for the above schemes amounted to Rs. 1,35,139 of which Rs. 54,545 were received

direct from the Imperial Council of Agricultural Research, and Rs. 80,594 from the Indian Central Cotton Committee.

The department has also to thank the Imperial Council of Agricultural Research for making budget provision for three new research schemes which will come into operation in 1936-37.

A sum of Rs. 1,25,000 was allotted to the department during the year out of the grant made to the province by the Government of India for rural development. The grant is being expended on (a) experiments in poultry-farming, (b) supplying stud-bulls to district councils and other approved organizations, (c) opening a new farm in Mandla district, (d) purchase of two cinema outfits for demonstration and propaganda purposes, (e) provision of storage accommodation for cultivators' produce, and (f) purchase of boring plant for the development of well irrigation. Thanks are due to the Government of India for the valuable support received.

J. C. McDOUGALL,
Offg. Director of Agriculture,
Central Provinces.

STATEMENT A

Number of cattle sold from Government Cattle-breeding Farms in the Central Provinces and Berar during the year 1935-36.

Name of circle	Bulls	Bullocks	Cows	Male buffaloes	She-buffaloes	Young stock of cows and buffaloes	Total for 1935-36	Total for previous year	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Northern circle	.. 12	..	..	6	6	4	28	31	
Southern circle	.. 7	10	29	..	4	22	72	64	
Eastern circle	.. 1	10	16	..	..	11	38	45	
Western circle	.. 4	26	5	..	..	9	44	125	
Agricultural College	.. ..	6	3	..	7	23	39	21	
Total	.. 24	52	53	6	17	69	221	286	
Total for previous year	.. 33	20	115	1	1	116	286	..	

STATEMENT B.

STATE

Name of circle	Number of private seed			
	Wheat	Rice	Cotton	Juar
(1)	(2)	(3)	(4)	(5)
Northern circle	4,357	1,144	1,546	354
Southern circle	1,131	1,617	682	63
Eastern circle	627	2,283	..	..
Western circle	365	..	3,024	823
College Farm, Nagpur ..	..	..	..	..
Total	6,480	5,044	5,252	1,240
Total for previous year ..	6,023	4,712	4,505	1,086

Name of circle	Seed distributed in			
	Wheat	Rice	Cotton	Juar
(1)	(11)	(12)	(13)	(14)
Northern circle	146,325	9,908	32,720	5,533
Southern circle	49,523	44,198	5,492	491
Eastern circle	8,434	104,019	..	..
Western circle	5,103	..	23,311	4,030
College Farm, Nagpur ..	58	..	184	16
Total	209,443	158,125	61,707	10,070
Total for previous year ..	196,286	133,447	53,308	8,489

MENT B

farms and unions

Groundnut	Sugarcane	Other crops	Total for 1935-36	Total for pre- vious year
(6)	(7)	(8)	(9)	(10)
681	..	2,035	10,117	9,150
171	509	107	4,280	3,770
118	133	207	3,368	2,993
1,299	..	152	5,663	5,324
..
<hr/> 2,269	<hr/> 642	<hr/> 2,501	<hr/> 23,428	<hr/> 21,237
<hr/> 2,675	<hr/> 462	<hr/> 1,774	<hr/> 21,237	<hr/> ..

maunds and canes.

Groundnut	Sugarcane	Other crops	Total for 1935-36	Total for previous year
(15)	(16)	(17)	(18)	(19)
14,810	1,243,600	11,719	221,015	184,193
734	1,493,393	980	101,418	97,015
489	968,073	333	113,275	91,343
13,282	..	1,071	46,797	58,913
13	..	172	443	340
<hr/> 29,328	<hr/> 3,705,066	<hr/> 14,275	<hr/> 482,948	<hr/> 431,804
<hr/> 29,498	<hr/> 2,298,933	<hr/> 10,776	<hr/> 431,804	<hr/> ..

STATE

Name of circle (1)	Approximate area in acres sown with improved seed from private seed farms and other sources					
	Wheat	Rice	Cotton	Juar	Ground-nut	Other crops
	(2)	(3)	(4)	(5)	(6)	(7)
Northern circle ..	343,397	38,277	93,721	20,626	13,530	64,249
Southern circle ..	203,583	158,189	109,849	14,664	3,066	10,859
Eastern circle ..	26,181	389,222	..	..	6,997	5,897
Western circle ..	16,864	..	301,757	142,813	82,239	604
Total ..	590,025	585,688	505,327	178,103	105,832	81,609
Total for previous year ..	572,399	528,556	441,498	150,557	111,568	38,659

STATE

Name of circle (1)	Number of implements and parts of implements sold					
	Ploughs	Cane mills	Fodder cutters	Akola hoes	Other implements	Spare parts
	(2)	(3)	(4)	(5)	(6)	(7)
Northern circle ..	510	28	9	591	943	3,328
Southern circle ..	401	107	5	2	467	1,773
Eastern circle ..	70	43	..	40	240	178
Western circle ..	1,281	..	6	48	37	15,897
College Farm, Nagpur ..	..	..	..	..	1	40
Total ..	2,262	178	20	681	1,688	21,216
Total for previous year ..	1,939	184	6	400	2,499	29,631

STATEMENT E

Name of circle		Number of agricultural shows and fairs held	Number of practical demonstrations carried out by the district staff	Number of illustrated lectures given
(1)		(2)	(3)	(4)
Northern circle	.. ..	14	1,532	163
Southern circle	.. ..	34	1,690	54
Eastern circle	.. ..	16	2,494	160
Western circle	.. ..	43	2,337	246
		<hr/>	<hr/>	<hr/>
Total	.. ..	107	8,053	623
		<hr/>	<hr/>	<hr/>
Total for previous year	.. ..	64	6,234	482
		<hr/>	<hr/>	<hr/>

DEPARTMENT OF AGRICULTURE
CENTRAL PROVINCES AND BERAR



REPORT
ON THE WORKING OF THE
DEPARTMENT OF AGRICULTURE
IN THE
CENTRAL PROVINCES
FOR THE YEAR ENDING THE
31ST MARCH 1937

NAGPUR
GOVERNMENT PRINTING, C. P. & BERAR
1938

Agents for the sale of Publications issued by the Government of the Central Provinces and Berar

[NOTE.—Appointments of all official Agents in the United Kingdom and on the Continent for the Sale of Government Publications have been terminated with effect from the 1st April 1925.

All publications in future are obtainable either direct from the High Commissioner for India, India House, Aldwych, London, W. C. 2, or through any bookseller.]

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No.

FROM

R. H. HILL, ESQ., I.A.S.,

DIRECTOR OF AGRICULTURE,

CENTRAL PROVINCES AND BERAR,

TO

THE REVENUE SECY. TO GOVT.,

CENTRAL PROVINCES AND BERAR.

Nagpur, the 22nd September 1937.

SIR,

I have the honour to submit, herewith, the report on the working of the Department of Agriculture, Central Provinces, for the year ending the 31st March 1937.

I have the honour to be

Sir,

Your most obedient servant,

R. H. HILL,

*Director of Agriculture,
Central Provinces and Berar.*

No. 1031-1507-X
GOVERNMENT OF THE
CENTRAL PROVINCES AND BERAR
AGRICULTURE DEPARTMENT

Nagpur, the 14th June 1938.

READ—

Report on the working of the Department of Agriculture for the year ending the 31st March 1937.

RESOLUTION

The Department of Agriculture made steady progress during the year 1936-37 in all branches of its activities. The number of private seed farms and unions rose to 26,781 [23,428] and the quantity of pure seed distributed to 595,637 [482,948] maunds. The area sown with improved seed rose from 2,046,584 to 2,194,807 acres and the value of the increased outturn resulting from the use of such seed is now estimated at Rs. 59,05,284 [Rs. 56,52,845]. The department was able to sell 27,869 [26,045] improved implements valued at Rs. 1,79,529 [Rs. 1,68,714]. No less than 8,987 [8,053] practical demonstrations were held during the year. The growing demand for improved seeds and implements is gratifying evidence of the utility of such demonstrations.

2. The year once again witnessed an improvement in the facilities for agricultural education. The Betul Bazar anglo-vernacular middle school was transferred to the department, and with the introduction of agricultural classes in the Government high school, there is now a complete course of agricultural education available in the Betul district from middle school to college.

3. Useful research of great value to agriculturists was continued during the year. A great extension of V-434 cotton which had been introduced in the previous year was witnessed, and the area under this crop now exceeds 20,000 acres. Its high spinning capacity and its adaptability to varying climatic conditions are of great importance to agriculturists and Government will watch its future with great interest. The rice research scheme

has also made satisfactory progress, and some useful hybrids have been secured, while under wheat three promising crosses of A-115 with foreign wheats which promise rust resisting capacity of a high order combined with a large yield, reached a sufficiently advanced stage to be sent out to Deputy Directors for trial. Marketing surveys were continued during the year under report. The surveys hitherto carried out show that there is much scope for agricultural and commercial improvements. The pooling system of marketing is becoming increasingly popular; the number of verum cotton bales thus pooled was 8,779 [6,823] the highest so far recorded. Propaganda to arouse the cultivator's interest in the growing of fruit was continued. This is a most promising line and one likely to prove most profitable to the cultivator.

4. His Excellency the Viceroy's appeal for the assistance of charitable gentlemen in improving the cattle of India has aroused active interest and has met with a widespread response. The Central Provinces Livestock Improvement Association was formed on the 13th March 1937, and Government hopes that the activities of the Association will speed up the progress in the improvement of livestock and create a permanent interest in the matter.

