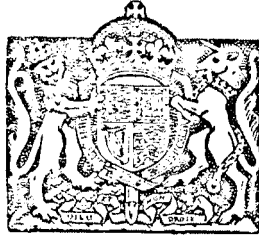


Contents.

C.P. & Berar Government Reports.

|   |   |  |          |              |
|---|---|--|----------|--------------|
| 1 | { | 1. Agriculture, J. 271r                | 1937-38. | pp. 1- 25.   |
|   |   | 2. do. J. 271r                         | 1938-39. | pp. 26- 47.  |
| 2 | { | 3. Season and Crop,                    | 1937-38. | pp. 48- 63.  |
|   |   | 4. do. X9(J). 271r                     | 1938-39. | pp. 69- 89.  |
| 3 | { | 5. Co-operative Societies.             | 1937-38. | pp. 90-132.  |
|   |   | 6. do. X9(J). 271r                     | 1938-39. | pp. 133-166. |
| 4 | { | 7. Education, T. 271r                  | 1936-37. | pp. 167-254. |
|   |   | 8. do. T. 271r                         | 1937-38. | pp. 255-313. |
|   |   | 9. do. T. 271r                         | 1938-39. | pp. 314-369. |
| 5 | { | 10. Excise Administration, X7294. 271r | 1937-38. | pp. 370-413. |
|   |   | 11. do. X7294. 271r                    | 1938-39. | pp. 414-458. |
| 6 | { | 12. Forest, JA. 271r                   | 1938-39. | pp. 459-494. |
|   |   | 13. Do. (Statements) do.               |          | pp. 495-521. |

GOVERNMENT OF THE  
CENTRAL PROVINCES AND BERAR



# REPORT

ON THE WORKING OF THE

DEPARTMENT OF AGRICULTURE

IN THE

CENTRAL PROVINCES & BERAR

FOR THE YEAR ENDING THE

31ST MARCH 1938

NAGPUR  
GOVERNMENT PRINTING, C. P. & BERAR  
1939

**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.]

**INDIA**

- KOLA :**  
The Proprietor, Shri Ramdas Stores, Tainapeth.
- ALLAHABAD :**  
Mr. Ram Narain Lal, Publisher, etc., 1, Bank Road.  
The Superintendent, Nazair Kanun Hind Press.
- AMRAOTI :**  
Thakur & Co., Ltd., Booksellers.
- BARODA :**  
Mr. M. C. Kothari, Bookseller and Publisher, Raopura Road.
- BHANDARA :**  
S. S. Dharashivkar, Esq., Opposite Municipal Water Reservoir.
- BILASPUR :**  
Mr. M. A. Subhan, Bookseller and Publisher.
- BOMBAY :**  
D. B. Taraporevala, Sons & Co., Treasure House of Books, Taj Building, No. 210, Hornby Road, Fort.  
Radhabai Amaram Sagoon.  
Sunder Pandurang, 25, Kaibadevi Road.  
Thacker & Co., Ltd.  
The Proprietors, New Book Company.
- CALCUTTA :**  
The Book Company, 44-A, College Street.  
Butterworth & Co. (India), Ltd., Avenue House, Post Box No. 251.  
The Indian School Supply Depot.  
M. C. Sircar & Sons, 75, Harrison Road.  
Newman & Co.  
R. Cambay & Co.  
S. K. Lahiri & Co.  
Thacker, Spink & Co.
- CAWNPORE :**  
The Manager, Sampson William and Co., 127-B, The Mall.
- CHHINDWARA :**  
The Proprietor, Verma Book Depot.
- COOCH BEHAR :**  
Babu S. C. Taluqdar, Proprietor, Students & Co.
- DELHI :**  
The Oxford Book and Stationery Co.  
R. S. Tomara & Sons, Opposite Fort Gate.
- ODHPUR :**  
Messrs. B. S. Mathur & Co., Chaturvilas, Paota, Civil Lines, Jodhpur (Rajputana).
- JUBBULPORE :**  
The Manager, Educational Book Depot.  
The Proprietor, Nerbudda Book Depot.  
The Manager, Bhargava Book Company, Publishers, Booksellers and Stationers.  
Radhamohan Esq., Proprietor, Shyam Stationery Mart, Andherdeo.
- KARACHI :**  
The Standard Bookstall.
- KHAMGAON :**  
Sakalkale Typewriting Institute.
- LAHORE :**  
The Punjab Sanskrit Book Depot.  
Rai Sahib M. Gulab Singh & Sons, Messrs. Careers & Co., Moheni Road.
- LUCKNOW :**  
The Proprietor, Newal Kishore Press.  
The Upper India Publishing House Ltd., 41, Aminabad Park.
- MADRAS :**  
Hazzinbotham & Co.  
S. Murthy & Co., Post Box No. 152.  
The Proprietor, The City Book Company, Post Box No. 253.
- NAGPUR :**  
Aidan Binzani, Proprietors, Karmavir Book Depot, Mahal.  
G. G. Khot & Sons, Sitabuldi, Messrs. Shastri & Sons, Walker Road.  
The Manager, Educational Book Depot.  
The Manager, "The Hitwada".  
The Proprietors, Bhisey Brothers, Booksellers and Publishers.  
Mr. D. M. Dhurnal, Proprietor, Provincial Book Binding Works.  
The Manager, Nagpur Law Journal, Central Law House, Tulsi Bag Road, Mahal.  
Neston Jacques & Co., Kamptee Road.
- PATNA :**  
The Patna Law Press Company.
- PESHAWAR CANTONMENT :**  
Faquirchand Marwah, Bookseller.
- POONA :**  
The Proprietors, New Kitabkhana.
- RAIPUR :**  
The Proprietor, Chaube Printing Works.
- RANGOON :**  
The Superintendent, American Baptist Mission Press.
- VELLORE :**  
A. Venkatasubban, Law Bookseller.
- YEOTMAL :**  
V. N. Sawant.  
Mr. M. G. D. B. ji, Law Books Agent.

No. 2047-1894-X

GOVERNMENT OF THE  
CENTRAL PROVINCES AND BERAR  
AGRICULTURE DEPARTMENT

---

*Nagpur, the 29th November 1938.*

READ—

Report on the working of the Department of Agriculture  
for the year ending the 31st March 1938.

RESOLUTION

The year was a difficult one for the Agriculture Department. The monsoon was abnormal. It started late, and excessive rains followed by a prolonged break in August were unsuited to cotton. The absence of satisfactory winter rains also affected the outturn of the *rabi* crops. The only part of the province which experienced a good harvest was the Chhattisgarh division, but here too the paddy crop was slightly inferior to the average of past years. With the decreased purchasing power of the cultivating classes, there was a slight setback in the quantity of pure seed distributed which fell to 523,862 [539,320] maunds, and there was a corresponding fall in the acreage sown with it from 2,194,807 [2,050,122]. The value of implements and spare parts sold by the department also fell to Rs. 1,38,329 [Rs. 1,79,529]. On the other hand the expansion of area under the recently developed strain of cotton, V-434, was maintained in spite of an unfavourable season. Groundnut made good progress in Berar where the area under this crop, which had risen to 136,000 acres in 1934 and had fallen to 97,000 acres in 1936, jumped to 157,000 acres in the year under report. Over 70 per cent of this area was under improved seed.

2. There were no fresh developments in agricultural education. But a feature of the year was the considerable increase in the number of students seeking admission to the College of Agriculture at Nagpur. Formerly admissions were limited to the number which could be accommodated in the hostel, but a departure from the standing rules requiring residence in the hostel was made during the year and 38 students were permitted to reside with their parents or accredited guardians.

3. The full programme of experimental work continued during the year. Four most promising strains of cotton, H413, H414, H415 and H420, were tried on a larger scale at the Nagpur farm and have given very good results. The programme of experimental work is expanding steadily. The sann hemp and oilseeds research schemes were started just before the year commenced and the citrus scheme during it. All these schemes, which are financed by the Imperial Council of Agricultural Research, have great potentialities for the agriculture of the province. The rice research scheme, also financed by the Imperial Council, has enabled the department to place at the disposal of the cultivators high-yielding coarse varieties of early, medium and late paddies suitable for each of the main rice tracts of the province. High-yielding fine rices have been evolved from the transplanted areas and a special hybrid fine rice, distinguishable from wild rice, is available for the *biasi* tract in Chhattisgarh. Four promising strains of *C Indicum* cotton, B61, B64, B73 and B90, tested on a field scale, proved wilt-resistant and capable of spinning up to 50's highest standard warp counts. Hybridization work has produced four very promising crosses between *Bani* and *Cernum*, H413, H414, H415 and H420, which yielded very well in field trials and can spin up to 30's. Work continued on the improvement of Buri 107 cotton which is in keen demand for replacing local Buri in Burhanpur tahsil.

4. The marketing section completed the fourth year of its five-year programme and submitted reports on four commodities. A special feature of the year's work has been the effort made to introduce grading as a general practice in the marketing of oranges. Over 7,000 baskets of oranges were graded and sold at Delhi and Calcutta and secured an average premium of 2½ annas per basket over ungraded fruit. It is to be hoped that this encouraging result will induce large scale grading. The verum marketing pool experienced a heavy fall of business as compared with last year, but this is accounted for largely by a strong demand for verum from local mills. The very satisfactory premium of Rs. 39-15-0 on Broach and Rs. 57-7-0 on Oomra was obtained for cotton sold through the pool.

5. Government continues to be indebted to the Indian Central Cotton Committee and the Imperial Council of Agricultural Research for generous grants for research and the total help received amounts to

Rs. 1,33,027. Without the support of these two bodies little research activity would have proved possible.

6. Government expresses its thanks to Mr. McDougall and to Mr. Hill who acted for him while he was on leave, for their able direction of the department and to their officers and the staff for another good year's work.

---

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,

K. B. L. SETH,

Secy. to Govt., C. P. & Berar,  
*Agriculture Department.*

No. 5516'

FROM

J. C. McDOUGALL, ESQ., M.A., B.Sc., I.A.S.,  
DIRECTOR OF AGRICULTURE,  
CENTRAL PROVINCES AND BERAR,

TO

THE REVENUE SECY. TO GOVT.,  
CENTRAL PROVINCES AND BERAR.

*Nagpur, the 17th September 1938.*

SIR,

I have the honour to submit, herewith, the report on the working of the Department of Agriculture, Central Provinces and Berar, for the year ending the 31st March 1938.

I have the honour to be,

SIR,

Your most obedient servant,

J. C. McDOUGALL,

*Director of Agriculture,*

*Central Provinces and Berar.*

**REPORT ON THE WORKING OF THE DEPARTMENT OF AGRICULTURE, CENTRAL PROVINCES AND BERAR, FOR THE YEAR ENDING THE 31st MARCH 1938**

---

**PART I. ADMINISTRATION**

I held charge of the department from the 1st April to the 13th June 1937 and again, on return from leave, from 15th January 1938 till the end of the year. During my absence Mr. R. H. Hill held charge.

Mr. R. H. Hill held charge of the office of Deputy Director of Agriculture, Economics and Marketing, from the 1st April to 13th June 1937 and again from the 15th January to the 17th March 1938 when he proceeded on 8 months' leave. Mr. G. D. Mehta, Senior Assistant Marketing Officer, officiated as Deputy Director of Agriculture, Economics and Marketing, from the 13th June till the 3rd December 1937 when, unfortunately, he died after a very brief illness. He was succeeded by Mr. P. D. Nair who held charge until Mr. Hill took over on the 14th January 1938. Mr. Nair again took over from Mr. Hill on the 18th of March 1938.

Mr. E. A. H. Churchill, Principal of the College of Agriculture, was on leave up to the 10th November 1937. During his absence Mr. J. F. Dastur was appointed Principal in addition to his own duties as Mycologist.

Mr. S. G. Mutkekar was on leave up till the 31st October 1937 during which period Mr. P. D. Nair officiated as Deputy Director of Agriculture in the Western Circle. Thereafter Mr. Nair served for brief periods as Deputy Director of Agriculture, Northern Circle, and Assistant Director attached to the head office.

Dr. R. J. Kalamkar was attached to the head office from the beginning of the year till the 22nd April 1937 and again from the 25th May till the 14th December. He officiated as Deputy Director of Agriculture in the Southern Circle in a leave vacancy between the 22nd April and the 24th May and again in a similar vacancy in the Northern Circle from the 14th December 1937 till the end of the financial year.



The services of Mr. D. N. Mahta, Economic Botanist for Cotton, were placed at the disposal of the Government of India for employment as Secretary, Indian Central Cotton Committee, Bombay, from the 30th September 1937.

Miss R. Shah was appointed Horticulturist, Citrus Research Station, Nagpur, with effect from the 30th April 1937 in connection with the scheme financed by the Imperial Council of Agricultural Research.

The Animal Husbandry Section was transferred to the Veterinary Department with effect from the 1st April 1937. Certain farms which combine cattle-breeding with crop production were retained under the Agriculture Department.

2. Expenditure on the department during the year amounted to Rs. 10,13,343 which included Rs. 59,495 on botanical and other gardens, Rs. 13,436 on the Rice Research Scheme, Rs. 14,949 on the Agricultural Marketing Scheme, Rs. 2,622 on the Gangai Pest Scheme, Rs. 1,627 on the Sann Hemp Scheme, Rs. 8,800 on the Oilseeds Scheme and Rs. 12,978 on the Citrus Research Scheme. Receipts amounted to Rs. 2,00,340. The net expenditure on all branches of the department's activities thus amounted to Rs. 8,13,003. Of this sum Rs. 54,412 were contributed by the Imperial Council of Agricultural Research and Rs. 78,615 by the Indian Central Cotton Committee to the research and extension schemes in progress. The net cost to the province was, therefore, Rs. 6,79,976 [Rs. 7,06,814].

## PART II.—AGRICULTURAL EDUCATION

3. There has been a considerable increase in the number of students seeking admission to the College of Agriculture in recent years. Formerly, admissions were limited to the number which could be accommodated in the hostel, but a departure from the standing rule requiring residence in the hostel had to be made in the year under report. Thirty-eight students were permitted to reside with their parents or accredited guardians.

Applications for admission numbered 127. Seventy were called for interview and 58 were finally admitted. The strength of the first year class was 58 throughout the year and 44 were promoted. Fifty-eight students including five compartmental candidates appeared for the Intermediate examination out of whom four passed in the first

division, 18 in the second and two in the third; 20 were placed in the 'pass' division and three were given compartmentals. The third year class consisted of 18 students out of whom 17 appeared at the examination and were promoted. Twenty-nine students appeared for the B. Ag. degree examination out of whom 16 were successful, one in the first division, 10 in the second, and two in the third; three passed without securing a division and four secured compartmental passes.

The fourth year students toured in Chhattisgarh and Berar, visiting Raipur, Drug, Chandkhuri, Ellichpur and Akola farms. The third year students were taken to Chhindwara, Seoni, Powarkhera and Adhartal farms and also to the Military grass and Dairy farms at Jubbulpore. The second year class visited Betul farm.