5. Government again acknowledges with gratitude the generous financial assistance received from the Imperial Council of Agricultural Research and the Indian Central Cotton Committee.

6. Government records its appreciation of the zeal and thoroughness with which Mr. McDougall and his officers have performed their duties.

ORDER.—Ordered that copies of this resolution, together with the enclosure, be forwarded to the Director of Agriculture and to all Commissioners of Divisions and Deputy Commissioners for information and guidance; and that it be published in Part I of the *Central Provinces and Berar Gazette*.

By order of the Governor,
Central Provinces & Berar,
C. J. W. LILLIE
Secy. to Govt., C. P. & Berar,
Agriculture Department.

**REPORT ON THE WORKING OF THE
DEPARTMENT OF AGRICULTURE,
CENTRAL PROVINCES, FOR
THE YEAR ENDING THE
31ST MARCH 1937**

PART I.—ADMINISTRATION

Mr. J. C. McDougall held charge of the department throughout the year.

The post of Assistant Director of Agriculture in the Provincial Agricultural Service, Class I, held in abeyance since 1932, was revived from the 1st of April 1936. Mr. P. D. Nair was appointed in the Provincial Agricultural Service, Class I, as Assistant Director of Agriculture from the 1st October 1936 and is now holding charge of the Western Circle, *vice* Mr. Mutkekar who proceeded on eight months' leave from the 1st March 1937.

Dr. R. J. Kalamkar was appointed in the Provincial Agricultural Service, Class I, as Assistant Director of Agriculture from the 1st March 1937.

Mr. E. A. H. Churchill proceeded on eight months' leave from the 11th February 1937 and Mr. J. F. Dastur, Mycologist to Government, Central Provinces, was appointed to officiate as Principal, College of Agriculture, in addition to his own duties.

Dr. B. K. Mukerji, Bio-Chemist, Rice Research Scheme, Central Provinces, was transferred to the United Provinces as Agricultural Chemist, with effect from the 28th June 1936, and Mr. B. B. Dave, temporary Botanist, was appointed to hold general charge and Rao Sahib D. V. Bal, Agricultural Chemist, was placed in charge of the bio-chemical part of the scheme.

Dr. R. H. Richharia was appointed as Oilseeds Specialist in connection with the Oilseeds Research Scheme, financed by the Imperial Council of Agricultural Research, with effect from the 10th February 1937.

2. Expenditure of the department during the year amounted to Rs. 10,71,338 which included Rs. 66,674 on botanical and other gardens, Rs. 15,115 on the Rice Research Scheme, Rs. 7,072 on the Cotton Cost Enquiry

Scheme, Rs. 17,943 on the Agricultural Marketing Scheme, Rs. 1,732 on the Gangai Pest Scheme, Rs. 3,310 on the Cattle and Milk Enquiry Scheme, Rs. 992 on the Sann Hemp Scheme and Rs. 830 on the Oilseeds Scheme. Receipts amounted to Rs. 2,33,992. The net expenditure on all branches of the Department's activities thus amounted to Rs. 8,37,346. Of this sum, Rs. 46,994 were contributed by the Imperial Council of Agricultural Research and Rs. 83,538 by the Indian Central Cotton Committee for research schemes in progress. The net cost to the province was therefore Rs. 7,06,814 [Rs. 6,77,503].

PART II.—AGRICULTURAL EDUCATION

3. The number of applications (157) for admission during the year to the College of Agriculture was unusually high. Sixty-two candidates were called for interview and 58 were finally admitted. The hostel accommodation being only sufficient for 130 students, the extra number admitted necessitated a departure from the accepted principle of keeping the college only residential, so, with the sanction of Government 25 students were permitted to reside outside the hostel, care being taken to allow this permission only to those who were living either with their parents or accredited guardians. The first year class had 60 students on the roll at the end of the year, and 50 were promoted. Forty-two students, including two compartmental candidates and one failure, appeared for the Intermediate examination: one passed in the first division, eight in the second, two in the third, seven in the "pass" division and four were given compartmental passes. The third year had 26 students and their work was satisfactory. Twenty-three appeared for the final B. Ag. degree examination and 15 were successful, ten being placed in the second division, four in the third, one in the "pass" division and two were given compartmental passes.

Students of the fourth year toured in Chhattisgarh and the northern districts, visiting the Raipur, Drug and Chandkhuri farms while those of the third year visited Chhindwara, Powarkheda and Adhartal farms and the Military Grass and Dairy farm at Jubbulpore. The second year class visited the Betul farm.

The health of the students remained satisfactory.

The strength of the College contingent of the University Training Corps was 32.

The Vernacular Dairy course which is usually held in alternate years was due to be held during the year under report, but, as there were only seven applicants of whom only one wanted to join, the course was held in abeyance.

4. The session of the Robertson Anglo-Vernacular Agricultural Middle School, Powarkheda, started with 56 boys on the roll. Thirty-six boys were enrolled later which brought the total number up to 92. Of the total number about half were the sons of malguzars and the remainder the sons of cultivators; 74 belonged to the Hoshangabad district. Seventeen boys appeared for the High School Entrance Examination and 12 passed. The boys' farm produce on an area of 6.5 acres amounted to Rs. 327-12-0. The carpentry class opened last year showed satisfactory progress: labels, bakhars and ploughs, etc., were prepared. As usual, three messes were run, one on a cash basis, while for the others the boys provided their own rations. The charges in the cash mess were between Rs. 4 and Rs. 4-8-0 per month. Receipts from all sources amounted to Rs. 2,917 [Rs. 2,507].

5. The management of the Betul Bazar Anglo-Vernacular Agricultural Middle School was transferred from the district council to the Agriculture Department. It stands in great need of apparatus and hostel equipment. These will be provided as funds permit. His Excellency the Governor and Lady Gowan visited the school on the 20th March 1937 and donated Rs. 100 for sports equipment.

6. Agriculture was introduced into the curricula of the Betul Government High School as an optional subject and the department set apart a portion of the Betul station garden for practical training. In this district the link of agricultural education from the middle school right up to the College is now complete. Departmental instruction in agriculture was continued at vernacular middle schools at Amarwara, Lakhnadon and Chhapara, and the students were examined by the Extra-Assistant Director of Agriculture, Chhindwara, at the close of the year.

7. The Peace Memorial Agricultural School was opened at Buldana to give a two years' course of practical training in agriculture to the sons of agriculturists of the district. The right type of students have not yet

been attracted to the school: the prospect of a stipend and the hope of eventually obtaining Government service attract most of the present students. During the year, 83 [47] applications for admission were received and 20 were selected. Nine boys appeared for the final examination and eight were successful.

8. A special course in agriculture is given at vernacular middle schools at Itki and Chandur where trained teachers were provided by the Education Department. Small plots are also attached to the schools for practical training.

PART III.—RESEARCH AND EXPERIMENTAL WORK

9. Cotton Botanist's Section—*Cotton*.—The chief work of this section is the breeding and selection of new high yielding strains of cotton of fine quality suitable to the conditions prevailing in the different cotton growing areas of the province; strains capable of resisting diseases and certain adverse climatic factors such as the early or late cessation of the monsoon, light, heavy or unseasonal rains.

Besides the above problems it is necessary, in view of the low price of cotton, to study the most suitable crop rotations both with regard to immediate monetary returns and to maintain or build up soil fertility, for any system of farming worthy of the name should leave the soil a little richer with each year's cropping.

Many features bearing on the economics of crop production such as better cultivation, harvesting and utilization of bye-products or waste were also investigated.

The production of medium or long staple cottons that would spin higher counts than 20's is being aimed at in accordance with the mutual policy of the Indian Central Cotton Committee and the Agriculture Department; the object is to oust the existing coarse cottons of these provinces by varieties that can compete in the world market.

The period under review witnessed a further extension of V-434. The progress of this cotton was carefully watched in the field and records of its performance in the different cotton tracts of the province were carefully maintained. There were some 20,000 acres under it

during the year and once again it proved the best all-round strain with remarkable adaptability to varying climatic conditions. Another characteristic revealed by this cotton was the tenacity of its burst bolls to withstand heavy rain and wind without dropping on the ground like coarser varieties. This cotton has also maintained its high spinning capacity. Out of a number of samples of different strains sent to the Technological Laboratory, Matunga, to be tested, V.434 gave the best spinning performance: it was adjudged suitable for spinning up to 33 standard warp counts. In the field the yields during the last four years on the Akola farm have been 589, 635, 475 and 589 lbs. per acre, respectively. Twenty-three bales of first quality, Akola Farm V.434, were sold to the Empress Mills at Rs. 230 per khandi (two bales) when Broach was quoted at Rs. 215. The premium obtained for improved cottons when compared with previous years was extremely low, but this was due to unusual market conditions in Bombay as a result of an attempt to corner Broach and a low demand from local mills due to strikes. It must, however, be realized that as the area under V.434 expands the premium for the superior quality of lint is not likely to remain at Rs. 30, the average of the previous three years. Still, even at half this premium it would pay the cultivator to grow this cotton in preference to the low grade coarse varieties. The area under V.434 in the coming season is expected to be in the neighbourhood of 200,000 acres.

Late Verum has maintained its position but owing to the all-round suitability of V.434, and the advantages of having as few varieties as possible in adjacent areas it is recommended that, except in places where late Verum shows a distinct advantage over V.434, the latter should be grown in preference.

While field trials of V.434 in the different parts of the province were being carried out, *viz.*, B. 90, B. 64, B. 73 and B. 61 were evolved as a result of breeding work. The Technological Laboratory, Matunga, has reported very favourably on these strains. However, the propagation, testing and trial through several seasons in different parts of the province are necessary before a further step in advance can be definitely declared to have taken place.

Two wilt resisting strains of Bani have been isolated which give spinning performances from 40 to 48 but unfortunately the ginning percentages are low. (27 to 28.)

But until the quality of cotton and not the ginning out-turn becomes the base of valuation there is little chance of extension of the area under such superior types.

Work has been carried out with Buri (acclimatized *G. Hirsutum*) which yields well in years of ample rainfall in the Tapti valley and is not subject to wilt. Buri 107 has been specially selected for its suitability for the area in and around Burhanpur, about 50,000 acres in extent.

With a view to ascertaining their comparative cropping power and money value, V.434, Late Verum, No. 438, Bani 306, Buri AK-Special and selected Roseum were tested in latin square under identical conditions of soil and treatment during the year under review and the results were as follows :—

Name of strain	Outturn of kapas in lbs. per acre	Outturn of lint per acre	Actual value received for lint per acre		
			Rs.	a.	p.
V. 434	.. 883	287	84	3	0
Late verum	.. 852	256.6	74	15	9
No. 438	.. 840	268.8	73	13	10
Bani 306	.. 784	211.7	62	1	8
Buri AK-Special	.. 856	239.7	70	5	6
Selected roseum	.. 930	325.5	74	1	9

Physiological work was carried out to study the root system, the effect of various cultural and manurial treatments and meteorological conditions upon the growth and development of the cotton plant.

Good progress has been made with regard to rotation crops. AK 12-24 groundnut, introduced four years ago, is most popular and the area under it is rapidly expanding. AK 8-11 has proved best for domestic purposes and is gradually replacing AK 10. Amongst juars, the two new strains 123-A and E. B. 1 were reported upon very favourably from all over the province.

Further work with rotation experiments has confirmed the past results and the department has now no hesitation in recommending the three course rotation consisting of cotton, juar and groundnut as the most profitable one for Berar from the points of view of cotton yield and soil fertility.

Breeding work on groundnut and selection work on juar, bajra and on the lesser millets (kodon and kutki) have given very encouraging results.

10. Rice Research Scheme.—Breeding work was continued particularly with a view to obtaining heavy yielding strains which could be easily distinguished from wild rice. Some early hybrids with the desired combination of characters and a better yield than E. B. 17 have been secured from the F₃ generation of a cross between E. B. 17 and Nagkesar. The hybrid strains, Bhondu × Parewa and 116 which have been under trial for the past few years have proved consistently superior to their prolific parent, Bhondu 10. Cross No. 19 (Budhiabako × Parewa) which can be readily distinguished from the wild type maintained its reputation as a high yielding fine rice under normal field conditions. These hybrids were distributed to cultivators this year for the first time and have been well reported upon.

At Raipur, Waraseoni and Jubbulpore, fifty-two yield tests were laid out at each centre in order to isolate high yielding varieties most suitable for each tract, and a total of fifty-nine varieties were eventually selected.

A botanical survey of paddy varieties grown in the province is now almost complete; 710 pure lines have been isolated and classified into 385 different types. Selection work on fine and scented rices has given strains of Kubrimohar and Chhatri of uniform quality and improved yield.

Observations on the natural cross-pollination of rice at Raipur showed that natural crossing under the conditions prevailing there did not exceed 1.3 per cent but that it can take place up to a distance of ten feet.

The root system of paddy was found to be much greater in the heavier soil dorsa (48 per cent clay) than in the lighter soil, matasi (25 per cent clay) but the yield is generally better in matasi.

Experiments on the loss of vitality in stored rice grains showed that they retain their full germinating capacity for about twenty months after harvest, *i.e.*, up to the time of the second sowing season.

In hulling tests carried out with improved varieties, the early ripening strain E. B. 17 gave the highest outturn of whole rice. Good milling results were also obtained from the fine rices, budhiabako, chhatri and chinoor.

Irrigation experiments carried out with late ripening paddy on dorsa soils since 1933-34 have proved that a crop in standing water gives a significantly higher yield than one which is given no irrigation.

Manurial experiments have shown that the application of 20 lbs. of phosphoric acid per acre in the form of superphosphate or 20 lbs. of phosphoric acid and 20 lbs. of nitrogen give the same net profit, namely, Rs. 4 per acre.

11. **Second Economic Botanist's Section.**—Work on wheat, pulses, oilseeds and fodder grasses was continued on the general lines indicated in last year's report. Towards the end of the year, all records connected with previous work on oilseeds as well as all the plant material available were transferred to the oilseeds specialist appointed under the new research scheme on oilseeds financed by the Imperial Council of Agricultural Research. Two prominent linseed hybrid strains were issued for trial on a field scale in the Northern and Southern Circles, and a number of other hybrids were tested on three experimental farms. Five of the latter are reported to have produced good results. A morphological description of sixty unit types of linseed previously isolated has been written up. Fifty-two classified unit types of *til* were grown in pure cultures and a number of selections were tested for yield. Of the 45 unit types of castor isolated from the kharif crop of last year 15 were selected for inclusion in a yield test.

Wheat.—In further tests on the Jubbulpore, Hoshangabad and Chhindwara farms of the hybrids obtained by crossing A-115 with foreign wheats three strains Nos. 76, 148 and 267 are reported to have done well both in yield and rust-resistance. Among another groups of crosses evolved to suit conditions in the Plateau districts, two early maturing strains (Nos. 3439 and 3463) will be given out to the Deputy Directors for trial. In the opinion of the head of the section the latter will be suitable also for Nagpur and Wardha districts.

A proposal has been made to the Imperial Council of Agricultural Research for the establishment of a wheat-breeding station for work on wheats suited to the black-soil areas of India. These areas have not secured their proportionate share of the immense benefits which have accrued to wheat growers in other parts of India from the extremely valuable work on wheat hitherto done by the Imperial Department of Agriculture, inasmuch as that work was almost exclusively concerned with the production of wheats suitable for alluvial soils. The proposal

has been accepted, in principle, by the Advisory Board of the Imperial Council of Agricultural Research and further developments may be expected shortly.

Gram.—It is reported that selections Nos. 62 and 352 continue to give satisfactory results at Jubbulpore and Hoshangabad farms and that No. 62 did particularly well at Raipur farm. Seed of No. 352 is being multiplied on the Northern Circle farms for distribution in wilt-infected areas.

Mung and Urad.—The classification of these crops has been completed and is ready for publication. Two strains of *mung* and two of *urad* gave very significant results in a yield test at Nagpur farm.

Miscellaneous.—Some natural crosses have been isolated from the wilt-resistant Pusa types of *tur* and will be grown for further study. Observations on the effect of different fertilizers on the quantity and quality of herbage at Telinkheri were continued. Suitable grass seeds were collected and supplied to the Northern Circle. Selected types of Soya bean were grown for distribution. Some important indigenous medicinal plants are under investigation.

12. Chemical Section.—The activities of this section are expanding steadily, with the result that the research side is understaffed. Chemical analysis of fruits and vegetables available in Nagpur has been undertaken and the investigation will be extended gradually to other food products, the ultimate object being to assemble the data necessary for the formulation of a rational standard of human diets suited to different conditions of work, age and health. Another new investigation is concerned with the determination of the amount of moisture cotton will absorb when exposed to different degrees of atmospheric humidity. This information will be useful in implementing the provisions of the Cotton Ginning and Pressing Factories (Amendment) Act of 1936. Consequent on the transfer of Dr. Mukerjee, Bio-Chemist, in charge of the Rice Research Scheme, Raipur, to the United Provinces, the responsibility for the direction of the bio-chemical part of that scheme has devolved on the Agricultural Chemist, as has also the supervision of the recently initiated Sann Hemp Research Scheme.

Analytical work continued on the general lines of the previous year; 295 samples were analysed and reported on.

Special investigations.—A study of the effect of manuring paddy—(a) with *sann* alone and (b) with *sann* in combination with phosphatic fertilizers showed that the combination not only gave a significantly higher yield than *sann* alone but also produced grain of a higher nutritive value. The normal percentage of phosphoric acid in the grain was increased by the application of phosphatic fertilizers in conjunction with *sann*, whereas with *sann* alone it was reduced.

The theory that nitrification in tropical soils is more a photo-chemical than a bacterial process was tested in a series of experiments which showed clearly that nitrates in ordinary arable soils are not due to the effect of sunlight which, in fact, is actually found to be detrimental to the process of nitrification.

In a study of the fluctuations in the organic nitrogen content of black cotton soils it was observed that: (a) fluctuations are considerable, (b) under field conditions both loss and recuperation takes place, the latter process being more frequent than the former, (c) no definite periodical change attributable to the season was in evidence, and (d) continuous cropping with wheat did not cause any deterioration, nor did a mixture of wheat and legumes show any significant increase.

Other activities.—Samples of gur were prepared on the Bilaspur farm according to the methods found most promising in the previous year, and also by the method of clarifying the juice by activated rice-husk charcoal. Sugarcane varieties under trial at Waraseoni and Bilaspur farms were analysed periodically to determine which were most suitable for the particular tracts. Cultures of nodule bacteria were supplied to Deputy Directors for inoculating leguminous crops. The application of small quantities of waste products from shellac factories as manure, which was recommended last year as a result of experiment, has now been adopted.

Educational.—The teaching work involved in the ordinary college course throws a heavy burden on the Agricultural Chemist and his assistants; an increase in the teaching staff has become necessary. Two men received post-graduate training in analytical work. Special lectures were delivered to a refresher class of agricultural assistants.

13. Entomological Section.—Trials were carried out with a view to finding a more economical method of treating orange trees affected with *Indarbela* which is a serious pest in these provinces.