The health of the students was quite satisfactory, medical attention being given throughout the year by Dr. C. B. Rai.

Thirty students were members of the University Training Corps. The College platoon secured the Guard Mounting Cup for the second time and one of the platoon was elevated to the rank of Under-Officer.

The College Council met three times during the year.

The Hon'ble Minister for Education paid a visit to the hostel. The second quinquennial inspection of the College by inspectors appointed by the University took place during the year.

The students went on strike on the 7th January 1938 as a protest against the detention of 14 students who failed to pass the preliminary test examination. Normal working was resumed on the 13th January.

The College Magazine issued regularly throughout the session. Every effort was made by the Editorial Committee to maintain the magazine at a high level of efficiency.

**4. Powarkhera Agricultural Middle School.**—The number of boys on the roll of the Powarkhera Agricultural Middle School, including new entrants, at the beginning of the session was 95, of whom 20 left in the course of the year. All of them were drawn from the cultivating classes, being sons of either malguzars or cultivators. Fifty-eight came from Hoshangabad district and the remainder from Betul, Saugor, Chhindwara, Nagpur and

the States. The High School Entrance Examination having been abolished in the year under review, the pupils of Class VIII were examined in the school itself. Sixteen boys appeared of whom 13 passed. An area of 6.5 acres cultivated by the boys produced a total income of Rs. 307. Two kinds of messes were run, one on a cash basis and the other with actual rations supplied by the boys. Charges in the cash mess averaged Rs. 4-4-0 per month. The receipts of the school from all sources amounted to Rs. 2,855 [Rs. 2,507].

5. **Betul Agricultural Middle School.**—The number on the roll at the beginning of the session was 63 boys including new entrants, of whom five left subsequently. All the boys came from Betul district and, with three exceptions, belonged to the cultivating classes. Sixteen appeared for the Class VIII examination of whom 14 passed. An area of 1.80 acres cultivated by the boys fetched a total income of Rs. 38-8-0. An interesting demonstration of practical agriculture was provided by the boys at the time of the visit of the Hon'ble Minister for Education on the 27th September 1937, and also at the "Farmers' Day" held on the farm on the 6th February 1938. The school mess is run with rations provided by the boys themselves at an average cost of Rs. 4 per month per boy.

The inclusion of instruction in carpentry and blacksmithy in the curriculum has been decided upon. The hostel building needs extension, and provision will be made for this as funds permit. The receipts of the school amounted to Rs. 1,256.

6. **The Peace Memorial Agricultural School, Buldana,** has been providing a two-year course in agriculture and allied subjects since 1929. It cannot be claimed even now that the right type of boy is taking advantage of it; most of them are attracted by the stipend and the prospect of Government service later. The real demand for this type of education cannot be ascertained so long as the present system of awarding a stipend to every boy continues. It requires to be replaced, as a first step, by a selective method based on merit in the class. During the year, 58 boys applied for admission and 19 admitted of whom four subsequently left. Nine boys were promoted and eight out of nine second year boys passed the final examination.

7. A special course in agriculture was provided at the middle schools at Itki and Chandur Railway which have small plots for practical work. Teachers trained in agriculture were provided by the Education Department and it is hoped such training will stimulate interest in manual work. Similar training was given in Amarwara, Lakhnadon, Chhapara and Chaurai middle schools in the Southern Circle. In the Northern Circle, training in practical agriculture was given to the V and VI Classes of the Middle School, Piparia, on Silari Farm and to the VII and VIII Classes of the Fisher Middle School, Khandwa, on the plot attached to that school. In Chhattisgarh, agricultural education was imparted at four selected centres, of which Mahuadih was the most important in that systematic practical training in the different operations of crop production was imparted. At other centres the teaching was mainly theoretical for want of adequate area for growing crops.

8. Agricultural Engineering section.—The staff of this section visited Adhartal, Chandkhuri, Raipur and Bilaspur farms and Wadhona, Mahadpur and Mahakali for investigation of pumping schemes and other Engineering problems and prepared estimates for suitable type of machinery for 20 power plants. Cane crushing plants were erected at Betul and Bilaspur farms and one pumping plant was erected for a cultivator in Burhanpur tahsil. Annual overhauls of the workshop engines, cinema demonstration lorries, projectors, electrical outfit, etc., were attended to. The engines at Bilaspur and Powarkhera farms were also given a thorough overhaul.

The workshop prepared Akola hoes, feeding troughs, and constructed a godown for the Horticultural Section.

The training class in workshop practice was attended by seven candidates of whom three were found proficient.

Pumping tests were carried out in and around Kalmeshwar with a view to find out the "pumping level" and the capacity of an average well for irrigating orange orchards. It was found that the pumping level was between 30' to 33' when discharge of water from the pump was adjusted to 28 to 30 gallons per minute, and that an average well of 35' to 40' depth and 6' to 7' diameter was able to command about three acres of oranges with one mote provided the lay-out was well arranged and the distribution of water properly looked after.

### PART III.—RESEARCH AND EXPERIMENTAL WORK

9. Experimental work in the circles—*Eastern circle*.—Varietal tests on improved paddies were carried out in co-operation with the Rice Research Officer. The general results are mentioned in the comments on the Rice Research Scheme. Varietal wheat trials have shown that Pusa 100 and A-113 are the most suitable varieties under ordinary conditions, while Pusa 101 is best under manured and irrigated conditions. Of the gram varieties tried E. B. 28—13 has given the best outturn; the introduced varieties of linseed have proved superior to the local type.

Trials of new varieties of cane imported from Coimbatore confirm the previous year's results that CO 312 and CO 313 are likely to replace the hitherto popular varieties previously introduced from Coimbatore. Dry method of planting cane on *kachhar* soil has again proved successful at Bilaspur farm. The method is now being tried at Labhandi in heavy soil.

Manuring of rice nurseries with 200 lbs. niciphos per acre confirmed the good results obtained in previous years.

The question whether it is more profitable to convert cane into *gur* or into sugar was investigated at Chandkhuri farm. The result shows that the cultivator stands to gain about Rs. 24 per acre on an average crop of 20 tons of cane by resorting to sugar-making. That result was obtained with a plant which is expensive to run and which could be replaced by a much more economic unit. The possibility of establishing a small sugar factory in an area in Bilaspur district where canal irrigation for cane is available is under examination.

10. Northern Circle.—Agronomic experiments are carried out at Adhartal and Powarkhera farms. Wheat trials showed that P 101 gave the best yield under irrigated and unirrigated conditions at Powarkhera while E. B. 76 proved the best at Adhartal with AO 90 and AO 88 in order of yield. Of the varietal trials of other crops, D 8 gram, E. B. III and Pusa 101 linseed, Pandhurna chillies, Tobacco No. 28 and A. K. 10 groundnut gave the highest yields at Powarkhera while gram V and linseed No. 55 gave the highest yield at Adhartal.

Investigations are in progress with a view to evolving a satisfactory technique for estimating crop yields.

Experiments on wheat were conducted on three farms and on cultivators' fields, and the data collected are being analysed statistically. Preliminary data have been collected also for sugarcane, juar and cotton. It is hoped that the investigations will lead to the formulating of a statistically sound method of conducting crop experiments.

11. Southern Circle.—Experimental work was carried out at two experimental farms, Tharsa and Chhindwara. Wheat varietal test at Chhindwara showed that AO 49 is the best yielder; at Tharsa AO 49 has proved best under irrigation and AO 68 under dry cultivation. Trials at Chhindwara with gram, linseed, groundnut and tur showed that local gram, linseed 55 F, groundnut A. K. 12-24 and tur No. 38 are the best yielders. Varietal trial of potatoes was not satisfactory inasmuch as the yield of all varieties was poor. Local gram gave the best yield at Tharsa.

Cane trials at Waraseoni, Sindewahi and Betul seed and demonstration farms showed the superiority of CO 312 and CO 313 which confirms the results obtained in the Eastern Circle. Nineteen new varieties of sugarcane were received for trial at Tharsa.

Trial of rice varieties received from the Officer-in-charge, Rice Research Scheme, Raipur, are in progress at Waraseoni.

12. Western Circle.—A certain amount of experimental work is carried out by the Deputy Director of Agriculture on the seed and demonstration farms. This work is concerned mainly with varietal tests of improved cottons produced at Akola farm to determine their suitability to local conditions. Manurial experiments on cotton and groundnut are also in progress.

#### EXPERIMENTAL WORK IN THE RESEARCH SECTIONS

13. Cotton Botanist's Section—*Cotton*.—The Botanical Research Scheme is concerned mainly with the production of high yielding, wilt-resistant, medium or long stapled cotton, capable of spinning higher counts than 20's with the object of replacing, if possible, the short stapled "Oomras" cotton. Work in this direction continued along the lines approved by the Indian Central Cotton Committee. Crops grown in rotation with cotton were also dealt with.

The chief feature of the year was the success which attended the expansion of the recently developed strain V 434 which, in spite of an unfavourable season, has again shown its superiority over the other types of cotton. Another important item was the comparative trial on a field scale of the four new strains of *G. indicum*, viz., B 61, B 64, B 73 and B 90 at the various Government farms. These, besides being resistant to wilt, possess very fine long lint capable of spinning up to 50's highest standard warp counts.

Breeding work on cotton continued on the same lines as in the past season. A number of promising selections were made during the year. Particular attention was paid to lint characters such as fineness, colour, evenness of length and giving percentage.

Single plant selections from the original stock of Verum 262, late Verum, V 434, Bani 306, E. B. 31, Buri 84 and Buri 107 were continued with the object of eliminating, if possible, any defects observed and a number of crosses were made, with the same object in view, between individuals within the same strain. During the year some 700 strains were grown in single plant cultures for observation in the experimental area and out of these nearly 60 were finally selected for plant bulk multiplication and preliminary trial. Work in connection with the improvement of Buri was continued. Buri 107 has given a very high yield and is doing very well on Akola farm and in Burhanpur tahsil.

The purity chequer method was again employed for testing and comparing new selections of the various approved strains. There were over 10,000 plants under observation during the season.

Hybridization work was continued on the same lines as in the past year. Some 130 strains of the Bani × Cernuum cross were grown in single plant cultures in small blocks for testing purification, while 14 pure strains showing indication of greater promise were grown in bigger blocks for the purposes of multiplying the seed and testing the yield. The four most promising strains H 413, H 414, H 415 and H 420 were grown on a larger scale at the Nagpur farm and have given very good results. Their average yield was more than 1,000 lbs. per acre while their staple was adjudged suitable for spinning up to 30's highest standard warp counts.

Physiological work included a series of daily observation on growth, flowering, bud and boll shedding and boll opening with a view to studying the effect of the climatic conditions and other factors on the cotton plant. Roots of different varieties were examined at different periods of growth and compared with one another. In the "Time of Sowing" experiment, in which four sowings were done at weekly intervals, the best results were obtained from the second sowing indicating that the sooner cotton is sown after sufficient rain has fallen the better.

Akola farm met with a particularly unfavourable year, the outturn of cotton and groundnut being only about half that of the previous year. The maintenance of a supply of pure seed of the approved strains of cotton is one of the farm's most important functions. Every year a sufficient quantity of seed to sow the whole farm in the succeeding season is selfed. The seed thus produced is then distributed to Government farms and A class seed farmers and thence finds its way into general cultivation. Experiments on groundnut again showed the marked superiority of the new strain A.K. 8-11 which gave the very satisfactory outturn of 2,110 lbs. per acre in spite of the unfavourable season. It is a large podded variety like A. K. 10 but yields about 4 to 5 per cent more seed on shelling. 150 cart-loads of organic manure was prepared out of cotton stalks by the usual composting method and served as a useful supplement to the ordinary supply of farmyard manure.

**14. Second Economic Botanist's Section.**—This section is concerned mainly with research on wheat, pulses and fodders.

*Wheat.*—Fixed strains of the crosses between A 115 and Australian and Palestine wheats were grown on a field scale at Adhartal and Powarkhera farms. Numbers 76 and 267 of these crosses have maintained their reputation as good yielders. Three new strains, *viz.*, 3,439 (AO 85 × P 4), 3,463 (red pissi × P 4) and 34,101 (AO 90 × P 4) have been handed over to the Deputy Director of Agriculture, Northern Circle, for field trials and multiplication of seed. The crosses between the rust resistant parents A 115 × P 4, A 115 × P 52, AO 68 × P 4 and AO 68 × P 52 were grown at Powarkhera, Kheri and Nagpur farms, and single plants having the desired economic characters have been isolated.



The inter-specific crosses *T. vulgare* (AO 13) × *T. durum* (No. 58) and *T. durum* (No. 58) × *T. dicoccum* (Khapli) were grown in F<sup>1</sup> generation. The F<sup>1</sup> plants of the first named cross have been again crossed with *T. dicoccum* and those of the second with (AO 13). These crosses have also been back-crossed. The object is to transfer the rust-resistant quality of Khapli to the high yielding *vulgare* wheat AO 13. Success has also been obtained this year in effecting *vulgare* × Khapli crosses, and it is hoped to get desirable rust-resistant segregates from these crosses in the near future.

The Amphidiploid *Aegilotriticum* containing 56 chromosomes was crossed with *T. vulgare* (AO 88) and (AO 13) and with the F<sup>1</sup> of *T. vulgare* × *T. dicoccum* to evolve rust-resistant high yielding wheats. The possible cause for the deterioration of Sharbati hybrids as regards their immunity to the attacks of rust fungi has also been studied.

*Gram.*—Fixed crosses No. 28 × Cawnpore, Nos. 33, 35, 36, 37, 38, 42 and 49 were tried again at Adhartal and Tharsa farms along with the local gram in randomised blocks. Of these, Nos. 36, 37, 38 and 42 have again given promising results.

With a view to increase the yielding capacity of Kabuli, Malida and D 8 grams which are particularly valued for frying purposes the following sets of crosses were made: Kabuli gram × No. 62; Malida × No.62; D 8 × No. 62. Work on selection of Karachi and other grams has been continued. Selections 28, 62 and 352 are gaining popularity on account of the good colour of the seed, wilt-resistant capacity and high yield.

*Tur.*—The demand for wilt-resistant strain No. 38 is steadily increasing. Crosses have been made between early maturing, high yielding tur No. 3 with wilt-resistant late Pusa types, 52 and 89, and also between No. 3 and wilt-resistant No. 38. Investigations into the cause of sterility of the newly discovered mutant with simple leaves are also in progress.

*Mung and urid.*—All the classified unit types of mung and urid were grown for observation and multiplication. It has been found that in mung, type No. 10 is early and types Nos. 6, 7 and 35 are good yielding and medium in maturity. In urid, types Nos. 8, 17 and 21 are big seeded, high yielding and early in maturity.

*Castor*.—Correlation between morphological and certain economic characters has been studied. Type Nos. 31 and 16 have given promising results.

*Grasses*.—The botanical composition of the herbage of the grass area at Richhai farm was determined and the effect of different fertilizers on their growth is being investigated. Experiments with burning the grass area indicated that in general the growth of all the grasses was vigorous, but unfortunately *Andropogon contortus* was unaffected.