At the request of the Imperial Council of Agricultural Research, a study of insect pests of sugarcane was undertaken on the Nagpur farm. Here, contrary to expectations, it was found that early in the season cane was attacked by *Sesamia inferens* and not *Scirpophaga* as is usually the case in Northern India.

Further trials regarding mechanical methods to control *Earias fabia* (Spotted bollworm) and with *Trichogramma minutum*, a parasite on *Heliothis obsoleta* (gram caterpillar) were carried out.

The efficacy of "Chlorasol" in protecting grain against insect pests in storage and the possibility of rearing Eri silkworms throughout the year were investigated.

14. Mycological Section.—The experiment in methods for the control of seedling blight in cotton did not give conclusive results as the incidence of the disease in the control plots was very low. The experiment will be repeated on a large scale on the Nagpur and Akola farms next year.

Treatment of *juar* seed for the control of smut gave the same result as in previous years and no further experiments are therefore necessary. Two-ounce and one-ounce packets of copper carbonate and sulphur are now in great demand. Head-smut caused by *Ustilago reiliance* is reported to have caused some damage to *juar*. The mode of infection and method of control will be investigated next season.

Climatic conditions gave rise to severe attack of rust on wheat in some parts of the province. The black and brown forms were most in evidence, orange rust being found only in rare cases. Damage was confined mainly to areas sown after November and to low-lying badly drained fields. It is the general experience that most of the damage in a rust year occurs in late-maturing varieties, and, therefore, the possibility of lessening the effect of the disease by introducing early maturing, high yielding varieties require at least as much attention as the search for varieties which are actually resistant to rust.

Loose smut on wheat (*Ustilago tritici*) is reported to be on the increase. This disease will be investigated next season.

Pan-sukh disease which is known to have caused considerable damage to paddy in Chhattisgarh in some years was found in Ramtek and Waraseoni tahsils. This disease is physiological and can be controlled by applying ammonium sulphate at the rate of 30 to 50 lbs. per acre. Drawing off the water from the fields and allowing the soil to dry as soon as the crop shows signs of the disease helps it to recover its normal growth. The "sterility" disease of paddy mentioned in the previous report did not occur in epidemic form this year.

Spraying experiments in connection with the *tikka* disease of groundnut have again demonstrated the efficacy of Bordeaux mixture combined with linseed oil or agral 1. When there is a heavy incidence of *tikka* the difference between sprayed and unsprayed plots is conspicuous.

Demonstrations of the treatments recommended for the control of foot-rot and anthracnose in *pan* have given good results. One garden at Anjangaon in Amraoti district, which came under treatment in October 1935, has remained healthy and given a good yield, whereas the other gardens are more or less complete failures. At Saugor also a garden under treatment is very much superior to the others. In spite of these successful demonstrations, however, *pan* cultivators are still unwilling to treat their gardens at their own cost.

The cause of hypertrophy in *til* is under investigation. Plants grown in insect-proof cages developed normal straight growth, but control plants grown in the open developed the typical bending of the stem and branches. A similar twisting was reproduced by applying a drop of acid. It appears, therefore, that the bending may be due to some toxic substance introduced by an insect.

A new disease of *urad* which causes the leaves to turn rusty and dry up prematurely was found in Chhindwara. *Rhizoctonia bataticola* was isolated from roots of diseased French beans, sann and bhendi, and from leaves of Buri cotton.

15. Agricultural Engineering Section.—The staff of the Section prepared designs and estimates required by officers of the department and estimates of agricultural machinery for agriculturists. Two power plants, purchased on taccavi loans were, on the recommendation of this department, purchased and erected. Steam engines belonging to the College Dairy, Khandwa farm, Waraseoni farm and Ellichpur farm were overhauled in the

workshop and returned to the respective farms. The two departmental lorries were thoroughly overhauled and a large number of shackles, shackle-pins, eye-bolts, plates, etc., were made in the workshop for the steam tackle outfit of the Northern Circle. Repairs to machinery were carried out on six Government farms and to private power plants at Walni, Warud and Lormi.

The usual oil engine class was attended by seven students of whom four passed the final test. Instructions in Agricultural Engineering were imparted to the staff of the department attending the refresher course.

Certain modifications were effected in the Walker seed drill for the efficient drilling of wheat in some tracts of Berar and trials carried out demonstrated its utility. The trials were greatly appreciated by those who saw them.

To minimize the heavy daily running cost of the Crossley petrol-paraffin engine, it was converted to run on charcoal gas and the economy effected thereby is about Rs. 1-4-0 per shift of 8 hours running.

Two more cinema demonstration lorries were purchased during the year and are at present being equipped to carry a complete cinema demonstration outfit and samples of improved seeds.

The Section has also been entrusted with the purchase, setting up and working of two power driven boring plants purchased from the Government of India grant for rural development.

The Section needs more staff in order to be in a position to attend more promptly to the demands made upon it.

PART IV.—ANIMAL HUSBANDRY SECTION

16. The year under review may be said to have been a very important one with regard to activities concerning cattle improvement. His Excellency the Viceroy's personal interest in the subject and his appeal to the public for donations for the purchase of stud bulls and their proper feed and care, has had a satisfactory response. In addition to public donations which were chiefly collected by the Deputy Commissioners, the Government of India also gave a grant for the same purpose. The total number of bulls provided from both accounts next season.

The Sahiwal (Montgomery) herd of the Telinkheri Dairy farm maintained its standard of milk yield. Of the 38 cows, 27 completed the normal lactation period and averaged 4,137 lbs. [3,573 lbs.] of milk per head; and of 31 she-buffaloes 19 had normal lactation periods and averaged 3,526 lbs. [3,325 lbs.] of milk per head. In the twelve years from 1923-24 to 1935-36 the average yield per cow per annum is reported to have been raised from 2,000 lbs. to 2,859 lbs. which, if valued at the rate of 6 seers per rupee, shows an increase of approximately Rs. 70 per head per annum.

The Telinkheri Dairy Co-operative Society consists of 18 members with a paid-up share capital of Rs. 4,841 [Rs. 4,597]. It is reported to be working satisfactorily under the new management.

At Garhi, where a Gaolao herd is maintained, 24 bulls were issued during the year for breeding purposes. As is common almost everywhere in the province, difficulty has been experienced from water shortage, so this year the bandhs across the two perennial streams that run through the farm were raised.

This increased water-supply will greatly facilitate the irrigation of clover.

On the Pakaria farm, formerly known as Pendra, the aim has been to breed a small efficient type of animal suitable for the Chhattisgarh tract. Nine bulls were issued during the year for breeding purposes.

Trials are being carried out to ascertain if berseem could be grown at this elevation (3,000 feet) for seed purposes. At present the annual provincial requirements worth about Rs. 300 have to be imported from the North-West Frontier Province.

The Ellichpur farm herd consists of pure Hansi-Hissar cattle of medium size. In previous years there was little demand for this type of animal which is a milking strain but during the year under review as a result of His Excellency the Viceroy's appeal the demand rose enormously and in addition to the 18 bulls issued from the farm, 80 had to be imported from the Punjab for distribution.

On the Bod farm the aim has been to improve the local breed by selection and by mating these with pure Hissar bulls.

17. Poultry farm.—The allotment of Rs. 5,958 from the Government of India grant for the equipment of this farm has been fully utilized for the purpose and six breeds, viz., white-leghorn, Rhode Island Red, Black Minorca, Australorps, Buff Orpington, Light Sussex and Well Summer are maintained for comparison with regard to their egg-lying capacity and general suitability in respect of climatic and other conditions prevailing in these provinces.

18. Village enquiry regarding cattle and the production and consumption of milk.—An enquiry in villages regarding the cattle and the production and consumption of milk was taken up under the auspices of the Imperial Council of Agricultural Research. The total cost of the scheme came to Rs. 3,311, the staff entertained being a Supervisor and ten investigators for a period of 6½ months.

With a view to make the survey most representative the following six districts were selected :—

- (1) Saugor, (2) Jubbulpore to represent the wheat tract, (3) Bhandara to represent the rice tract, (4) Amraoti to represent the cotton tract of Berar, (5) Nagpur and (6) Wardha to represent the tract of mixed farming.

Fifty-three villages were selected and the total number of holdings surveyed was 1,050. The points furnished by the enquiry may briefly be summarized as follows :—

- (1) The average cultivated area of a holding surveyed is 22 acres varying from 12 acres in the Jubbulpore district to 38 in the Wardha district. The average size of a holding is comparatively large in the Wardha and Amraoti districts, where kharif crops like cotton and *juar* are chiefly grown.
- (2) The average number of members in a family is 6.5 persons, of whom 4.3 are over 10 years of age, the proportion of males and females being more or less equal.
- (3) There are 3.2 milk cattle per family, the number of cows being nearly double that of she-buffaloes.
- (4) The average area cultivated per work animal varies from 10 acres in the Wardha and Amraoti districts to 5 in the Jubbulpore and Bhandara districts.

- (5) The average daily milk production of a cow is 25 ounces and that of a buffalo 85 ounces.
- (6) The average consumption of fluid milk per adult and child is 2.6 ounces, and per infant 1.2 ounces. The *per capita* consumption is 2.5 ounces.
- (7) The production of milk per holding per day is 70 ounces of which over 17 per cent is sold in the form of fluid milk and about 9 per cent in the form of ghee.

PART V.—ECONOMICS AND MARKETING

19. This Section has completed the second year of their five-year programme during which time reports of surveys carried out on wheat, rice, tobacco, bananas, coffee, grapes, linseed, eggs, milk and cattle have been submitted and those on groundnut, markets and fairs, co-operative marketing, hides and skins are nearing completion and will be submitted shortly. The staff of the Section carried out investigations on commodities side by side with the work of compiling reports and tackled at the same time the numerous supplementary questions arising from reports already submitted.

The staff made extensive tours lasting over 257 days, in the course of which they interviewed numerous people engaged or interested in every phase of marketing. They also visited 6 of the 14 states which have been allotted to this Section under the Marketing Scheme.

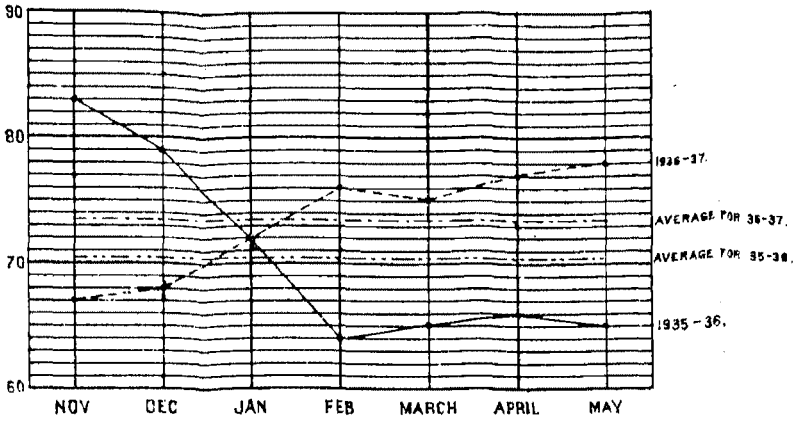
The marketing surveys have ventilated that great scope exists in the province for agricultural and commercial improvement, the most outstanding being the potentialities of bidi-making, for which raw tobacco amounting to 214,000 maunds valued at Rs. 32.10 lakhs is at present annually imported for want of a suitable local product, although the geographical position of this province, an abundant supply of tendu leaves and cheap labour help to make this the most important bidi-making province in India. It is hoped, however, that the types of tobacco which are at present under trial on Government farms will solve this difficulty in the not distant future and develop this line of business.

Other very useful observations contributed by the survey as being of immense value to the growers were the

COMPARATIVE MONTHLY AVERAGE PRICES OF COTTON LINSEED
RICE WHEAT TIL AT THE CHIEF CENTRES OF PRODUCTION.

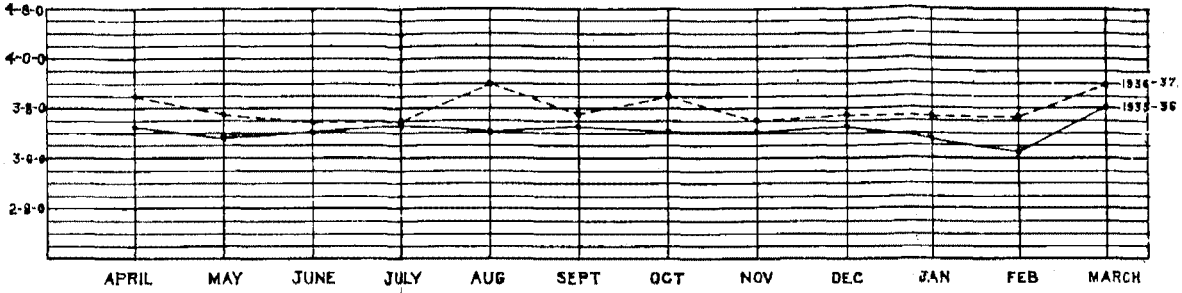
RS PER
KHANDI
(784 LBS)

JADI KAPAS: NAGPUR (FOR TWO SEASONS ONLY)



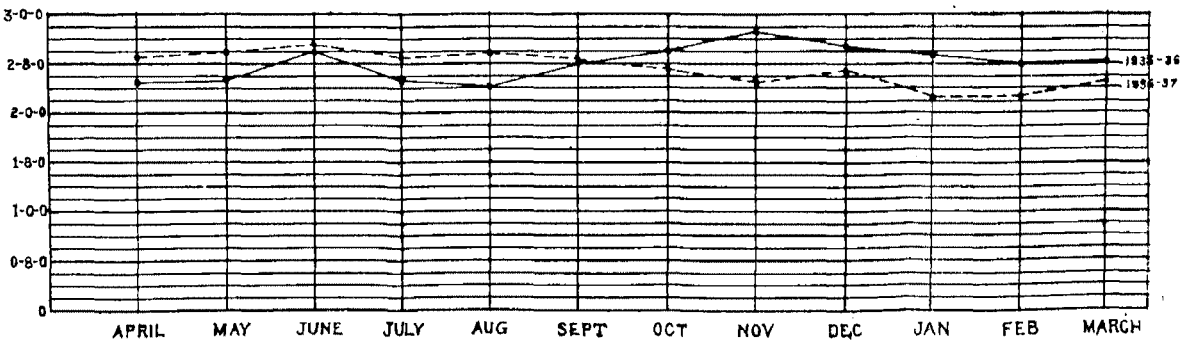
RS PER MAUND

LINSEED RAIPUR



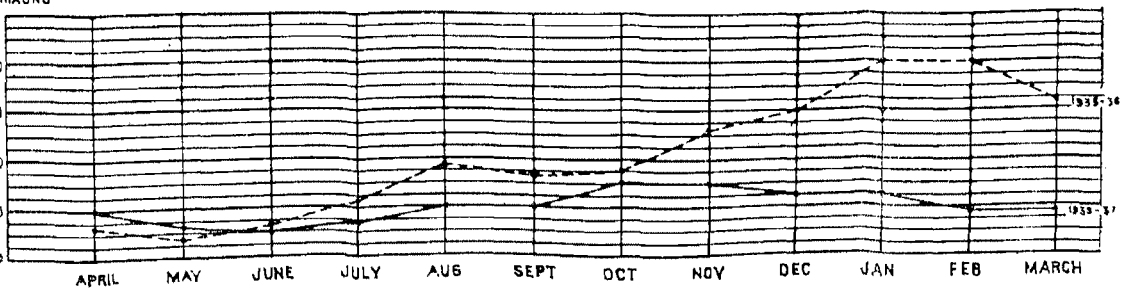
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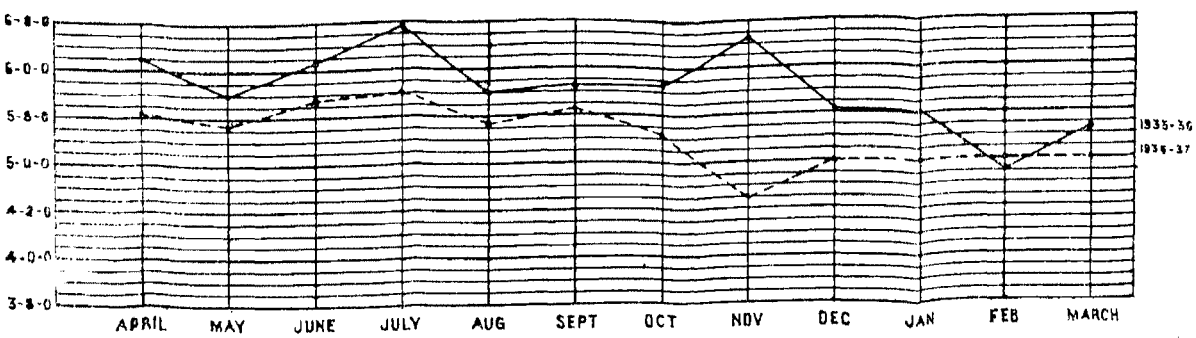
RS PER MAUND

WHEAT JUBBULPORE



RS PER MAUND

TIL JUBBULPORE



Growers' Co-operative godowns in the proximity of important wholesale rail-head grain markets where the growers could store their produce till more favourable prices were obtained. The Association would advance to the grower up to 65 per cent of the current market value of produce received. Similarly, the development of consumers' co-operative purchasing and distributing societies would be considered of great educative value to the people in teaching them to appreciate superior quality.

Various useful suggestions have been made with regard to the improvement of cattle and cattle marketing.

Research is necessary to ascertain the economic carrying capacity of different grazing tracts, and to devise a system of control for their improvement. Experiments at the Chandkhuri farm show that considerable improvement could be effected with judicious management.

Experience gained in surveying various commodities show that milk offers by far the greatest scope for marketing improvement. Lack of cheap transport confines at present the milk supply to cities and urban areas only, where cattle-food and labour are expensive. Co-operative dairies could, however, produce milk very cheaply at places far from cities where good grazing facilities exist and transport it in 3—5 ton tankers run on charcoal gas at a very low cost—about 12 lbs. of charcoal against a gallon of petrol; many dairies could manufacture their own charcoal for about six annas a maund and equip themselves with ample cheap power to run a plant on the most up to date lines. This is expected to result in a plentiful supply of pure milk at considerably less cost to the consumer, if distribution could be effected through wholesale depôts and retail halwai shops which would be registered and open to inspection at any time. The keeping of milch cattle in the cities could then be prohibited and a cheap supply of pure milk would automatically increase consumption much to the benefit of the health of the citizens and to the financial advantage of the rural gaolies who are now compelled to convert their milk into ghee. Milk-yielding competitions could also be organized to stimulate interest in the production of milk and oil mills encouraged to take an interest in the feeding of cakes to dairy cattle as is done by Lever Brothers, England. Broadcasting and practical demonstrations should prove the best lines for intensive propaganda to teach illiterate people to appreciate better quality.

It was found that the problem of weights and measures was very complicated and that it is urgently necessary that a uniform standard should be adopted throughout the province.