Soya bean Nos. 53 and 59 have continued to give a high yield.

15. Chemical section—*General Analytical Work*.—General analytical and advisory work has increased considerably in recent years. 304 samples representing soils, manures and fertilizers, fodders and feeding stuffs, were analysed and reported upon. Determinations of moisture present initially in the samples of grasses received from the Forest Department were carried out. Analysis of a sample of well-decomposed *mahua* refuse received from the Seoni distillery showed that this material is quite rich in organic matter and nitrogen, the actual percentages of these constituents being 60.74 and 3.67, respectively. A large quantity of this material is available for free distribution to the cultivators. In view of the fact that both nitrogen and organic matter are almost invariably the limiting factors in crop production, the field staff has been advised to advocate its use for manure in the area adjoining the distillery. An examination of a sample of *mahua* cake ash showed that this material contains about 17 per cent phosphoric acid and 33 per cent potash, a large proportion of the former being present in a water-soluble form. Pot culture experiments carried out with paddy definitely showed that this material is as good a fertilizer as superphosphate. Arrangements are, therefore, being made to carry out field trials on paddy and groundnut in the coming year.

At the instance of the Imperial Council of Agricultural Research, mechanical analysis of samples of typical soils received from various provinces is being carried out by three different methods, the object being to arrive at a standard method for use in agricultural laboratories in India. A study of the seasonal variations in the natural moisture content of wheat from selected centres in the province is in progress on behalf of the same authority.

*Other investigations.*—The observation recorded in the previous year's report that no nitrification of added organic or ammoniacal nitrogen takes place in soils containing adequate moisture and exposed to sunlight has been confirmed. It was found that when soils previously exposed to sunlight are subsequently incubated in the dark, the nitrifying organisms slowly recover from the ill-effects of sunlight and begin to function in a normal manner.

Experiments to determine under field conditions, the comparative value of certain legumes as nitrogen recuperators, have been started on the College Farm, Nagpur, and the effect, if any, produced by the three course rotation—cotton—juar—groundnut—on the nitrogen content of the soil is being studied at the Experimental Farm, Akola.

Samples of *gur* have been prepared this year by five methods designed to improve keeping quality and colour and the results will be judged during the next year. Filtration of sugarcane juice through ordinary or activated rice husk charcoal was found to produce a decided improvement in the colour of the *gur*. Agricultural assistants on certain farms have been trained in the method of preparation of charcoal and its use for purposes of filtration, and a large quantity of rice husk charcoal was prepared and utilized during this year.

Cultures of four specific nodule bacteria were prepared and supplied to Deputy Directors and the Plant Pathologist, Sudan, for treating leguminous seeds before sowing.

Owing to the very large number of students admitted to the Agricultural College during the past two years, and the limited laboratory accommodation, the teaching work has considerably increased. In addition to the usual teaching work in the College of Agriculture, post-graduate research work of one student was supervised.

16. *Mycological section—Cotton.*—The experiments on the Nagpur College Farm have once again shown that cotton seeds treated before sowing with Agrosen G, Hortosan B, Abavit B, Ceresan, Copper Carbonate, Sulphur and Sulphuric Acid give a higher yield of cotton than untreated seeds. A crop raised on soil manured with neem-cake gave a much higher yield than the crop grown on unmanured field. Similar results were obtained on Akola Farm.

Manurial experiments for the control of cotton wilt were started during the year. They will be continued for three years when the results will be analysed. In some parts of Berar cotton was badly attacked by anthracnose in the boll stage on account of the high humidity prevailing in October. Verum 434 was most affected; Bani 306 and V 438 were slightly less affected but Buri and Roseum were more or less free from infection.

*Juar*.—Experiments have shown that juar head smut (*Sorosporium Reilianum*) is a soil-borne disease. Soil inoculated with spores in pots and in the field produced a certain percentage of smutted plants, the infection being more marked in the "pot" series. The controls in both series produced a crop which was 100 per cent healthy. Seeds dusted with smut spores gave a healthy crop, but in healthy seeds germinated on moist filter paper covered with smut spores, there were a few cases of infection. Attempts to infect the plants through the growing point or through the lateral "eyes" failed.

Young juar plants have been successfully inoculated by placing spores of grain smut (*Sphacelotheca Sorghi*) on the growing points or by introducing the inoculum in the stem below the growing point with a hypodermic syringe. Treatment by heating seed coated with grain smut spores in the direct rays of the sun in the month of May did not prove efficacious.

Treating Ramkel fodder juar seed with fungicides like Copper Carbonate, Sulphur, Ceresan, and Agrosan G. has had a beneficial effect on the yield of fodder and grain. Ceresan gave the highest yield. The yield of fodder and grain per acre from the replicate plots sown with untreated seed was 4,176 lbs. and 595 lbs., respectively, and that from replicated plots sown with seed dusted with Ceresan was 4,488 lbs. and 662 lbs., respectively.

*Wheat*.—There was no general incidence of rust in the season. A few sporadic cases of infection with black rust were reported from some places, but they occurred late and no damage was caused. There were a few stray cases of smut (*Ustilago tritici*) infection in Nagpur. Seed had been collected from the neighbourhood of smutted plants in 1937. Part of that seed was heated in the sun in various ways and the remaining part was kept as control. The seed was sown last season. The incidence of smut was negligible. In 1937 the incidence of loose smut was appreciable on the Nagpur farm

whereas in 1938 there were only a few stray cases of infection though the seed was from the 1937 crop. It appears, therefore, that the soil temperature at the time of sowing may have some sterilizing influence on the infected seed. This investigation is being continued.

*Groundnut.*—*Tikka* disease appeared only late in the season and not much damage occurred, but the plots sprayed with Bordeaux mixture, and especially those which were sprayed with Bordeaux mixture to which linseed oil was added as a sticker, gave a much higher yield both of tops and pods. Spraying even in the absence of *tikka* disease has been found to be advantageous. Similar results were obtained from trials on the Government farm at Akola.

*Pan.*—The treated pan garden at Anjangaon continued to remain healthy and to give a higher yield of leaves than the untreated gardens. It is estimated that the net profit on the treated gardens after deducting the cost of the treatment, was at least Rs. 370 more last year than in untreated gardens of the same age. The reasons why the treatment is not generally adopted by pan-growers appear to be—

- (1) that it has to be carried out regularly from the time a garden is planted up to the time it is broken up and therefore the *baris* have to incur extra expenditure at a time when the garden is young and does not bring in any immediate monetary return, and
- (2) that the garden is usually under the ownership of a dozen or more *baris* and therefore it is difficult to induce all of them to treat the garden as a whole.

If the treatment of diseased gardens is to be made popular, free demonstrations in important growing centres are necessary, and for these demonstrations a whole garden of about an acre or more is essential. Demonstration in a small plot in a garden is of little use.

*Til.*—The study of the hypertrophy of til plants was continued and the previous year's results were confirmed. The cause of the hypertrophy seems to be an insect. Typical zig-zag bending has been reproduced by the use of silver nitrate and certain acids. Mechanical wounding or puncturing the bark had no effect on the normal growth of the stem. Plants grown in insect-proof cages developed normally.

*Citrus*.—An outbreak of “pink disease” (*Corticium salmonicolor*) was reported from citrus orchards in Balaghat and was controlled by pruning and spraying. The “mottling” or “frenching” disease of orange and mozambique trees has been reported from several places. Remedial measures are being tried. An outbreak of canker (*Phytophthora citri*) on grape fruit was reported from the northern area.

*Miscellaneous*.—Very little damage to rice was caused by the sterility disease. “Frog eye” disease (*Cercospora nicotianae*) and “Brown spot” (*Alternaria longipes*) of tobacco were reported from Ellichpur and Bilaspur. The “root-knot” or “eelworm” disease of tobacco caused a certain amount of damage. This disease is being investigated.

17. Entomological section.—Much of the time of the Entomologist was, as usual, devoted to teaching work in the College which he had to manage single-handed throughout the season. Towards the end of the year the section became an independent unit and was strengthened by the addition of two technical assistants, and a clerk.

The efficacy of chlorasol in protecting stored grain from damage by pests has been established and it has proved equally effective in controlling Indarbela on orange trees. Arrangements have been made with a Nagpur firm to keep a stock for quick delivery. Nicotine sulphate applied at the rate of half ounce in four gallons of water in which four ounces of fish oil resin soap had been previously dissolved proved very effective against aphids and aleurodidae. Two research schemes financed by the Indian Central Cotton Committee and Imperial Council of Agricultural Research respectively were controlled and directed by the Entomologist and proposals for a third research scheme and for introducing apiculture were made. Intensive study of cotton bollworms has shown that the spotted bollworm (*Earias fabia*) and the American bollworm (*Heliothis obsoleta*) are serious pests on cotton in this province. Eggs of *corcyra cephalonica* parasitized by *Trichogramma minutum* were imported from Bangalore with a view to determining whether the parasite could be used in controlling those bollworms. Eggs of both species were freely parasitized. Further work was done on *Pachydictya oryzae* which affects paddy seriously, and new facts have emerged which will be published separately.

Numerous enquiries regarding control measures for various pests were dealt with promptly, in most cases by correspondence but also by personal visits by the Entomologist whenever possible.

A leaflet on the *moorda* or *churda* disease of chillies was published, and the final report on the Central Provinces Entomological Scheme financed by the Indian Central Cotton Committee was compiled and submitted to the Committee.

18. **Rice Research Scheme.**—*Soil research*—Samples of soils from twenty-nine profiles to a depth of  $4\frac{1}{2}$  feet from Bilaspur and Raipur districts were taken during the year. Analysis of eight soil profiles consisting of light, medium and heavy soils and representing forty-seven samples was completed during the year under report. The results obtained showed the following important characteristics of the types of soils examined :—

*Matasi soils.*—These soils are very poor in calcium carbonate throughout the profile and contain a low proportion of clay and a high percentage of fine sand, the former generally increasing and the latter decreasing with the depth of the soil. They usually show somewhat acidic character and are poor in total exchangeable bases and organic carbon. The proportions of organic carbon, carbon nitrogen ratio and the percentage of organic matter humified decrease with the depth of the soil.

*Dorsa I soils.*—These soils contain a high proportion of clay and a low proportion of fine sand throughout the profile. The surface soil contains 0.05 to 0.10 per cent of calcium carbonate while at lower depths a higher percentage is met with. They are richer than the *matasi* soils in total exchangeable bases, phosphoric acid, organic carbon and humus and show a slightly alkaline reaction throughout the profile. The humified organic matter increases with the depth of the soil.

*Kanhar soils.*—These soils are similar to the heavy type of *dorsa* soils described above. Percentages of organic matter humified do not show any particular relationship with the various depths of the soil.

Investigations into the losses of valuable plant food through leaching from different types of rice soils showed the following :—

Owing to the heavier nature of the soil, quantities of the leachates obtained after different periods are strikingly lower in the case of *dorsa* soil than those obtained from the light *matasi* soil.

Results of analysis of the soils before and after leaching for different periods indicate that the composition of the soil which is either untreated or treated with moderate doses of fertilizers is not appreciably altered as a result of leaching.

Analysis of the various leachates, however, shows that in the case of both the soils there is a progressive increase in the amounts of total solids lost as the period of leaching increases. Most of the nitrate nitrogen from the *matasi* soil is washed out in the first twenty-four hours, whereas there is a progressive increase in the amount of nitrate nitrogen lost from the *dorsa* soil as the period of leaching increases. Quantities of most of the constituents lost by leaching from the *dorsa* soil are strikingly lower than those lost from the *matasi* soil.

19. Botanical research.—As regards the botanical work there are three main openings for the improvement of the rice crop. The first is to get a high yielding fine rice, the second is to improve the yield of coarse rice and the third is to eradicate wild rice. The work has now reached the stage of showing practical results in each of these three lines.

Breeding and genetical work was continued with a view to evolve high yielding strains which can be easily distinguished from wild rice. The  $F_3$  generations of the crosses of Nagkesar with E. B. 17, Bhondu, Budhaibako 1, Gurmatia 17 and Luchai 4 were grown and the inheritance of colour of leaf-blade colour of ripe inner glumes and breadth of kernels was studied. The green colour of the leaf-blade was found to behave as a monogenic character in two crosses and as a digenic character in others, green being dominant to purple. The straw colour of the ripe inner glumes was dominant to brown furrows given in



F a ratio of 3 straw : 1 brown furrows. In crosses of medium and coarse kernels the  $F_1$  was intermediate giving in  $F_2$  a ratio of 3 medium : 1 coarse. Single factor difference was also observed between medium and fine kernels, fineness behaving as recessive.

Promising hybrids possessing the desired combination of characters have been secured from all the above crosses and the problem now is to evolve high yielding strains.

In a yield trial with eleven promising cultures of E. B. 17 × Nagkesar, in the fourth generation, cross No. 9 gave the highest yield exceeding the parent Nagkesar by 19 per cent.

Yield trials over a period of five years at the station and three other centres in the districts have demonstrated definitely the high yielding capacity of hybrid strains Bhondu × Parewa No. 116 and No. 22. These crosses will now replace the standard varieties Bhondu 10 and Parewa 22.

Cross No. 19 between Budhiabako and Parewa, evolved to meet the demand for a high yielding fine rice which can be distinguished from wild rice, gave very good results and has been adopted for large scale distribution in the Eastern Circle.

A number of replicated yield tests are in progress at Raipur, Waraseoni and Jubbulpore for the isolation of high yielding varieties suitable for the three main rice-growing tracts of the province. Experiments at Raipur for the last four years have shown that in early varieties E. B. No. 17 gives the highest yield. In medium ripening varieties *Katechinga* is superior to the standard strain *Ludka 3*, but *Budhiabako 1* continues to give the best yield. In late varieties *Ajan* is better than the standard variety *Gurmatia 17* but *Luchai 4* and *Chinoor 21* are easily the best in this group.

Variety trials at Waraseoni farm for the last three years have shown that in early varieties *Sultugurmatia* and *Jalchinga* give better yields than E. B. 17 and the local variety *Chipda*. Among medium ripening varieties *Budhiabako 1* and *Lalgurmatia* are distinctly superior to the local varieties *Samudrasok* and *Ruibuta*. In late varieties *Benisar* is better than the standard variety *Luchai 4* and *Ajan* better than the local *Pisso* or *Hardigabh*.

Varietal tests conducted at Jubbulpore for the last three years have shown that in early ripening varieties *Dilpasand* is better than the farm strains No. 6 and No. 7 and *Sultugurmatia* better than E. B. 17 or the local variety *Sathia*. In medium ripening varieties *Motichur* is distinctly superior to the local varieties *Dilbuksha* and *Haradgundi*.

The highest yielding fine and scented varieties isolated so far are *Chhatri* in early varieties, *Kubrimohar* and *Banspatri* in medium ripening varieties and *Motichur* and *Chinoor* in late varieties. Selection work in *Kubrimohar* and *Banspatri* has already yielded strains of uniform quality and improved cropping power. Of the eight promising strains of *Chhatri* selected last year, No. 40 gave the highest yield exceeding the local type by 32 per cent.

A botanical study of the paddy varieties grown in the Central Provinces was continued and a tentative classification of the types isolated has been made.

Observations on natural cross pollination showed that natural crossing in rice can take place to a distance of twenty feet. The highest percentage is 1.75 which occurs within a radius of two feet.

The development of the root system was found to be much better in the heavier *dorsa* soil than in the lighter *matasi* although the yield is better in *matasi* soil. The average dry weight of roots per plant was more in transplanted rice than in *biasi* rice. Rice sown broadcast showed the poorest root development.

In hulling tests with improved varieties, *Budhiabako 1* gave the highest outturn of whole rice. The fine rices *Chhatri*, *Kubrimohar* and *Chinoor* also gave good milling results.

Manurial experiments conducted for the past three years have shown that the application of phosphoric acid at 20 lb. per acre, in the form of superphosphate, is most economical and gives the largest net profit of Rs. 3-12-0 per acre. 20 lb.  $P_2O_5$  with 20 lb. nitrogen in the form of ammonium sulphate also gives a net profit of Rs. 2-14-0 per acre.

20. Sunn hemp research scheme.—This scheme commenced in January 1937, and is being financed by the Imperial Council of Agricultural Research for two years. One assistant has been provided. He is engaged

in botanical and cultural-*cum*-processing investigations, the former being directed by the Second Economic Botanist and the latter by the Agricultural Chemist.

The cultural work included a study of the effect of (a) seed rate, (b) time of sowing, and (c) time of harvesting on the yield and quality of the fibre. The results of the first year, which have been analysed statistically, are in favour of a seed rate of 80 to 100 lb. per acre, early sowing, and harvesting at the dead ripe stage. Retting experiments in standing and running water were conducted in December, March and May, *i.e.*, under low, medium and high temperature conditions. Fibre retted in running water was observed to be superior in colour and fairly free from gummy matter. The retting process took seven days in the cold weather and could be extended for two more days without adverse effects. In March and May the optimum retting period was five to six days. Longer periods produced deterioration in the fibre.

Botanical work included a study of the biology of the flower, observations on the setting of seed and isolation of suitable types collected from inside and outside the province and trials of commercial varieties obtained from Chhindwara and Jubbulpore with variety obtained from Pusa. The trial revealed no significant difference between the local types but both were definitely superior to the Pusa variety.

21. Oilseeds research scheme.—The scheme, which is being financed by the Imperial Council of Agricultural Research for two years, was put into operation in February 1937. It deals with four oilseed crops, linseed, sesamum, niger and safflower. The technical staff consists of the Oilseed Specialist and two assistants in the Subordinate Service. The objects are to evolve types in which the factors of good yield, high oil percentage, good quality oil and resistance to pests and diseases will be combined. During the year samples collected from all over the Central Provinces and Berar and from other provinces were grown in single lines and several selections were made with respect to various economic characters. The actual numbers of isolations in different crops were sesamum 3,976, linseed 3,986, niger 11 and safflower 1,632. Pollen sterility to a variable degree was observed in sesamum, niger and safflower.

Six flax varieties from the Argentine and several improved linseed strains from different provinces were tried,

but none were found to be of any special merit. Thirty-four Pusa types of safflower were also grown but were severely attacked by aphids.

Root-systems of local sesamums collected from various parts of the province were studied and classified into two principal types, namely, shallow-rooted and deep-rooted.

The possibility of converting linseed straw into useful products received attention. Methods of retting suited to village conditions were studied and simple methods of extracting the fibre were evolved. The fibre so obtained is somewhat weak in comparison with other commercial fibres but an English firm to which a sample was submitted for opinion considered that it could be used for spinning and weaving with other fibres, or even alone after being cottonized. The Oilseed Specialist has manufactured rope from it which in his opinion can replace rope made from sann hemp. That opinion, however, requires verification.

22. **Citrus research scheme.**—This scheme was started during the year under report and is being financed entirely for five years by the Imperial Council of Agricultural Research. The staff consists of a Horticulturist of Provincial Service, Class I status, and three assistants in the Subordinate Service grade. The horticultural work was concerned with observations on plant growth in relation to contour levels, study of a number of different root-stocks and scions and of the effect of root-stock on scion, germination of seeds and study of the growth and root system of seedlings. Mycological and entomological problems were also under investigation and the Horticulturist claims that a new species of Ichneumonid parasite of the genus *Pristomerus* has been discovered.

#### PART IV.—ECONOMICS AND MARKETING

23. There were several changes in the personnel of the section during the year. Mr. Hill, the permanent Deputy Director of Agriculture, Economics and Marketing, was away from the section for about seven months officiating as Director of Agriculture. Mr. G. D. Mehta, the senior Assistant Marketing Officer died, and Mr. Pathak, Assistant Marketing Officer (live-stock) reverted to the Veterinary Department. The latter's post was then split into two posts of Assistant Marketing

Officers, one for fruit and the other for live-stock, and two junior men were appointed. There are now four Assistant Marketing Officers in this Section and it is expected that the new arrangement will help to put through the survey work more expeditiously.

The Section is in the fourth year of its five-year programme, and work on the lines detailed in the last year's report was continued. Reports on co-operative marketing, hides and skins, grapes and coffee, were compiled and submitted while those on markets and fairs, barley, maize, potatoes, oranges and groundnut are under preparation.

The staff toured for 256 days and visited Sarangarh, Raigarh, Udaipur, Jashpur, Surguja and Korea States. They also visited all the important markets and interviewed numerous people engaged in marketing operations. The Deputy Director attended the conferences held at Simla, Bombay and Delhi. An important outcome of the discussions at these conferences has been the decision to establish experimental ghee grading stations at suitable centres. In response to this, efforts are being made to establish a ghee grading station at Saugor which is the largest ghee exporting centre in this province.

Work on the grading of oranges was started with the help of a grading machine supplied by the Central Marketing Department. The machine worked in the Nagpur orange market for about  $3\frac{1}{2}$  months and graded 7,081 baskets of oranges. These baskets were despatched for sale to Delhi and Calcutta and fetched on an average two annas nine pies per basket more than ungraded produce.

Thirty-two crates of Nagpur oranges of different types and maturity were sent to Kirkee for cold storage trials. The results of these experiments are awaited.

A trial consignment of eight cases of Nagpur oranges were despatched to Covent Garden, London, in March 1937 to explore the possibilities of a market for them in Europe. The fruit reached its destination in good condition and was sold at 15 and 16 shillings per case at a time when Jaffa oranges were selling from 10 to 13 shillings for similar sizes. But on account of the heavy shipping and other charges the financial results of the trial were not very encouraging. Any development in this direction depends upon the co-operation of the railways and shipping companies in the matter of freights and storage facilities.

A small consignment of oranges was sent for canning trials to the Director of the Fruit and Vegetable Preservation Research Station, Campden, England. His report shows that the flavour of the oranges when canned is quite satisfactory but the covering liquid remains very cloudy owing to the presence of small particles of pith. Further trials are required in this direction.

The prospects of increasing the transport of cattle by rail, in case the rates were reduced, were brought to the notice of the railways and consequently the Great Indian Peninsula and Bengal-Nagpur Railways granted a reduction of 28 per cent in freight for cattle booked to two principal cattle importing stations on the Bengal-Nagpur Railway from eight exporting stations on the Great Indian Peninsula Railway. The Great Indian Peninsula Railway also gave 31 per cent reduction on freight on cattle carried from Singaji fair with the result that 64 waggons were despatched from Singaji this year as against five last year.

24. Marketing of Verum cotton.—The Section commenced operations in November with the usual complement of staff sanctioned by the Indian Central Cotton Committee. The low premium which Verum cotton secured during the previous season was responsible for a fall in area under this cotton and the pool handled only 4,575½ [8,779½] bales. Other factors which affected pooling were the strong demand from local mills for verum kapas during December and January and the attractive premiums offered in the open market.

The bumper crop of cotton in America told very heavily on the general price level of ordinary cotton which was very low, viz., Rs. 156½ [Rs. 218] for Broach and Rs. 139½ [Rs. 198] for Oomra on the 10th November 1937. The market remained steady at those rates for a time but during December prices improved to Rs. 174 for Broach and Rs. 156½ for Oomra. A slight drop was again noticeable towards the end of that month but with the new year there was an irregular rise which continued till the end of February, when prices dropped again to Rs. 163 for Broach and Rs. 144 for Oomra by the last week in March.

There was very little demand from Japan which is usually a heavy buyer of Indian cotton, and export to Japan was consequently very low. This was, however, counteracted to some extent by a brisk demand from the

Indian mills which bought heavily during December and part of January in expectation of better prices for cloth and yarn due to Japan being at War. The demand for staple cotton was very keen throughout and satisfactory premium for Verum was obtained. Local mills were the principal buyers, only small lots going outside the province to Central India, Khandesh and Bombay. The average price at which the 4,475½ bales of the pool were sold worked out to Rs. 212-5-0 per khandi f. o. r. Bombay basis, the premium obtained being Rs. 39-15-0 on Broach and Rs. 57-7-0 on Oomra, which is very satisfactory.

#### PART V.—DEMONSTRATION AND PROPAGANDA

25. Character of the season.—The monsoon commenced late and followed a somewhat abnormal course throughout. *Kharif* sowings were started only towards the end of June. Germination of *kharif* crops, though generally fairly satisfactory, was defective in crops other than rice in Chhattisgarh, and in a few places in Berar where some re-sowing was necessary. Precipitation was heavy throughout July in all circles and gave no opportunity for intercultivation with the result that weeds flourished and crops made slow growth. A long break in August improved the position considerably and conditions throughout September remained favourable. Prospects in the cotton tract fell off again in October when the monsoon ceased and intense heat supervened. Of the *kharif* crops, cotton fared worst, groundnut somewhat better and *juar* still better. Paddy was a considerably smaller crop than the average of past years.

Preparation for *rabi* sowing were given a good start by the August break. Sowings were done in normal time in most places and earlier than usual in some, and germination was generally satisfactory except in Chhattisgarh where late October rain made some re-sowing necessary. Crops made good growth to begin with but lack of winter rain combined with abnormal heat prevented full development and this was followed later on by cold spells and hailstorms in some of the northern districts. Rust made a slight appearance but did not cause serious damage and cut worms did some harm to linseed in Chhattisgarh. The cumulative effect was that *rabi* crops in general were below normal.

26. Northern circle.—The quantity of pure seed distributed from all sources during the year was 2.66 [2.76] lakhs of maunds. The slight fall as compared with the previous year was due mainly to one factor common to the three cotton-growing circles, namely, a temporary setback in the popularity of verum on account of the low premiums obtained in the previous year, in consequence of which the area grown under departmental supervision in the circle fell from 31,661 to 20,887 acres. The pool handled 1,445 [3,112] bales. Fruit seedlings to the number of 53,953 [58,635] were distributed. The value of the increased outturn resulting from the use of improved seed is estimated by the Deputy Director to be 11.15 [10.22] lakhs of rupees.

There was a small increase in the value of improved implements and equipment sold which amounted to Rs. 35,210 [Rs. 34,454]. Sales, included 346 iron ploughs, 52 cane mills, 62 winnowers and 24 rahats. Taccavi loans amounting to Rs. 17,050 [Rs. 17,531] were granted to finance the purchase of seeds, implements and manures.

The revenue accounts of Saugor and Khandwa farms showed a profit of Rs. 1,764 and Rs. 1,078, respectively. The new demonstration farm at Dindori incurred a loss of Rs. 2,638, partly because of the difficulties inherent in starting a new farm on land which had been badly neglected in the past, partly also on account of indifferent management. The loss is not likely to be repeated.

Of the seven Government demonstration plots, four showed a profit on the year's working. One of the other three was opened only in the year under report. Another, which is commanded by the Bahoribund tank and was thickly covered with forest growth when taken over from the Forest Department, was opened in the previous year. It is likely to develop into a very useful centre for the production and distribution of fruit seedlings and for demonstrating the growing of garden crops. The third is in the centre of the Piparia village uplift area. It provides a training centre in practical agriculture for the pupils of the Middle School, Piparia, and has also served a very useful purpose in the general uplift scheme of that area.

The number of private demonstration plots was raised from 16 to 24 during the year, eight of them located in Saugor district, six in Jubbulpore, six in Mandla and



four in Hoshangabad. Regular accounts on departmental lines were maintained only for the Hoshangabad group in which all worked at a profit. Proper accounts will be kept in all private plots in future. Other forms of demonstration included 1,801 [1,583] practical demonstrations, 183 lantern and cinema lectures and the holding of "Farmers' Days" at Dindori and Saugor farms and the Deori demonstration plot. The Dindori demonstration in particular attracted a large gathering of cultivators.

The record of business done by the 20 tahsil agricultural associations is not imposing. Mention may, however, be made of the Burhanpur association which earned a profit of 5.36 per cent on a working capital of Rs. 7,770 by the sale of seed, implements and fertilizers. Sohagpur association invested Rs. 1,764 on the purchase of seed potatoes which brought in a profit of Rs. 200. Patan association embarked on a scheme of hiring out winnowers which has made a promising beginning.

Uplift work was concentrated mainly in a group of 35 villages in Hoshangabad district, 21 in Nimar and 22 in Jubbulpore. In Mandla district the work was more diffused. Saugor district in general suffered from lack of demonstration staff. The principal activities were the introduction of profitable crops like sugarcane, groundnut, D 8 gram, chillies, potatoes, and fruit gardens, conservation of manure and preparation of compost.

Charges for ploughing by steam tackle were reduced from Rs. 12 to Rs. 9 per acre. Work commenced towards the end of January and 459 acres were ploughed by the end of the working season. Experiments on night working were conducted with a view to determining the best arrangement for coping with the increased demand which will arise next season in consequence of the reduction in the ploughing charges.

27. Southern Circle.—The demand for improved seed was met from Government and private farms and seed unions. 93,514 [107,490] maunds of improved seed and 1,816,765 [2,118,629] whole canes were distributed from all sources during the year.

Pooling of verum cotton was continued on the usual lines at eight ginning centres and 362 [764] bales were sold at a premium ranging from Rs. 7-8-0 to Rs. 17 per khandi of *kapas*.

Artificial manures for sugarcane and paddy met an increased demand, mostly in Bhandara and Balaghat districts, and 6,198 [5,512] maunds consisting mostly of ammonium sulphate were given out.

The continued depressed condition of the cultivators of the cotton tract is evident from the marked decline in the value of implements sold which amounted to Rs. 46,662 [Rs. 60,457]. Taccavi for pure seed, manures and implements continued to be in popular demand and loans to the extent of Rs. 91,679 [Rs. 73,998] were recommended during the year.