A small consignment of Nagpur oranges was sent to Covent Gardens, London, on behalf of a prominent grower and member of the Nagpur District Orange Growers' Association to test its commercial value in the London market. As, however, the commercial value of a commodity in a foreign market cannot be judged by a small single consignment, the question of sending further trial consignments in the coming season will be considered in due course.

Development work in the form of orange grading was carried out during February and March, in co-operation with the Central Marketing staff who provided an English grading machine and complete staff to do this work free of cost.

An attempt was made to induce the merchants to have their oranges graded and to send them regularly to the chief markets, Calcutta, Bombay and Delhi, to ascertain whether graded fruit would command a higher price over a given period. In the beginning it was difficult to persuade the merchants to try grading even when a concession in railway freight was granted and an offer to make good any loss on sales were given but after two months some were willing to grade even if granted no concession of any kind.

The grading was done under the Government of India Agricultural Produce (Grading and Marking) Act, 1937. Under this Act graded produce is sealed under the authority of the Agricultural Marketing Adviser to the Government of India.

During the two months 1,619 baskets of graded and 1,607 baskets of ungraded fruit as a check on the graded were sent to Delhi, Bombay, Calcutta, Lahore, Karachi and Madras, but chiefly to Bombay and Calcutta. Considerable difficulty was experienced in getting merchants to abide by their agreements to furnish all details of sales but in spite of all their efforts to show that grading did not pay there was a very strong demand to have fruit graded by the time the grading station was due to close.

20. Marketing of verum cotton.—The Section opened early with its usual complement of staff, financed by the Indian Central Cotton Committee and the number of bales pooled throughout the season was 8,779½ [6,823].

This is the highest number yet dealt with annually since the scheme started and furnishes clear proof that the growers appreciate the benefits to be derived from the pooling system.

The price of Broach and Oomra was about Rs. 218 and Rs. 198 throughout November and it improved slightly up to Christmas due to the excellent off-take of cotton by mills in America and a brisk world demand.

On the 27th December a bullish influence caused the price of Broach to shoot up to Rs. 232. Later a report that the American Government intended to dispose of a part of their loan cotton early in January had a damping effect, and although the loan cotton was released on the 3rd January the effect was counteracted to a great extent by heavy buying of Oomras and Bengals by the Japanese.

Strikes in America, War in Spain and a newly-introduced ordinance in Japan making the import of raw material, including cotton, on licence obligatory exercised a strong influence in bringing the price of Broach down to Rs. 226 towards the end of January with a gradual fall to Rs. 218½ on the 20th February. In the first half of March market conditions were favourable and on the 18th Broach stood at Rs. 252 and Oomra at Rs. 238. On the 8th April a rumour that the American Government intended to take measures to reduce the influx of gold into America had a marked effect on the prices of many commodities including cotton which underwent considerable fluctuation.

The average at which 8,072 bales of Verum, excluding 675 bales of rain-damaged kapas were sold on F. O. R. Bombay basis, was Rs. 230 per khandi; in other words, Verum obtained an average premium of Re. 1-3-0 [Rs. 42-9-0] on Broach and Rs. 19 [Rs. 60-4-0] on Oomra, *i.e.*, a premium of 1.2 per cent and 19 per cent respectively. These are, no doubt, low when compared with the premia obtained in the previous years but the season was exceptional in that the demand for staple cotton both in Bombay and up-country was exceptionally dull. The Bombay brokers attributed the low price to the unusual market conditions that resulted from an attempt to corner the August-July Broach crop in anticipation of a low yield. But as the crop was a bumper one the attempt failed and large stocks were thrown on the market. Another cause of low prices was the accumulation of stocks and many mills in the Central Provinces were closed for some time due to strikes.

PART VI.—DEMONSTRATION AND PROPAGANDA

21. **Character of the season.**—The season was normal in all circles. Kharif sowings were carried out under favourable conditions and germination was satisfactory everywhere. Timely and well-distributed rains received in July and August with sufficient long breaks facilitated timely weeding and intercultural operations. Moderate showers interrupted by long breaks in August and September encouraged a rapid and vigorous growth of plants. An incidence of mild attack of Aphis on cotton was for a time widespread in Berar, but it was washed down by the heavy showers received at the close of the month. The excellent condition of crops in the beginning of October held out hopes of bumper harvests, but continuous heavy rains received about the middle of November caused serious damage with the result that cotton was stained and juar discoloured, so prices fell. The October rains proved particularly favourable to mature paddy crop in Chhattisgarh where it gave good yields, but proved responsible also for the incidence of cutworm on early-sown linseed which was badly damaged.

In spite of the vagaries of weather which resulted in damaged crops, the season was on the whole favourable for most kharif crops and excellent for groundnut which gave a heavy harvest everywhere. It was also generally favourable for rice which gave a normal harvest except where the crop suffered from *Gangai* disease.

The October and November rains were particularly heavy in the Dharni tract and caused heavy damage both to kharif and rabi crops.

In the northern districts rabi sowings were started earlier than usual owing to the early cessation of rains; in the southern part, sowings were completed under normal conditions but rains received in November spoiled germination and necessitated resowing in some places. The crop showed satisfactory improvement for a time till the end of December. A series of cold waves followed by frequent showers of rains and hailstorms in January, February and March promoted the growth of rust in linseed and wheat in northern districts and Chhattisgarh where it spread considerably and caused widespread damage to late sown wheat.

22. **Northern Circle.**—The most important work carried out in this circle was the marketing of Verum

cotton on the Pool system. Six pools were conducted at six centres in the Nimar district and one at Harda in Hoshangabad district. The total area under certified Verum was 35,571 acres but the produce of only 25,871 acres [3,262 bales] were pooled. In Nimar 3,112 bales were sold at Rs. 3,44,343 and premia of Rs. 22,846 earned over Oomras; Rs. 18,565 in premia were obtained by farmers who sold their Verum in the open market. At Harda 150 bales were sold and premia of Rs. 1,260 secured.

In November unexpected heavy rain damaged 671 bales of Verum but it is interesting to note that they fetched as high a price as the undamaged Jadi or ordinary cotton.

It is estimated that 633,704 acres were sown with improved seed, of which 276,125 maunds and 378,250 whole seed canes and 26,600 plantain suckers were distributed. The value of the increase in outturn resulting from seed distribution is stated to be about Rs. 10,22,800 [Rs. 9,23,530].

There was a decline in the sale of implements which amounted to Rs. 34,454 [Rs. 37,885]. This year McCormick seed drills were tried in the Rehli tahsil of the Saugor district for the first time and proved successful. In the Harda tahsil 7,000 acres were sown with the aid of 27 drills; here it may be said that their use in farm economy has been generally accepted.

Taccavi loans amounting to Rs. 17,531 were granted to cultivators for the purchase of improved seed, implements and breeding bulls.

Village uplift activities were continued in all districts. These included digging of pits for the conservation of manure, general cleanliness of the village, advice and demonstration regarding the growing of more profitable crops and more economic methods of cultivation, establishment of village seed unions to inculcate the spirit of thrift and self-help.

Work started among the aborigines of the Mandla district has been encouraging; for all the improved paddy seed the department could supply has been readily accepted. The Colaba plough too has proved popular. By way of introduction 29 were supplied free and it was noted that these were definitely preferred to the Nari.

A co-operative system of crop watching was introduced which can be carried out by four men where 20 were employed before.

The low price of most field crops has compelled many cultivators to supplement their income by growing fruits and vegetables. During the year about 40,000 plants and five waggon-loads of potatoes were supplied by the department in the Jubbulpore and Saugor districts.

In the management of home-farms of the Court of Wards the department's staff rendered assistance by preparing cropping programmes, giving advice and supplying seed.

The reduction in the charges for ploughing by steam tackle from Rs. 17—Rs. 25 to Rs. 12 per acre resulted in more orders being received than the department could cope with.

The P-Barhi seed distribution scheme was not a success, so with Government's sanction, final accounts were prepared and handed over to the revenue authorities for recovery of arrears.

Forty-four ocular demonstrations to demonstrate the value of using artificial fertilizers supplied free by the Imperial Chemical Industries, were carried out on vegetable and cane plots and it was, with few exceptions, quite obvious that their use would be profitable.

As a result of His Excellency the Viceroy's appeal for better cattle, cattle-breeding farms were unable to meet the unusually heavy demand for bulls. Seventy-nine were imported from Central India at prices much above normal; 67 were issued to breeding centres and eight free to eight controlled breeding areas.

23. Southern Circle.—The total number of pure seed distributing agencies in the circle was 5,089 [4,422] and the quantity distributed was 104,869 maunds [101,418 maunds] and 2,118,629 [1,493,393] whole seed canes.

Eight Verum pooling centres sold 764 [798] bales.

It is clear that the value of artificial manures is now being appreciated by the paddy cultivator. During the year 5,512 [5,438] maunds of ammonium sulphate and nicifos were sold on taccavi, chiefly in the Bhandara and Balaghat districts.

Implements, cane mills, rahats and wire fencing valued at Rs. 60,457 [Rs. 61,874] were sold; and taccavi loans amounting to Rs. 73,998 [Rs. 72,319] were recommended for the same purpose.

Tahsil Agricultural Associations are being reorganized; only those who are really interested in agricultural improvement are encouraged to become members.

Practical demonstrations were held at 1,705 [1,690] centres and at religious fairs. Magic lantern lectures and cinema shows were given at the most important places.

His Excellency the Viceroy's appeal did much to stimulate an interest in cattle-breeding and many donations received for the purchase of breeding bulls were collected as a result of propaganda carried out by the field staff. Bulls, 129 in number, were distributed: 31 were issued free under the Government of India grant and 98 from public donations. The buffaloes of the Murrah breed were also distributed. A cattle show was held at Arvi when several demonstrations and a ploughing match were arranged.

The Nagpur Orange Growers' Association, registered in February 1936, made steady progress. The share capital at the end of the year was Rs. 3,225 [Rs. 2,900] and the membership 80 [67]. Government has rendered assistance by placing at the Association's disposal the services of an agricultural assistant to organize and carry out the Association's programme and by granting taccavi loans to growers for better cultivation and to enable them to retain their fruit till the marketing season instead of selling it for a fraction of its value to contractors in the rainy season, as is the usual custom.

Co-operative marketing operations, *i.e.*, assembling, grading and despatching, were carried out at two centres, Katol and Kohli, and 230 cart-loads of oranges were sold, chiefly in the Lahore and Madras markets.

The prices obtained were only fair as there was much competition from merchants who, because of numerous deductions which they imposed, are in a better position to compete; besides, the growers have yet to learn the principles of co-operation: they are too easily stampeded by false rumours often deliberately circulated. The Association also took up the sale of fruit trees during the year and 940 were sold. If it specializes in the sale of Government certified stock (trees) there is no doubt that this branch of the business will increase rapidly.

24. Eastern Circle.—Several new development schemes have been put into operation. Prominent among these are: (1) the formation of controlled cattle-breeding units with the help of the revenue staff and district councils, (2) formation of Co-operative Cattle-breeding Societies, and (3) organization of producers' associations with a view to creating better marketing facilities in co-operation with central banks. Such enterprises provide opportunities for team work in which several departments can co-operate for the improvement of rural conditions.

Donations received in response to the appeal of His Excellency the Viceroy, together with funds from the Government of India grant made it possible to supply 55 bulls which were distributed in 37 controlled-breeding centres. Five Co-operative Cattle-breeding Societies were organized—one in each of the three districts and one each on the Court of Wards estates at Mohalla and Sahaspur Lohara. Grazing areas under the control of the department have been leased out to the three district societies on easy terms and grazing has been provided free of charge for the other two societies. The members contribute one to five good cows which are sired by selected bulls. The progeny will remain the property of the individual owners and all expenditure will be shared proportionately. Easy grazing terms were also granted to a Co-operative Dairy Society formed at Drug farm for the supply of milk to the town. The formation of a producers' association at the headquarters of each district has, as its immediate objective, the bulk marketing of improved varieties of paddy. Each association is being provided with a storage godown out of the Government of India grant.

Recent research has put at the disposal of district staff improved varieties of paddy, wheat, gram, linseed and sugarcane which are markedly superior to the varieties commonly grown. Expansion of the area under sugarcane in the area commanded by the Kharung and Maniari tanks was hampered by the abnormally low prices of *gur* which left a very small margin of profit on cane not intensively cultivated. The drop in prices of *gur* led to the manufacture of sugar by the open pan system at Chandkhuri farm which gave an extra income of Rs. 1-8-0 per ton of cane, or Rs. 30 per acre. Research

on methods of improving molassine *gur* is, however, necessary before sugar extraction can be generally recommended to cane growers. A method of cane cultivation which enables the crop to mature with only four or five waterings, and which had been under experiment in previous years, was applied very successfully to the whole of the cane area on Bilaspur farm. This method will be advocated in areas where water has to be lifted.

Improved seed, amounting to 119,423 [113,275] maunds and 7.52 [9.68] lakhs of canes, was distributed from 4,016 [3,368] private seed farms. The number of seed unions was 286 [290], with a membership of 5,861 [5,891] and a capital of 25,140 [20,810] maunds. The policy has been to consolidate existing unions rather than to increase the number. The Baghmarra Union continues to show very commendable enterprise and has solved the problem of idle time by the extensive introduction of new crops which have increased the income of the village by at least Rs. 4,000.

Progress in fruit and vegetable cultivation has been very satisfactory. The policy is to select a village with good irrigation facilities, persuade some one to plant a garden and help him to run it properly. Orchards were established in 291 villages and 37,945 [27,270] young fruit trees were supplied, of which 2,244 were given free from nurseries maintained by agricultural assistants at their headquarters. Vegetable gardens were started in 144 centres.

Implements and equipment of the value of Rs. 15,563 [Rs. 16,727] were sold during the year. Sales of fertilizers and oilcakes for manure amounted to 6,198 [3,927] maunds. Rs. 21,745 [Rs. 19,318] were given out in *taccavi* for the purchase of seed, manures, implements and equipment.

Three of the five Government demonstration plots in existence last year were closed down, having served the purposes for which they were opened. One new plot was opened at Bhilai and one of the relinquished plots was taken over by the newly constituted Crop Cultivation Society at Baloda Bazar. Twenty-seven private demonstration plots were run at the expense of the owners under departmental supervision and all except one newly opened at Kargi made substantial profits. The Deputy Director observes that the success of these plots is giving

rise to a demand for trained village managers. Two such appointments were made recently but substantial progress in this direction is hampered by the lack of facilities for training men in general village management. If the necessary training could be provided it would open up promising careers for the educated unemployed and also help to mitigate the evil effects of absentee landlordism.

Propaganda was carried on along the usual lines by means of practical demonstrations, lantern lectures, "farmers' days", and distribution of literature. Practical demonstrations numbered 2,803 [2,494]. "Farmers' days" were organized on two Government farms and three demonstration plots. Successful exhibitions were arranged by the Pendra and Bistrampur Missions, by the Deputy Commissioner, Drug in Mohalla and Sahaspur Lohara Zamindaris and by the Deputy Commissioner, Bilaspur, at several fairs. Intensive village uplift propaganda was conducted in 564 villages; home-farms under Court of Wards continued to receive special attention. It is satisfactory to note that they are becoming increasingly useful as demonstration centres and as suppliers of pure seed, and that the Deputy Director holds up the home-farm at Seoni in Bilaspur district as a model of efficient farming.

25. Western Circle.—There was a fall in the quantity of seed distributed, 38,579 maunds [46,797 maunds] partly due to the reduction in demand for roseum whose acreage fell from 7.3 lakhs in 1935-36 to 4.3 lakhs in 1936-37 and partly to less demand for Verum in the Akola district due to poor outturns in the previous year. On the other hand, the demand for groundnut seed was unusually high due to heavy yields and good prices in previous years. Although a large number of seed farmers are registered, considerable difficulty is experienced every year in meeting the demand for pure seed, because of their habit of selling all their crops immediately after harvest. This problem could be effectively solved by organizing growers' co-operative godowns where pure seed as well as other seed, could be purchased and issued at sowing time at a premium. During the year the Mehkar Taluq Agricultural Association working in close co-operation with the Verum growers, accepted their seed for storage, gave them substantial advances and sold the seed at a profit at sowing time to the financier

advantage of all concerned. Such organizations are essential, otherwise seed is issued only to the same growers and little progress is made.

In the heavier soils of Berar, V-434 has now fairly well established itself as the best all-round cotton. In the lighter soils of the ghat tract which call for an early maturing type, Verum 262 is more suitable.

Pooling operations were carried out at 24 centres and 4,574 [3,233] bales were sold. The price of stapled cotton this year was the lowest since the pooling system was started in 1930-31. Many growers were very disappointed with the low premia obtained this year; since they do not understand the intricacies of marketing, they naturally think it is due to some fault in the cotton.

Fortunately, due to lower prices of cotton many cultivators have increased the acreage under groundnut which is all to the good, since apart from its greater immediate cash value it is an excellent rotation crop for increasing soil fertility which will eventually be reflected by higher cotton outturns, weather conditions being favourable.

Ten centres were opened in the circle under the new scheme of Controlled Cattle-breeding and 17 bulls provided from the Government of India grant for Rural Development were supplied. As a result of His Excellency the Viceroy's appeal 50 bulls were donated and given to different centres and funds for the purchase of many more have been collected.

Poultry rearing has been started on all Government farms in Berar with a view to demonstrating its value as a subsidiary industry and to produce good breeding stock for distribution.

Mostly all of the Government and private demonstration plots run under the direct control or according to the advice of the district staff have shown good results financially. Difficulty is experienced at times due to the apathy of the owners who are not sufficiently interested to carry out instructions. Most failures are due to their not carrying out the necessary operations at the correct time.

A comprehensive systematic agricultural programme of propaganda has been drawn up for 59 villages where rural uplift activities are carried out by the different departments.

The number of shows held during the year was 49 [43] and 2,886 [2,332] practical demonstrations were given. Illustrated lantern lectures were given at 213 [266] centres and cinema lorry demonstrations at 35 places. The cinema lorry is popular. It is hoped that one lorry only for the cotton tract will be ready for demonstration work by the end of the year.

There were 23 taluq agricultural associations and 24 agricultural societies working in the circle. The total profit earned by them during the year was Rs. 8,448 [Rs. 12,488] which works out to 13.18 per cent on their share capital. Hiring of ploughs was the most profitable undertaking and earned Rs. 5,697 on the 1,073 ploughs hired out.

Cactus, a major pest in Berar, is being successfully eradicated by inoculating it with the cochineal parasite.

26. **General economic condition.**—There was a considerable increase in the outturn of cotton when compared with the previous year but unfortunately the benefit of this increase was off-set by unusually low prices during the first four months of the marketing season when most of the cultivators sold their stocks. Still, on the whole, Berar fared better than the Central Provinces as the groundnut crop was a bumper one and prices were high, and the juar crop, although damaged in places from lodging, gave a satisfactory yield of grain and fodder.