Thirty-one private plots were run under the advice of the department and efforts are being made to start many more in accordance with the accepted policy of making them the real centres of demonstration of the activities of the department. Five Government demonstration plots were also in operation. Two of the older established ones showed net profits of Rs. 100-5-0 and Rs. 68-7-3, respectively, on the year's working. The other three are being brought into order. Six new plots, three in Chhindwara district and three in Chanda district, were started during the year with a view to demonstrate improved methods of agriculture to the cultivators of the backward tracts.

"Farmers' Days" were held on the Seoni and Betul farms to enable agriculturists to see at close range the standing crops and other agricultural improvements advocated by the department. Ploughing competitions proved an added attraction to the visitors. Similar demonstrations were arranged on a smaller scale at the Katangi plot in Balaghat district.

Practical demonstrations were arranged at 1,817 [1,705] different centres and at all religious fairs which attract large crowds. A cinema demonstration was held at the Ramtek fair, and also at Chhindwara where films of agricultural interest were exhibited to gatherings of teachers and students drawn from schools working under the control of the district council. Lantern lectures were delivered at 56 [21] centres. An agricultural demonstration was also arranged on the occasion of the Silver Jubilee of the Central Bank at Bhandara on the 12th February 1938 when lectures relating to agricultural matters were delivered.

The Orange Growers' Association made some headway and increased its share capital to Rs. 3,775 [Rs. 3,225]

with a membership of 100 [80]. The work was conducted at three centres, viz., Kohli, Katol and Kalamba, and taccavi advances amounting to Rs. 11,175 were given to members who were unable to hold on to their fruit for lack of money. Fifteen wagon loads of oranges were sent to important outside markets like Madras, Delhi and Lahore and secured a fair price generally, although in certain cases, due to sudden fall in rates, prices obtained were low. The orange trade is subject to wide fluctuations in rates and has so far been monopolized by dalals and middlemen. The association has in the circumstances to contend with keen competition from trade interests and can only assert itself when there is a considerable increase in its membership and the growers decide to sell all their produce through its agency only.

Four new agricultural associations were registered during the year which increased the number of co-operative agricultural associations to 14. All of them transact business in improved seeds, manures and implements but although reorganization has made some progress possible, lack of interest on the part of members of the older bodies is a severe handicap to progressive work. Village uplift work was continued at all centres selected by the department. One such centre—Kanki in Balaghat district—was visited by His Excellency the Governor on the 5th November 1937 and another at Koradih in Nagpur district was visited by Professor Ogilvie of Edinburgh on the 11th January 1938.

A scheme designed to stimulate interest in growing different kinds of fruit trees in home bars was organized in the Balaghat district in co-operation with the Revenue Department to commemorate the Coronation of His Majesty King George. 10,194 orange, 123 mosambi and 1,050 grafted mango trees were given out under this scheme. The total number of fruit seedlings distributed in the circle was 52,661.

Adequate arrangements for well irrigation have now been completed at the Seoni and Betul farms, and the block under fruit at the Betul farm is being developed to include several different varieties. The revenue accounts of both these farms showed substantial profits of Rs. 2,555-5-3 and Rs. 2,052-2-2 on the year's working. Sindewahi farm which had been leased out for several years prior to April 1936 and which had consequently deteriorated in fertility is being gradually brought back

Rs. 14-6-6. The low yield of sugarcane combined with extra expenditure incurred on experimental work at the Waraseoni farm resulted in a deficit of Rs. 1,008-2-9 on the working of that farm. Experimental work on rabi crops was carried out at Tharsa and Chhindwara farms; on paddy and sugarcane at Waraseoni and on sugarcane at Betul.

28. Eastern Circle.—Research work on paddy at the Rice Research Scheme, Raipur, is now yielding fruitful results in so far as varieties and crosses of all types, *i.e.*, coarse, medium and fine, have been tried on all the seed and demonstration farms with satisfactory results. All available seed has been reserved for distribution.

Seed farms numbered 4,662 [4,016]. The quantity of improved seed distributed from all sources amounted to 1.12 [1.22] lakhs of maunds, exclusive of over 6 lakhs of whole canes. Adequate supervision of such a large number of seed farms is a matter of considerable difficulty with the limited staff available. They have been classified into Central, A and B categories. Central and A class farms are under the direct supervision of agricultural assistants while B class farms are looked after by jamadars. Fresh seed is supplied to the central farms every year, and to the others as often as is considered necessary. Improved varieties of all crops recommended by the department are estimated to have covered 5.31 [5.03] lakhs of acres, and to have brought an increased profit of at least Rs. 14.9 [Rs. 15.02] lakhs to the cultivators. The number of fruit seedlings distributed was 48,741 [40,209].

Implements and equipment valued at Rs. 15,113 [Rs. 15,563] were sold, mostly for horticultural purposes, and the same source of demand was mainly responsible for the distribution of 7,021 [6,198] maunds of cake and artificial fertilizers. Taccavi loans amounting to Rs. 20,997 [Rs. 21,745] were given for the purchase of improved seeds, manures; sugarcane mills, water lifts and fencing. A number of applications for sugarcane mills from needy cultivators had to be refused for want of adequate security. In such cases there are two possible alternatives, one being to issue the mills on a system of joint security and the other to pledge them to Government until they are paid up. The ordinary cultivator is apprehensive of the first alternative but the second merits careful consideration.

The introduction of garden crops on Government farms has added considerably to their usefulness. Bilaspur farm grew potatoes very successfully and that crop is increasing in the neighbourhood. Cigarette types of tobacco are also under trial as well as different methods of curing. The introduction of hot weather vegetables on Drug farm has been copied by a number of people in the surrounding villages to such an extent that the supply now exceeds the local demand. The abnormal fall in the price of gur, however, affected the financial position of these farms. Bilaspur farm showed a surplus of only Rs. 186 [Rs. 159] in the working account, and for the same reason the surplus on the Drug working account was only Rs. 110 [Rs. 530] in spite of very satisfactory crop outturns. These small surpluses do not fully meet interest and depreciation charges. The working account of the Chandkhuri farm showed a deficit of Rs. 738.

Three Government demonstration plots continued to operate at Bana, Lormi and Bhilai. The first two were started to popularize cane cultivation under Government tanks and the third to create local interest in improved agriculture. All of them served their purpose satisfactorily and were run at a profit. Thirty private plots were run, all at a profit, under the immediate supervision of jamadars working under the general guidance of the departmental officers. In one of those, the plot at Seoni in Champa zamindari, the margin between receipts and recurring expenditure was Rs. 12-10-0 per acre. Private plots have proved extremely useful as a means of popularizing the work of the department and there is no limit to their multiplication except that imposed by shortage of supervising staff. In this circle, where absentee landlordism is prevalent, the successful running of demonstration plots has created a demand for trained village managers but the demand cannot be met because of the lack of men fully trained in the duties connected with village management. A new scheme designed to provide this type of training will be submitted to Government shortly.

There has been a rapid increase in fruit and vegetable cultivation in the circle. This is attributed to the method of working through one enterprising cultivator in villages which have irrigation facilities. Orchards have been extended to 489 [291] villages and vegetable cultivation to 198. Twenty-five ornamental gardens were laid out for malguzars and 2,437 trees were planted in Coronation groves in 64 villages.

Other forms of propaganda included 3,736 [2,803] practical demonstrations, 116 [55] lantern lectures and 75 cinema shows; seventeen co-operative rallies arranged by District Co-operative Banks were attended; 'Farmers' Days' were held at five centres and regular exhibitions arranged at six. The number of books and bulletins sold was 619 [446].

Of the five agricultural associations functioning in the circle, four have already been registered and the fifth will be registered shortly. Their main business consists of stocking fertilizers and implements for sale and hire. The share capital which amounted to Rs. 3,385 fetched a total profit of Rs. 1,295.

The re-orientation of the departmental policy with regard to seed unions whereby efforts are directed to consolidate the existing seed unions rather than to increase their number has proved helpful in inculcating the principles of self-help and co-operation among cultivators. The existing 296 [286] unions with a membership of 6,051 [5,861] had a capital of 28,987 [25,138] maunds of paddy. Twelve seed unions were registered under the Co-operative Societies' Act and 29 [18] unions were supplied with pure seed from Government farms in exchange for ordinary seed. The success in co-operative effort achieved by Bhagmarra village union continues to set a striking example in self-help to agriculturists which has been copied in eight adjoining villages where progress is reported to be satisfactory. The "Co-operative Cultivation" societies at Raipur and Baloda Bazaar earned a net profit of Rs. 135 and Rs. 87, respectively, on a capital investment of Rs. 970 and Rs. 800. Such types of societies are multiplying gradually, the latest addition being one at Mungeli. Joint cultivation of sugarcane is under trial at Kuagaon, and at Nandeli in co-operation with the Bilaspur Central Bank. This innovation is promising in view of the fact that it is the common practice to grow cane in a joint area called the *bercha* in which each cultivator has his own separate piece of land, the area cultivated by each being so small that there is no scope for the use of labour saving devices unless the cultivation is done on a co-operative basis.

The Co-operative Dairy at Drug is now in its second year of working. The present strength of the milking herd is 19 murrh buffaloes. 20,210 seers of milk was produced during the year and yielded a net profit of

Rs. 956. The enterprise has created a local demand for pure milk produced and distributed under hygienic conditions and similar concerns will, it is hoped, soon be established at Raipur and Bilaspur.

29. Western circle.—The number of seed farms rose to 7,981 [6,042]. From all sources, 52,560 [38,579] maunds of pure seed were distributed. There was a falling off in the demand for verum seed in consequence of the low premium obtained for verum in the previous year. On the other hand, the demand for groundnut and wheat seed rose substantially. Groundnut was in particular request because the yield and price in the previous year compared favourably with those of cotton. Difficulty is felt every year in meeting the demand for pure seed in spite of the large number of seed farms, because of the unwillingness or inability of seed farmers to hold over their produce for seed purposes. Some of the Taluq Agricultural Associations have realized the situation and have entered into the business of stocking seed for sale. Without increasing help from such organizations, seed supply cannot be put on a really satisfactory basis.

In Eastern Berar and the ghat taluqs of Western Berar V 434 has now become fairly well established as the best all round cotton. During the year 5,252 [3,740] maunds of seed sufficient to sow over 26,000 acres was distributed. Pooling operations were carried out at 30 centres and 2,616 [4,574] bales were sold. Low premiums in the previous year were responsible for the fall.

Unsatisfactory economic conditions adversely affected the sale of implements. The implement chiefly in demand is the iron plough of which 621 [2,007], and 12,775 [17,378] spare parts were sold. The trade in spare parts shows that the implements previously distributed are in constant use. The total value of the implements and spare parts sold was Rs. 40,306 [69,042].

The Department has been recommending—

- (1) proper conservation of cattle-dung and urine;
- (2) preparation of compost manure from cotton stalks and other farm refuse;
- (3) green manuring;
- (4) rotation with leguminous crops;
- (5) utilization of poudrette and town sweepings;
- (6) use of artificial manure, particularly for irrigated crops.

People now realize the value of manuring and many are adopting some or all of the above methods. The general use of fertilizers at present prices is not likely to pay but ammonium sulphate and niciphos are in common use for irrigated crops.

Low prices and low outturns of cotton are likely to secure for groundnut a permanent footing in the crop rotation. The groundnut area in the division which was only 2,500 acres in 1932-33 rose to 136,000 in 1933-34, fell again to 97,000 in 1936-37, and jumped to nearly 157,000 in the year under report; and it is likely that a further substantial increase will occur in 1938-39. That there is room for expansion is shown by the fact that, on balance, the province is still an importer of groundnut oil, and only about 5 per cent of the groundnut produced is exported in the form of nuts, the remainder being either crushed or used for food or seed. The most expensive item in the cultivation of this crop is the cost of seed which comes to about Rs. 6 per acre and many cultivators therefore hesitate to incur this initial expenditure. Realizing this difficulty, Government placed an allotment of Rs. 20,000 at the disposal of the Deputy Commissioner, Akola, towards the end of the year, for the purchase and distribution of groundnut seed on taccavi through the agency of the Agriculture Department.

Although *rabi* crops are, in general, of secondary importance in Berar, they are grown on a considerable scale in the ghat taluqs, and in the Chandur Bazar and Dharni tracts of Amraoti district. Dharni plot and Basim farm are the only two centres in Berar available for the testing and multiplication of *rabi* seed. More land directly under the control of Government is urgently required for this important work. The situation could be met, for the time being, by opening two large demonstration plots on long lease, one to be located in the Chandur Bazar tract and the other in Mehkar taluq.

There are five seed and demonstration farms in Berar, *viz.*, Basim, Borgaon, Buldana, Yeotmal and Ellichpur. The Ellichpur farm continued to be run as a combined cattle-breeding and seed and demonstration farm. The Basim farm which had been leased to the taluq Agricultural Association was taken back under departmental management on the 1st April 1938. Ellichpur farm, which had previously formed part of the Animal



Husbandry Section was placed under the control of the Deputy Director of Agriculture from the beginning of the year. Borgaon farm, in addition to its other activities, is the central poultry-breeding station for Berar, and it also maintains a depot for young bulls reared at Ellichpur or imported from elsewhere, pending their sale.

Low prices of cotton and other commodities prevailing during the season affected the profits of the four farms under departmental management in spite of fairly satisfactory outturns. Yeotmal and Buldana made profits of Rs. 894-6-3 and Rs. 545-4-5, respectively, on the working account. Borgaon sustained a loss of Rs. 84-4-3 and Ellichpur a loss of Rs. 4,654-4-0. The loss on Ellichpur is due to the fact that the cost of rearing young stock is not balanced by the value realized when the animals are full grown. The bull depot is a similar drain on the finances of the Borgaon farm.

Four Government demonstration plots were run—two in Yeotmal district at Pusad and Kelapur, and two in Amraoti district at Amraoti and Dharni. The Amraoti and Pusad plots gave a net profit of Rs. 31-13-5 and Rs. 7-14-10 per acre, respectively, while Dharni plot gave a nominal profit of Re. 0-13-9 per acre. There was a loss of Rs. 1-11-3 per acre in the Kelapur plot. This was due to heavy expenditure incurred in putting down a fruit orchard. The outturns of the plot were satisfactory. Two new Government demonstration plots and two seed depôts are being established in the Melghat.

The circle contains 23 taluq agricultural associations and 29 branch associations. These associations run shops for the supply of pure seeds, implements and spare parts. The total profits amounted to Rs. 10,499 [Rs. 8,448] which works out at Rs. 16 per cent on the share capital. Hiring out of iron ploughs is the most prominent feature of the associations' activities. 1,130 [1,073] ploughs were available for hire and the income so earned was Rs. 7,382 [Rs. 5,697].

The staff organized 3,256 [2,886] ocular demonstrations and 43 [49] agricultural shows. Illustrated lantern lectures and cinema demonstrations were given at 280 [213] centres. Seven ploughing matches were also organized. The "Farmers' Day" functions organized on Government farms and private demonstration plots attracted considerable attention and gave the cultivators an

opportunity of meeting the departmental staff and discussing with them local agricultural problems and difficulties. Village uplift work was carried out intensively in 61 villages in Amraoti district, nine in Akola, 15 in Yeotmal and 11 in Buldana.

## PART VI.—HORTICULTURAL GARDENS AND ARBORICULTURE

30. All gardens under the management of Government in Nagpur produced a good display of annuals in both the seasons with the exception of zinnias which were again affected by leaf curl. The supply of vegetables was also quite satisfactory. Owing to the increasing demand for fruit trees, various types of fruit plants were imported from Agra and Sind for trial. These included lime, lemon, orange and grape fruit. The gardens continued to be popular with the public, both for recreation and utility purposes. The total receipts of all gardens amounted to Rs. 10,620-5-3 [Rs. 9,950-1-9] and the expenditure to Rs. 17,690-8-7 [Rs. 18,988-6-0].

The season at Pachmarhi was favourable for garden operations on the whole. Contrary to the general experience there was no appreciable damage from frost, and the result was an abundant crop of vegetables, especially tomatoes and peas. Strawberries were more in demand than the supply could cope with. There was the usual attractive display of flowers, prominent among them being dahlias, chrysanthemums and sweet peas. Considerable changes were made in the garden during the year and a number of good varieties of peach and plum trees imported from Baluchistan and the North-West Frontier Province were planted. There was, however, a severe drop in receipts, which amounted to only Rs. 6,238-6-9 [Rs. 7,870-4-0]. This is due mainly to the fact that Government did not go to Pachmarhi in the second season. The total expenditure amounted to Rs. 7,714-10-0 [Rs. 7,388], the increase being due to improvements and extension of fruit cultivation.

Ten district gardens were run under the direct management of the department, two by local bodies or other departments and four were leased out. These gardens are becoming increasingly popular as public resorts and are also useful centres for demonstrating horticultural methods and for propagating and supplying

fruit seedlings. Every effort is made to keep the balance between expenditure and receipts within the limits prescribed by Government.

31. **Acknowledgments.**—The department is much indebted to the Indian Central Cotton Committee which has continued to finance research on cotton, distribution and marketing of improved varieties and bollworm investigations, and to the Imperial Council of Agricultural Research for substantial contributions for research on rice, oilseeds, sann hemp, citrus and the *Gangai* pest of paddy. The contributions received from the Indian Central Cotton Committee and the Imperial Council of Agricultural Research on all the schemes which are in operation amounted to Rs. 78,615 and Rs. 54,412, respectively, or a total of Rs. 1,33,027.

J. C. McDOUGALL,  
*Director of Agriculture,*  
*Central Provinces & Berar.*

---

---

STATEMENTS

---

---

| Name of circle                 | Number of private seed farms and unions |       |        |       |
|--------------------------------|---|-------|--------|-------|
|                                | Wheat                                   | Rice  | Cotton | Juar  |
| (1)                            | (2)                                     | (3)   | (4)    | (5)   |
| Northern circle                | .. 3,748                                | 1,380 | 1,459  | 370   |
| Southern circle                | .. 1,006                                | 1,003 | 445    | 119   |
| Eastern circle                 | .. 624                                  | 2,968 | ..     | ..    |
| Western circle                 | .. 409                                  | ..    | 3,821  | 952   |
| <b>Total</b>                   | .. 5,787                                | 5,351 | 5,725  | 1,441 |
| <b>Total for previous year</b> | .. 6,791                                | 5,695 | 5,606  | 1,548 |

| Name of circle                 | Seed distributed in maunds and canes |         |        |       |
|--------------------------------|--------------------------------------|---------|--------|-------|
|                                | Wheat                                | Rice    | Cotton | Juar  |
| (1)                            | (11)                                 | (12)    | (13)   | (14)  |
| Northern circle                | .. 200,461                           | 13,692  | 22,608 | 1,036 |
| Southern circle                | .. 44,534                            | 37,403  | 4,219  | 2,021 |
| Eastern circle                 | .. 8,007                             | 102,137 | ..     | ..    |
| Western circle                 | .. 4,399                             | ..      | 14,431 | 1,510 |
| College Farm, Nagpur           | .. 68                                | ..      | 267    | 3     |
| <b>Total</b>                   | .. 257,469                           | 153,232 | 41,525 | 4,570 |
| <b>Total for previous year</b> | .. 260,287                           | 163,675 | 57,829 | 7,708 |

## MENT A

| Number of private seed farms and unions— <i>concl'd.</i> |             |             | Total for<br>1937-38                               | Total for<br>1936-37       |
|--|-------------|-------------|--|----------------------------|
| Groundnut  | Sugarcane   | Other crops |  |                            |
| (6)  | (7)         | (8)         | (9)  | (10)                       |
| 819  | 574         | 2,259       | 10,609   | 11,634                     |
| 289  | 623         | 303         | 3,788  | 5,089                      |
| 314  | 286         | 470         | 4,662  | 4,016                      |
| 2,194  | ..          | 605         | 7,981  | 6,042                      |
| 3,616  | 1,483       | 3,637       | 27,040   | 26,781                     |
| 2,779  | 971         | 3,248       | 26,781   | ..                         |
| Seed distributed in maunds and canes— <i>concl'd.</i>    |             |             | Total for<br>1937-38<br>(excluding<br>whole canes) | Total for<br>previous year |
| Groundnut  | Whole canes | Other crops |  |                            |
| (15)   | (16)        | (17)        | (18)   | (19)                       |
| 16,352   | 679,407     | 12,105      | 266,254  | 276,123                    |
| 1,762  | 1,816,765   | 1,294       | 91,233   | 104,869                    |
| 1,090  | 623,964     | 691         | 111,925  | 119,423                    |
| 33,025   | ..          | 510         | 53,875   | 38,518                     |
| 24   | ..          | 213         | 575  | 387                        |
| 52,253   | 3,120,136   | 14,813      | 523,862  | 539,320                    |
| 34,058   | 4,248,761   | 15,763      | 539,320  | ..                         |

## STATE-

| Name of circle             | Approximate area in acres sown with improved seed from private seed farms and other sources |         |         |         |           |
|----------------------------|---|---------|---------|---------|-----------|
|                            | Wheat   | Rice    | Cotton  | Juar    | Groundnut |
| (1)                        | (2)   | (3)     | (4)     | (5)     | (6)       |
| Northern circle ..         | 325,680   | 49,423  | 84,959  | 22,760  | 7,522     |
| Southern circle ..         | 214,778   | 159,251 | 74,873  | 25,592  | 9,601     |
| Eastern circle ..          | 22,619  | 493,888 | ..      | ..      | 8,807     |
| Western circle ..          | 5,338   | ..      | 229,941 | 117,950 | 125,536   |
| Total ..                   | 568,415   | 702,562 | 389,773 | 166,302 | 151,466   |
| Total for previous year .. | 649,687   | 667,733 | 476,923 | 218,672 | 98,166    |

## STATE-

| 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 ..         | 346   | 32         | ..             | ..         | 1,060            | 2,750       |
| Southern circle ..         | 281   | 119        | 1              | 7          | 275              | 1,198       |
| Eastern circle ..          | 30  | 42         | ..             | 7          | 207              | 207         |
| Western circle ..          | 621   | ..         | 3              | 30         | 27               | 12,921      |
| College Farm, Nagpur ..    | 1   | ..         | ..             | ..         | ..               | 14          |
| Total ..                   | 1,279   | 193        | 4              | 44         | 1,569            | 17,090      |
| Total for previous year .. | 2,753   | 229        | 9              | 427        | 1,432            | 23,019      |

## MENT B

| Approximate area in acres sown with improved seed from private seed farms and other sources— <i>concl'd.</i> |           | Total for 1937-38 | Total for previous year | Approximate value of the increased outturn resulting from use of Improved seed for |       |           |       |
|--|-----------|-------------------|-------------------------|--|-------|-----------|-------|
| Other crops  | Sugarcane |                   |                         | 1937-38  |       | 1936-37   |       |
| (7)  | (8)       | (9)               | (10)                    | (11)   |       | (12)      |       |
|  |           |                   |                         | Rs.  | a. p. | Rs.       | a. p. |
| 47,544   | 3,115     | 541,003           | 637,304                 | 1,113,680  | 0 0   | 10,22,800 | 0 0   |
| ..   | 12,151    | 496,246           | 503,994                 | 23,26,660  | 0 0   | 23,90,676 | 8 0   |
| 1,752  | 3,760     | 530,826           | 503,343                 | 14,91,863  | 0 0   | 15,02,615 | 2 0   |
| 3,282  | ..        | 482,047           | 553,766                 | 9,85,156   | 0 0   | 9,89,193  | 0 0   |
| 52,578   | 19,026    | 2,050,122         | 2,198,407               | 59,17,359  | 0 0   | 59,05,284 | 10 0  |
| 83,626   | ..        | 2,194,807         | 2,046,584               | 59,05,284  | 10 0  | ..        | ..    |

## MENT C

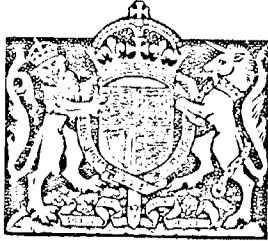
| Total number | Total value in rupees |       | Total value in rupees for previous year |       | Books sold | Bulletins sold | Total | Total for previous year |
|--------------|-----------------------|-------|---|-------|------------|----------------|-------|-------------------------|
|              | (8)                   | (9)   | (10)                                    | (11)  |            |                |       |                         |
|              | Rs.                   | a. p. | Rs.                                     | a. p. |            |                |       |                         |
| 4,188        | 36,210                | 0 0   | 34,454                                  | 0 0   | 38         | 280            | 318   | 129                     |
| 1,881        | 46,662                | 5 3   | 60,457                                  | 4 4   | 27         | 110            | 137   | 241                     |
| 493          | 15,113                | 10 6  | 15,563                                  | 4 9   | 43         | 576            | 619   | 446                     |
| 13,602       | 40,306                | 0 0   | 69,042                                  | 0 0   | 38         | 1,262          | 1,300 | 851                     |
| 15           | 37                    | 5 6   | 12                                      | 10 5  | ..         | ..             | ..    | ..                      |
| 20,179       | 1,38,329              | 5 3   | 1,79,529                                | 3 6   | 146        | 2,228          | 2,374 | 1,667                   |
| 27,869       | 1,79,529              | 3 6   | ..                                      | ..    | 157        | 1,510          | 1,667 | ..                      |



## STATEMENT D

| 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         | 9   | 1,801  | 183                                  |
| Southern circle         | 23  | 1,817  | 56                                   |
| Eastern circle          | 11  | 3,736  | 191                                  |
| Western circle          | 43  | 3,254  | 280                                  |
| Total                   | 86  | 10,608   | 710                                  |
| Total for previous year | 101   | 8,987  | 448                                  |

GOVERNMENT OF THE  
CENTRAL PROVINCES AND BERAR



REPORT  
ON THE WORKING OF THE  
DEPARTMENT OF AGRICULTURE  
IN THE  
CENTRAL PROVINCES & BERAR  
FOR THE YEAR ENDING THE  
31ST MARCH 1939

---

NAGPUR  
GOVERNMENT PRINTING, C. P. & BERAR  
1940

**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 or 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.]

**INDIA**

**AKOLA**

The Proprietor, Shri Ram's Stores,  
Tainapeth.

**ALIGARH**

The Manager, Rama Book Depôt, Univer-  
sity Booksellers, etc., Sarai Hakim.

**ALLAHABAD**

Mr. Ram Narain Lal, Publisher, etc.,  
1, Bank Road.  
The Superintendent, Nazam Kanun Hind  
Press.

**AMRAOTI**

Thakur & Co., Ltd., Booksellers.

**BARODA**

Mr. M. C. Kothari, Bookseller & Publisher,  
Raopura Road.

**BHANDARA**

S. S. Dharashivkar, Esq., Opposite Muni-  
cipal Water Reservoir.

**BILASPUR**

Mr. M. A. Subhan, Bookseller & Publisher.

**BOMBAY**

D. B. Taraorevala, Sons & Co., Treasure  
House of Books, Taj Building, 210,  
Hornby Road, Fort.  
Radhabai Atmaram Sagon.  
Sunder Pandurang, 25, Kalbadevi Road.  
Thacker & Co., Ltd.  
The Proprietors, New Book Co.

**CALCUTTA**

The Book Company, 4/4-A, College Street.  
Butterworth & Co. (India), Ltd., Avenue  
House, Post Box No. 251.  
The Indian School Supply Depôt.  
M. C. Sircar & Sons, 75, Harrison Road.  
Newman & Co.  
R. Cambay & Co.  
S. K. Lahiri & Co.  
Thacker, Spink & Co.

**CHHINDWARA**

Mannilal Ganeshprasad Gupta, General  
Merchant & Bookseller.  
The Proprietor, Verma Book Depôt.

**COOCH BEHAR**

Babu S. C. Taluqdar, Proprietor, Students  
& Co.

**DELHI**

The Oxford Book & Stationery Co.

**JODHPUR**

Messrs. B. S. Mathur & Co., Chaturvilas,  
Posta, Civil Lines, Jodhpur (Rajputana).

**JUBBULPORE**

The Manager, Educational Book Depôt.  
The Proprietor, Nerbudda Book Depôt.

**JUBBULPORE—con. ld.**

The Manager, Bhargava Book Co., Pub-  
lishers, Booksellers & Stationers.  
Radhamohan, Esq., Proprietor, Shyam  
Stationery Mart, Andherdeo.

**KARACHI**

The Standard Bookstall.

**KHAMGAON**

Sakalkale Typewriting Institute.

**LAHORE**

The Punjab Sanskrit Book Depôt.  
Rai Sahib M. Gulab Singh & Sons.  
Messrs. Careers & Co., Moh ni Road.

**LUCKNOW**

The Proprietor, Newal Kishore Press.  
The Upper India Publishing House, Ltd.,  
41, Aminabad Park.

**MADRAS**

Higginbotham & Co.  
S. Murthy & Co., Post Box No. 152.  
The Proprietor, The City Book Co., Pos-  
t Box No. 283.

**NAGPUR**

Aidan Binzani, Proprietors, Karmavir  
Book Depôt, Mahal.  
G. G. Khot & Sons, Sitabuldi.  
Messrs. Shastri & Sons, Walker Road.  
The Manager, Educational Book Depôt.  
The Manager, "The Hitwada".  
The Proprietors, Bhisey Brothers, Book-  
sellers & Publishers.  
Mr. D. M. Dhumal, Proprietor, Provincial  
Book Binding Works.  
The Manager, Nagpur Law Journal,  
Central Law House, Tulsi Bag Road,  
Mahal.  
Neston Jacques & Co., Kamptee Road.

**PATNA**

The Patna Law Press Co.  
Laxmi Trading Co., Padri-ki-Haveli, Patna  
City.

**PESHAWAR CANTONMENT**

Faqirchand Mirwah, Bookseller.

**POONA**

The Manager, International Book Service,  
Deccan Gymkhana Colony.  
The Manager, "Harijan," Fergusson  
College Road.

**RAIPUR**

The Proprietor, Chaube Printing Works.

**RANGOON**

The Superintendent, American Baptist  
Mission Press.