The prices of all grains, except rice, rose about the end of the season after most of the cultivators had sold their produce. Merchants whose business it is to study the influence of world affairs on prices and trade movements, stored their grain and awaited the rise they knew would come.

Although the farmers have not gained to the extent they might, had marketing been better organized, still the better market tone has given them hope and encouragement for the future.

PART VII.—HORTICULTURAL GARDENS AND AGRICULTURE

27. During the year under review the weather was not particularly favourable for garden operations. However, on the whole, Maharajbagh and Telinkheri were well maintained and continued to attract a large number of people. The display of dahlias whose bulbs

were imported from Holland last year were unusually fine and there was a good demand for them. The total receipts of these two gardens were Rs. 10,826 [Rs. 12,430] against an expenditure of Rs. 36,265 [Rs. 34,827]. The drop in receipts is attributed to unusual rains followed by an unusually rapid rise in temperature which did a great deal of damage to flowers and plants for sale.

Arboricultural operations were carried out as usual where necessary. Casualties were replaced and fresh plantings made amounting in all to 112 trees. Much interest is now being taken in this subject since the institution of the Nagpur Improvement Trust.

What has been stated above regarding the weather conditions in Nagpur may also be said about Pachmarhi but in addition the fruit and vegetable crops were badly damaged by severe frost in December while many mangoes were lost due to a cyclone in May. The display of seasonal flowers was on the whole fairly good, that of dahlias, chrysanthemums and sweet peas was particularly attractive. The total receipts during the year were Rs. 7,870 [Rs. 7,072] while the expenditure amounted to Rs. 7,322-8-0 [Rs. 7,387-14-9].

As it is now possible, due to a recent recast of policy, to pay greater attention than formerly to the ornamental aspect of public gardens, this is being done and much improvement has been effected. A special effort is being made through the district staff to arouse the cultivators' interest in fruit-growing and much progress has been made in this direction particularly in Chhattisgarh. At present many of the fruit trees planted are useless since they are propagated from non-bearing stock. Later, when certified grafts are available under the citrus fruit research scheme, it is hoped that the public gardens will not only provide amenities to the public but serve as certified nurseries, *i.e.*, nurseries where grafts of known origin and performance can be certified.

28. **Acknowledgments.**—The very generous assistance given by the Indian Central Cotton Committee towards financing the botanical scheme (which includes the breeding of better cotton and its rotation crops and better methods of cultivation); the marketing of improved cottons; and a study of cotton boll-worm, has rendered valuable results and been highly appreciated by the department.

Similarly, the department is greatly indebted to the Imperial Council of Agricultural Research for its continued support in financing schemes on rice, oilseeds research, agricultural marketing, Cotton Cost Enquiry, sann hemp, tobacco, the *Gangai* pest and citrus fruit research. A small enquiry over a period of six months regarding cattle, and the production and consumption of milk in typical villages of certain districts was also financed by the Imperial Council of Agricultural Research.

The amounts received from the Imperial Council of Agricultural Research and the Indian Central Cotton Committee on account of research or enquiry schemes were Rs. 46,994 and Rs. 83,538, respectively, *i.e.*, a total of Rs. 1,30,532.

Further expenditure was incurred from the Government of India grant (Rs. 1,25,000) received last year on : (a) experiments in poultry farming, (b) supply of stud bulls to district councils and other approved organizations, (c) opening of a new farm in the Mandla district, (d) purchase of two cinema lorries for demonstration and propaganda, (e) provision of storage accommodation for cultivators' produce, and (f) purchase of boring plants for the development of well irrigation. The department is very grateful to the Government of India for its very generous assistance.

R. H. HILL,
Director of Agriculture,
Central Provinces.

STATEMENT A

Number of cattle sold from the Government cattle-breeding farms in the Central Provinces and Berar during the year 1936-37.

Name of circle	Bulls	Bullocks	Cows	Male buffaloes	She buffaloes	Young stock of cows and buffaloes	Total for 1936-37	Total for previous year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Northern circle ..	94	..	..	..	4	5	102	28
Southern circle ..	42	..	..	..	..	..	42	72
Eastern circle ..	91	6	..	..	..	..	97	38
Western circle ..	54	27	27	..	..	9	117	44
Agricultural college ..	..	..	1	..	..	9	10	39
Total ..	281	33	28	..	4	23	369	221
Total for previous year	24	52	53	6	17	69	221	..

STATEMENT

Name of circle (1)	Number of private seed farms and union			
	Wheat (2)	Rice (3)	Cotton (4)	Juar (5)
Northern circle ..	4,699	1,268	2,025	358
Southern circle ..	1,152	1,818	710	76
Eastern circle ..	667	2,609	..	..
Western circle ..	273	..	2,871	1,114
College Farm, Nagpur ..	..	..	..	..
Total ..	6,791	5,695	5,606	1,548
Total for previous year ..	5,480	5,044	5,252	1,240

Name of circle (1)	Seed distributed in maunds and canes			
	Wheat (11)	Rice (12)	Cotton (13)	Juar (14)
Northern circle ..	196,884	10,961	31,697	5,392
Southern circle ..	50,442	43,776	7,729	533
Eastern circle ..	9,228	108,938	..	..
Western circle ..	3,644	..	18,217	1,782
College Farm, Nagpur ..	89	..	186	1
Total ..	260,287	163,675	57,829	7,708
Total for previous year ..	209,443	158,125	61,707	10,070

B.

Number of private seed farms and unions—*concl'd.*

Number of private seed farms and unions— <i>concl'd.</i>			Total for 1936-37	Total for previous year
Groundnut	Sugarcane	Other crops		
(6)	(7)	(8)	(9)	(10)
774	..	2,510	11,634	101,117
231	778	181	5,089	4,280
208	193	339	4,016	3,368
1,566	..	218	6,042	5,663
..
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2,779	971	3,248	26,781	23,428
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
2,269	642	2,501	23,428	..
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

Seed distributed in maunds and canes—*concl'd.*

Seed distributed in maunds and canes— <i>concl'd.</i>			Total for 1936-37	Total for previous year
Groundnut	Whole canes	Other crops		
(15)	(16)	(17)	(18)	(19)
17,155	1,378,250	14,034	276,123	221,015
1,436	2,118,629	953	104,869	101,418
759	751,882	498	119,423	131,275
14,691	..	184	38,518	46,797
17	..	94	387	443
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
50,312	4,248,761	15,763	595,637	482,948
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
29,328	3,705,066	14,275	482,948	..
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STATEMENT C

Name of Circle	Approximate area in acres sown with improved seed from private seed farms and other sources					
	Wheat	Rice	Cotton	Juar	Ground-nut	Other crops
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Northern Circle ..	392,122	41,612	104,108	23,013	8,239	64,610
Southern Circle ..	213,387	165,192	87,875	16,246	6,096	12,198
Eastern Circle ..	29,147	460,929	..	..	8,037	5,230
Western Circle ..	15,031	..	284,940	179,413	72,794	1,588
Total ..	649,687	667,733	476,923	218,672	98,166	83,626
Total for previous year ..	590,025	585,688	505,327	178,103	105,832	81,609

Name of Circle	Total for 1936-37	Total for previous year	Approximate value of the increased outturn resulting from use of improved seed for					
			1936-37		1935-36			
(1)	(8)	(9)	(10)	(11)				
			Rs.	a.	p.	Rs.	a.	p.
Northern Circle ..	633,704	573,800	10,22,800	0	0	9,23,530	0	0
Southern Circle ..	503,994	500,210	23,90,676	8	0	23,19,574	8	0
Eastern Circle ..	503,343	428,297	15,02,615	2	0	13,37,871	1	0
Western Circle ..	553,766	544,277	9,89,193	0	0	10,71,870	0	0
Total ..	2,194,807	2,046,584	59,05,284	10	0	56,52,845	9	0
Total for previous year ..	20,46,584	..	56,52,845	9	0	..	..	..

STATEMENT D

Number of implements and parts of implements sold

Name of Circle	Number of implements and parts of implements sold					
	Ploughs	Cane mills	Fodder cutters	Akola hoes	Other implements	Spare parts
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Northern Circle ..	373	33	4	397	768	2,922
Southern Circle ..	356	161	2	3	391	1,910
Eastern Circle ..	17	35	..	16	236	73
Western Circle ..	2,007	..	3	11	37	18,099
College Farm, Nagpur ..	..	..	..	..	..	15
Total ..	2,753	229	9	427	1,432	23,019
Total for previous year ..	2,262	178	20	681	1,688	21,216

Total number	Total value in rupees	Total value in rupees for previous year	Books sold	Bulletins sold	Total	Total for previous year
(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Rs. a. p.	Rs. a. p.				
4,497	34,454 0 0	37,885 0 0	29	100	129	454
2,823	60,457 4 4	61,874 3 6	18	223	241	251
377	15,563 4 9	16,727 9 0	..	446	446	469
20,157	69,042 0 0	52,240 0 0	110	741	851	1,039
15	12 10 5	47 3 8	..	..	..	..
27,869	1,79,529 3 6	1,68,774 0 2	157	1,510	1,667	2,253
26,045	1,68,774 0 2	..	143	2,110	2,253	..

STATEMENT E

Name of Circle	Number of agricultural shows and fairs held	Number of practical demonstrations carried out by the district staff	Number of illustrated lectures given
(1)	(2)	(3)	(4)
Northern Circle	.. 11	1,583	159
Southern Circle	.. 25	1,705	21
Eastern Circle	.. 16	2,803	55
Western Circle	.. 49	2,896	213
		<hr/>	<hr/>
Total	.. 101	8,987	448
		<hr/>	<hr/>
Total for previous year	.. 107	8,053	623
		<hr/>	<hr/>