**VELLORE**

Mr. A. Venkatasubban, Law Bookseller.

**YEOTMAL**

Mr. V. N. Saraswat.  
Mr. M. G. Bakshi, Law Books Agents.

No. 753-2599-X of 1939

GOVERNMENT OF THE  
CENTRAL PROVINCES AND BERAR  
AGRICULTURE DEPARTMENT

*Nagpur, the 24th April 1940.*

READ—Report on the working of the Department of Agriculture for the year ending the 31st March 1939.

RESOLUTION

The seasonal conditions during the year were unfavourable for crops, and the price levels of agricultural commodities continued to be depressed. It is gratifying to note, however, that, notwithstanding these adverse factors, the Agriculture Department made steady progress in practically all branches of its activities. The quantity of pure seed distributed to agriculturists from the large number of seed firms and seed unions aggregated 533,281 [523,862] maunds. The total area under improved seed likewise increased to 2,170,144 [2,050,122] acres, and the value of crops raised from improved seed is estimated at about Rs. 62 lakhs [Rs. 59 lakhs]. The Agriculture Department similarly sold improved implements and spare parts worth Rs. 1,41,700 [Rs. 1,38,329].

2. Government is pleased to note that with the exception of the citrus research section, research and experimental work also made substantial progress. New types of wheat suited to the local conditions prevailing in the different circles have been evolved, while tests on improved types of paddy are continuing. An experiment which has great possibilities for the future is the successful cultivation and curing of cigarette tobacco on the Bilaspur farm. About 62,000 acres are reported to be under the latest and so far the most satisfactory type of Verum cotton, V-434, while work is in progress to evolve yet better types. Government has noted with interest that the inclusion of groundnut in the cotton tract rotation has had a marked effect in improving the yield of cotton. Government is also interested to note the high manurial value of *maha* spent wash, and hopes that some method of utilising it, in areas where it is easily available, will be devised.

3. Experiments carried out for the extraction of fibre from linseed straw and its cottonisation, with a view to being spun into yarn, have yielded valuable results and have great economic possibilities for the province if some method of exploiting the results of the research can be found.

4. On the marketing side nine survey reports were completed and experiments on the grading of oranges yielded encouraging results. The scheme for the marketing of Verum cotton continues to make progress. Government is pleased to note that in spite of unfavourable conditions this type of cotton fetched a premium of 27.75 per cent over Broach and of 38.63 per cent over Oomra varieties. It is also satisfactory that the Nagpur Orange Growers' Association has further consolidated its position in spite of keen outside competition.

5. In view of the importance of agriculture for the welfare of the province, the increasing demand for agricultural education is a hopeful and welcome sign. Government fully appreciates the strain which has been imposed on the staff in its endeavours to cope with this demand. Government is also conscious of the fact that, on account of financial stringency, progressive reduction in the net expenditure on this important nation-building department has been forced on it, and hopes that with the return of easier economic conditions it would be possible to allot larger funds.

6. Government also wishes to place on record its grateful acknowledgment of the assistance received from the Imperial Council of Agricultural Research and the Indian Central Cotton Committee for their generous grants, without which the various research schemes could not have been carried out.

7. Government records its appreciation of the zeal and efficiency with which Mr. McDougall has continued to administer the department and of the good work done by his officers and their staff.

---

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 and Berar,

K. B. L. SETH,  
*Secy. to Govt., C. P. & Berar,*  
*Agriculture Department.*

No. 5578

From

J. C. McDOUGALL, Esq., M.A., B.Sc., I.A.S.,  
 DIRECTOR OF AGRICULTURE,  
*Central Provinces and Berar,*

To

THE REVENUE SECRETARY TO GOVERN-  
 MENT,  
 CENTRAL PROVINCES AND BERAR.

*Nagpur, the*  $\frac{21\text{st June } 1939.}{21\text{st September } 1939.}$

SIR,

I have the honour to submit, herewith, the report on the working of the Department of Agriculture, Central Provinces and Berar, for the year ending the 31st March 1939.

I have the honour to be,

SIR,

Your most obedient servant,

J. C. McDOUGALL,

*Director of Agriculture,  
 Central Provinces and Berar*

**REPORT ON THE WORKING OF THE DEPARTMENT OF AGRICULTURE, CENTRAL PROVINCES AND BERAR, FOR THE YEAR ENDING THE 31<sup>ST</sup> MARCH 1939**

---

**PART I.—ADMINISTRATION**

I held charge of the department throughout the year.

Mr. R. H. Hill, Deputy Director in charge of the Economics and Marketing Section, was on leave from the 18th March till the 26th November, 1938. Mr. P. D. Nair officiated in his place. For the remainder of the year Mr. Nair was attached to the head office.

Mr. J. F. Dastur, Mycologist, was on leave from the 25th April to the 30th June, 1938, during which period Rao Bahadur D. V. Bal held charge of the Mycological Section in addition to his own duties as Agricultural Chemist.

Miss R. Shah, Horticulturist, Citrus Research Scheme, was on leave from the 27th to the 30th September and again from the 26th October to the 25th November, 1938.

Dr. G. S. Bhatia, whose substantive post was previously that of Lecturer in Botany, was appointed to the post of Assistant to the Second Economic Botanist, on probation, with effect from the 1st November, 1938. He also held charge of the office of the Second Economic Botanist from the 15th June, 1938.

Mr. K. R. Sontakay was appointed as temporary Entomologist on the 10th March, 1939.

Mr. Nair, Dr. Kalamkar, Dr. Richharia and Miss Shah were confirmed in their respective appointments during the year.

Messrs. K. P. Shrivastava, A. R. P. Ayer, Govind Prasad, L. N. Dubey, and Rai Bahadur G. R. Dutt all of the Class II Service, retired or proceeded on leave preparatory to retirement in the course of the year.

2. Expenditure on the Department during the year amounted to Rs. 10,04,037 [Rs. 10,13,343] which included Rs. 57,043 on botanical and other gardens, Rs. 12,253 on the Rice Research Scheme, Rs. 15,421 on the Agricultural Marketing Scheme, Rs. 10,112 on the Oilseeds Scheme,

Rs. 9,295 on the Citrus Research Scheme, Rs. 1,588 on the Sann Hemp Scheme and Rs. 785 on the Gangai Pest Scheme. Receipts amounted to Rs. 2,14,763. The net expenditure on all branches of Department's activities thus amounted to Rs. 7,89,274. Of this sum, Rs. 49,454 were contributed by the Imperial Council of Agricultural Research and Rs. 67,586 by the Indian Central Cotton Committee to the research and extension schemes in progress. The net cost to the province was, therefore, Rs. 6,72,234 [Rs. 6,79,976].

## PART II.—AGRICULTURAL EDUCATION

3. The demand for admission to the College of Agriculture was again very keen. Applications received were 132 [127]; 56 [72] candidates were called for interview and 54 [58] were admitted. The total strength at the end of the session was 170. With the approval of Government, 48 students were permitted to live with their parents or guardians owing to limited accommodation in the hostel.

Out of 51 students who took the first year promotion examination, 43 were promoted to the second year class. Fifty-seven students, including three who had previously secured compartmental passes, appeared for the University Intermediate examination. Of these, three passed in the first division, seventeen in the second, eight in the third and eight secured bare passes without obtaining a division, while four obtained compartmental passes. Of the 39 students in third year, all but three were promoted to the fourth year class. For the degree examination 31 men appeared, of whom 22 were successful. Of these, nine were placed in the second division, five in the third, eight passed without securing a division and one was given a compartmental pass.

The designation of the B. Ag. and M. Ag. degrees has been changed to B. Sc. (Agr.) and M. Sc. (Agr.). This will apply to degrees secured in the examinations of March, 1938 and thereafter.

The final year students toured in Chhattisgarh and Berar, visiting Drug, Bilaspur, Ellichpur and Akola farms. The third year students visited Chhindwara, Powarkheda and Adhartal farms, the Military Grass and Dairy farms at Jubbulpore. and the agricultural exhibition held at Tripuri in connection with the All-India Congress Session. The Intermediate class visited Betul farm.



Mr. B. Subbarao and Mr. S. K. Misra continued as Warden and Assistant Warden, respectively. The health of the students was very satisfactory throughout. Physical defects observed by the Medical Officer of the University were brought to the notice of parents and guardians.

The College Council met once during the year. The social gathering, held in October, was presided over by Mr. C. B. Parakh. All four issues of the College Magazine came out at the scheduled time. Every effort is being made to maintain the magazine at a high level of efficiency. The strength of the college contingent of the University Training Corps was 25 [30]. There were six admissions to the unit and no discharges except of men who had left the College.

The increase in the number of students attending the College of Agriculture which has been in evidence during the past few years has made heavy additional calls on the staff of the research sections who are responsible for teaching, particularly with regard to practical classes. Apart from the teaching involved in the ordinary B. Sc. (Agr.) curriculum, special instruction was given to two post-graduate students by the Chemistry Section. The shortage in staff generally is felt as soon as the classes have to be divided into three or more sections. This is rendered necessary by the University regulation which prescribes that the number of students per demonstrator shall not exceed 16 and may also involve the breach of another University rule that teachers may not teach for more than 24 hours per week. The difficulty lies chiefly with the all-important practical classes. Any further substantial increase in numbers would render three sections necessary in all the four classes instead of in three as at present. Every effort is, however, made to keep matters running smoothly.

The short practical dairy course provided in alternate years was held from October till March and attended by 10 students.

The electrical installation in the hostel which had been condemned by the Electrical Engineer was completely re-wired. The dining hall of the Muhammadan mess was enclosed with fly-proof mesh. The nuisance caused by the close proximity of the municipal pail depôt to the hostel still continues, unfortunately.

Two students continued their post-graduate work under the guidance and supervision of the Agricultural Chemist.

Mr. B. Subbarao and Mr. S. K. Misra continued as Warden and Assistant Warden, respectively. The health of the students was very satisfactory throughout. Physical defects observed by the Medical Officer of the University were brought to the notice of parents and guardians.

The College Council met once during the year. The social gathering, held in October, was presided over by Mr. C. B. Parakh. All four issues of the College Magazine came out at the scheduled time. Every effort is being made to maintain the magazine at a high level of efficiency. The strength of the college contingent of the University Training Corps was 25 [30]. There were six admissions to the unit and no discharges except of men who had left the College.

The increase in the number of students attending the College of Agriculture which has been in evidence during the past few years has made heavy additional calls on the staff of the research sections who are responsible for teaching, particularly with regard to practical classes. Apart from the teaching involved in the ordinary B. Sc. (Agr.) curriculum, special instruction was given to two post-graduate students by the Chemistry Section. The shortage in staff generally is felt as soon as the classes have to be divided into three or more sections. This is rendered necessary by the University regulation which prescribes that the number of students per demonstrator shall not exceed 16 and may also involve the breach of another University rule that teachers may not teach for more than 24 hours per week. The difficulty lies chiefly with the all-important practical classes. Any further substantial increase in numbers would render three sections necessary in all the four classes instead of in three as at present. Every effort is, however, made to keep matters running smoothly.

The short practical dairy course provided in alternate years was held from October till March and attended by 10 students.

The electrical installation in the hostel which had been condemned by the Electrical Engineer was completely re-wired. The dining hall of the Muhammadan mess was enclosed with fly-proof mesh. The nuisance caused by the close proximity of the municipal pail depôt to the hostel still continues, unfortunately.

Two students continued their post-graduate work under the guidance and supervision of the Agricultural Chemist.

4. Mr. K. S. S. Iyer, Lecturer in Surveying, was deputed to the Bombay Province for a fortnight to study the methods of dealing with soil erosion which have recently been initiated successfully in that province, the object being to start similar projects in this province in co-operation with village uplift authorities.

5. On the roll of the Robertson Anglo-Hindi Middle School, Powarkheda, there were 77 students, including new entrants, the majority coming from Hoshangabad district and the remainder from Betul, Saugor, Nimar, Chhindwara and the adjoining States. There was, however, a serious subsequent leakage as 15 boys left in the course of the year. This is attributed to the increasing educational facilities now being made available nearer home. Sixteen students appeared for the final examination of whom 14 passed. As usual, two messes were run, one on a cash basis, and the other with rations supplied by the boys themselves. The average charge per head in the cash mess was Rs. 4-2-0 per month. Produce of the value of Rs. 317 was obtained from an area of 6.5 acres cultivated by the boys and an additional Rs. 70 came from the school orange and guava gardens. The receipts of the school from all sources amounted to Rs. 2,229 [Rs. 2,855], the fall being due to the decline in the number of students.

6. The Agricultural Anglo-Hindi Middle School, Betul Bazar, completed its third year under the control of the department. It is gaining in popularity and the attendance is gradually increasing. Seventy-seven boys were on the roll at the end of the session as compared with 58 last year. Fourteen boys went up for the final examination and 12 passed. Facilities for imparting instruction in carpentry and smithy work have been provided for the ensuing year. The school was visited by the Hon'ble Minister for Education. Additional buildings are a pressing necessity. Some provision has been made in the next year's budget and further additions will be made as funds permit.

7. The Peace Memorial Agricultural School at Buldana, which was opened in 1929, is still failing to attract the right type of boy. The main attraction is the stipend and the hope of obtaining Government service afterwards. Admission was formerly restricted to residents of Buldana district but this rule was relaxed this year in favour of two boys from other districts. The suggestions made in the previous report for attracting a better type of boy is being

brought to the notice of the school authorities. Out of 45 applicants, 14 were admitted of whom three left subsequently as they were not given stipends. Nine second-year boys appeared for the final examination and all passed. Eleven first-year boys were promoted to the second-year class.

8. Agriculture was taught as an optional subject at Basim and Betul Government High Schools. Agricultural instruction was also given in the middle schools at Itki, Chandur Railway, Mowadih, Amarwara, Lakhnadon, Chhapara and Chaurai.

### PART III.—RESEARCH AND EXPERIMENTAL WORK

#### A.—Experimental Work in the Circles

9. Northern Circle.—Agronomic experiments dealing with varietal trials, methods of cultivation, sowing, spacing, effect of manures on yield and quality, and effects of irrigation are in progress on the experimental farms at Adhartal and Powarkheda. Investigations on a suitable technique for estimating crop yields are receiving the special attention of the Deputy Director who is a trained statistician. The more important results are given below.

Wheat trials at Powarkheda showed that under irrigated conditions AO 13 gave the highest yield, and that two new Raipur crosses appear very promising. At Kheri, which is an outlying station of Adhartal, application of 15 lb. nitrogen in the form of niciphos II fertilizer gave an extra net profit of Rs. 2 per acre on unirrigated wheat. Doses of niciphos II and ammonium sulphate up to 20 lb. nitrogen per acre were applied at a profit to irrigated wheat taken as a second crop after paddy. An experiment to determine the best time for sowing berseem showed that the best results are obtained by sowing in October and November. Sunflower as an alternative fodder crop to *ringni juar*, and *teora* gave satisfactory results. The possibility of growing chillies and tobacco under dry conditions was investigated at various centres. Experimental work on cultivators' plots to determine, with precision, the suitability or otherwise of varieties evolved by the department to local conditions were put down for the first time at 22 centres. The cultivators are co-operating willingly in this work.

Investigations of wheat yields by a sampling method were done at Powarkheda in collaboration with the Agricultural Meteorologist, Poona. A sampling technique for

the estimation of cotton yields was tried in Khandwa, and for paddy yields in a number of villages under the Jubbulpore tank. These investigations have been conducted with a view to the eventual formulation of a statistically sound method of estimating crop yield.

**10. Southern Circle.**—Wheat varietal tests at Chhindwara and Tharsa showed that AO 49 is the best yielder for those tracts, followed by E. B. 76. Trials connected with important pulses and oilseeds at Chhindwara brought out that local gram, No. 55 linseed, AK 8-11 groundnut, and No. 38 tur were the best yielders in their several groups. In the potato varietal test at Chhindwara, the Darjeeling variety stood first, but none were economical owing to low yields. Sugarcane trials at Chhindwara, Tharsa, Seoni and Sindewahi established that CO 290 was the best from the point of view of yield and net profit, followed by CO 312 and CO 313. The two latter varieties did best at Waraseoni and Betul.

**11. Eastern Circle.**—Varietal tests on improved paddies were carried out in co-operation with the Officer-in-Charge, Rice Research Scheme. New wheat hybrids evolved by the Second Economic Botanist did well, but further trials are necessary before there can be any question of issuing the seed to cultivators. Of the other crops, No. 28 gram, No. 55 linseed, and CO 312 and 313 sugarcane proved most suitable. The dry method of planting cane which has been successfully established in *kachhar* soil on Bilaspur farm, did not prove successful under black soil conditions at Labhandi. There are possibilities of extending this method in tracts with suitable soil where cane is grown under lift irrigation, as five or six irrigations suffice to bring the crop to maturity.

Compost manure was made successfully from cane trash and weeds on all the farms. Cigarette tobacco was grown satisfactorily on Bilaspur farm and cured in a specially constructed barn.

**12. Western Circle.**—The most important part of the experimental work for this circle is done at Akola farm under the control of the Economic Botanist. The Deputy Director, however, does a certain amount of experimental work on the seed and demonstration farms, mainly to determine the suitability of improved varieties to local conditions. Varietal and manurial experiments on cotton and groundnut are in progress.

## B.—Experimental Work in the Sections

**13. Cotton Botanist's Section.**—Research was continued on lines laid down by the Indian Central Cotton Committee. V 434 cotton continues to be the most satisfactory of the verum strains so far evolved and is very rapidly replacing the earlier selections in general cultivation. 62,000 acres of V 434 are estimated to have been grown in the year under report. Further selection work on various verum strains was continued with the object of improving ginning percentage and yield.

The comparative yield trials of the four new strains of *G. indicum*, viz., B 61, B 64, B 73 and B 90, at the various Government farms, have shown the superior performance of B 64 and B 90 over the remaining two. These trials will be conducted for one more season, before forming definite conclusions regarding their fitness for general distribution.

The Bani-Cernum hybrids, H 413, H 414, H 415 and H 420, mentioned in last year's report have again yielded very promising results. In certain respects all of them are likely to be superior to the best all-round cotton of the moment—V 434.

Further work on single-plant selection on the Buri cottons (*G. hirsutum*) is being carried out with a view to isolate new strains with higher ginning percentage and higher yield. Buri 107 was grown in an area of some 2,500 acres in Burhanpur tahsil last season and is reported to have done extremely well. Its suitability to conditions prevailing last season is further proved by the highly satisfactory outturn obtained at Akola farm on an area of nine acres where it gave an average yield of 563 lb. per acre. The Indian Central Cotton Committee is now financing a scheme for establishing this variety in Burhanpur tahsil.

Breeding work on groundnut was continued and some new material is showing promise of high yield and high oil content. The new strain AK 8-11 has again given good results on the Akola farm. It is very similar to AK 10 in several respects but gives a bigger outturn per acre. In lifting qualities it is decidedly superior and it yields 4 to 6 per cent more seed on shelling.

Breeding work in connection with *juar* (*Andropogon sorghum*) and *bajra* (*Pennisetum typhoideum*) was continued.

On Akola farm seasonal conditions were far from satisfactory in spite of an extremely promising start. The most damaging features were the heavy precipitations in July and the first half of August, followed by unwanted rain in October. In spite of this the average yield of cotton over 99 acres was 450 lb. which shows the extent to which the effect of adverse conditions can be mitigated by good management. As usual, sufficient seed of the improved strains under distribution was selfed to provide seed for the whole farm area next year.

Rotation experiments have shown the advantage of including groundnut in the Berar crop rotation. Cotton following groundnut yielded 109 lb. more of kapas than cotton after cotton. This is important in view of the necessity of finding alternative crops as substitutes for cotton, which, of late years, has given low returns on account of poor yields and low prices. Unfortunately, however, the price of groundnut in the past season was the lowest ever recorded.

**14. Second Economic Botanist's Section.**—Work continued along the lines mentioned in the last report, with the addition of *kodon* and *kutki* to the crops for which the section is responsible.

*Wheat.*—Rust-resistant selections Nos. 76 and 267, and the hybrid No. 281 are reported to have reached the stage at which they can be safely recommended to replace the standard rust-resistant variety A 115. Other fixed hybrids, Nos. 311 and 312, bred from rust-resistant parents, gave encouraging results in preliminary yield tests on Government farms. A large number of wheat varieties have been collected from abroad for use as breeding material, the object being to combine their rust-resisting capacity with the cropping power of the standard local varieties. The section now has a considerable amount of material which will form a useful starting point for the new research scheme on wheats for the black soils of India which was finally approved by the Advisory Board of the Imperial Council of Agricultural Research in February 1938, and will be put into operation at Powarkheda as soon as funds are allotted.

*Gram.*—Fixed crosses between No. 28 and wilt-resistant Karachi gram were under preliminary yield test at Nagpur. Work on the crosses between No. 62 and Kabuli, Malida

and D. 8 grams was continued, as were also the yield trials of crosses between No. 28 and Cawnpore on a field scale.

*Tur.*—Crosses between wilt-resistant Pusa types Nos. 52 and 80, and high yielding early local types, E. B. 3 and E. B. 3×E. B. 38, were grown in F 1 generation in a wilt-infected area, and the results indicate that the disease-resistance character may be partially dominant. A wild perennial variety, the seed of which was collected in the previous year, was found to be strongly resistant to wilt. It has been crossed with E. B. 3 and E. B. 38.

*Soya Bean.*—The four best acclimatized varieties, Nos. 49, 53, 57 and 59 were under yield trial in randomized blocks. Nos. 53 and 59 gave satisfactory results. The former is a white-seeded variety of good quality. Attempts to hand-pollinate soya bean have not so far proved successful.

*Mung and urad.*—The classification and observation work of the previous year was followed up by trials of certain selections which gave some information regarding the types most likely to be suitable. None of the Pusa types did well.

*Castor.*—Types Nos. 16 and 31 selected in the previous season were tested for yield and analysed for oil content. The former gave a higher percentage of oil and the latter a higher yield. Crosses have, therefore, been made between the two with a view to combine both qualities.

*Grasses.*—A set of experiments on the improvement of pasture land was drawn up jointly by the Sylviculturist of the Forest Department and the Second Economic Botanist. Studies were made of the botanical composition of the herbage at Richhai farm. Propagating material of a number of grasses was obtained from Ceylon.

**15. Chemical Section.**—General analytical and advisory work showed a further increase over past years. Seven hundred and eighty-four samples of soils, manures, feeding stuffs, etc., were analysed and reported on. Determinations of moisture present initially in samples of grasses were made on behalf of the Forest Department. Analysis of a sample of *mahua* spent wash received from the Distillery Inspector, Betul, proved that it is a valuable fertilizer, and that an acre-inch of irrigation with this liquid would add approximately 4,000 lb. of organic matter, 60 lb. nitrogen, 40 lb. phosphoric acid and 235 lb. potash per



acre. Fresh dry *mahua* refuse was found to be rich in proteins and minerals and would prove a useful cattle feed, comparing very favourably with common concentrates like *tur*, *chuni*, and wheat bran. Analysis of samples of wheat from the manurial experimental plots at Saugor farm did not show any striking differences in the composition of the seed as a result of different manurial treatments.

Periodical analysis of varieties of sugarcane from the various farms showed that CO 313 gave the highest percentage of sugar on all farms on which it was grown.

Experiments undertaken with a view to determine the effect of different rations on milk yield and quality showed that inclusion of cotton seed in the ration of buffaloes does not show any particular advantage over a ration consisting of groundnut cake and *juar* meal in so far as the general health of the animals, milk yield and percentage of fat in the milk are concerned. These results further establish the important fact that market samples of genuine butter and *ghee* should ordinarily give a much higher Reichert Meissl value than the minimum of 10.0 fixed under the Central Provinces Prevention of Adulteration Act of 1919, and in this respect they, therefore, confirm the results previously obtained.

Periodical determinations of the natural moisture content in wheat stocked according to the different methods of storage prevalent in the province showed that it varies between 5 and 13.5 per cent, depending upon the method of storage, type of wheat, the time of the year and the weather conditions at the time of sampling. A number of determinations of percentages of moisture and seed in cotton lint samples were carried out under the provisions of the Cotton Ginning and Pressing Factories (Amendment) Act.

In response to enquiries for advice regarding a simple method of testing *ghee*, a number of tests were carried out, as a result of which the anhydrous acetic acid method was recommended. This method was demonstrated at the Tripuri exhibition.

Pure cultures of nodule bacteria from sann hemp and gram were sent to certain farms in the Northern and Eastern circles.

Considerable inroads were made on the time of the Agricultural Chemist in supervising the construction of a new gas plant and of apparatus installed for determining the moisture content of cotton samples.

In common with other sections responsible for practical instruction in the College of Agriculture, increasing demands continue to be made on the staff on account of the larger number of students. Special lectures were arranged by this section for a class of village workers held at Nalwadi, and for fruit preservation held at Nagpur under the auspices of the District Village Uplift Committee. Research work of two post-graduate students was supervised by the Agricultural Chemist.

**16. Mycological Section.**—Experiments to test the effect of treating cotton seed with certain fungicides for the control of seedling blight have been in progress for some years and have shown that treated seed gives a better stand of plants and a higher outturn ranging from 10 to 30 per cent. The treatment will be introduced on Government farms next season. The form of blight caused by the *anthracnose* fungus is being controlled by delinting the seed with sulphuric acid. Cotton wilt studies showed that, in plots treated with kainit, wilt incidence was less than in those treated with other chemicals.

*Juar.*—Past investigations have proved conclusively that gram smut (*Sphacelotheca sorghi*) can be effectively controlled by dusting the seed with copper carbonate or sulphur. The effect of exposing the seed to the sun in May was tested last season. Exposure to the sun for five hours brought the infection down from 20 per cent to 5 per cent. Study of the head smut form (*Sorosporium reiliana*) was continued. Soil inoculated with the fungus in 1937 in pot and field trials was resown without further addition of inoculum last year and showed a distinct decrease in infection. This was most marked in the pot experiments in which infection was only 3 per cent as against 37.5 per cent in the previous year.

*Wheat.*—A special assistant for the survey of wheat-rust epidemiology was attached to the section for four months. This survey is part of an all-India investigation financed by the Imperial Council of Agricultural Research. The investigation covered all the important wheat areas of the province. Stem rust was first observed in the third week of January in Jubbulpore but the general incidence was slight.

Experiments on wheat loose smut (*Ustilago tritici*) were continued. Time of sowing had no effect on incidence nor was there any marked effect from exposing the seed to the heat of the sun in May.

*Groundnut*.—The efficacy of spraying the plant with Bordeaux mixture *cum* linseed oil as a remedy for *tikka* disease has again been demonstrated, one or two sprayings being sufficient according to the severity of the incidence.

*Rice*.—Incidence of sterility disease caused by eel-worm was severe owing to high atmospheric humidity in October. Removal of rice stubble from the fields is recommended as a control measure.

*Pan*.—Demonstrations of control measures for foot-rot and *anthracnose* disease could not be continued for lack of funds.

The Imperial Council of Agricultural Research has sanctioned a five-year research scheme for the investigation of *pan* problems in the province. Four acres of land will be taken on lease in Ramtek for the investigation.

*Citrus*.—"Pink" disease (*Corticium salmonicolor*) was reported from several districts. Orange trees in which the disease was brought under control by pruning and spraying in Balaghat were marked with a view to see whether it will recur again and whether they serve as *foci* of infection. The disease has been identified on jack-fruit. Forest trees in the neighbourhood were examined as possible sources of infection, but no traces of infection were found.

There was a severe outbreak of "Mottle leaf" disease on mosambique and orange trees at Bilaspur farm. Zinc oxide and zinc-sulphate-lime sprays were applied with very beneficial effects, particularly on trees previously manured with zinc sulphate.

*Miscellaneous*.—It is now definitely established that hypertrophy of *til*, resulting in a zigzag bending of the stem, is the result of insect attack. A new disease on sann hemp was observed on the College farm and will be further investigated. A powdery mildew, a *corticium*-like fungus, was observed on oranges at Burhanpur which may also be new. *Sphaerotheca sp.* did considerable damage to *niger* on Dindori farm.

**17. Entomological Section.**—The personnel of the section changed completely in the course of the year. Rai Bahadur Dutt went on leave preparatory to retirement. Two temporary assistants left, one to proceed abroad for further study and the other to take up another appointment. The present Entomologist joined his duties in March.

At the suggestion of the Imperial Council of Agricultural Research, weekly dustings of Paris-green were applied to standing paddy at Labhandi farm to test their effect on the anopheline larva population and on the yield and quality of rice. The number of larva found in the periodical counts was insignificant, and no conclusions can yet be drawn regarding the effect on the paddy crop.

Several reports of attacks of the gall fly (*Pachydiplosis oryzae*) on paddy were received from Balaghat district. Special attention was paid to the light-trap method of controlling the fly.

An infestation of *Aleurolobus barodensis* and *Pyrilla Sp.* on sugarcane on several Government farms was dealt with by spraying with nicotine sulphate and fish oil resin soap. Tin sheets smeared with sticky paste were also effective.

The question of encouraging bee-keeping as a side industry was taken up in co-operation with the Nagpur District Village Uplift Committee. The Entomologist, Rai Bahadur Dutt, made a special study in Bangalore of the technique employed there, and a fieldman was sent to Bangalore for practical training. Three hives of *apis indica* have been established successfully at Nagpur. The project is attracting considerable interest, and arrangements for holding special classes in bee-keeping have been made by the Village Uplift Board and the section.

It has been established in previous investigations financed by the Indian Central Cotton Committee that the *Heliothis obsoleta* caterpillar does substantial damage to cotton in this province. The Indian Central Cotton Committee has now provided funds for the further investigation of this pest, and this will commence shortly. The final report on the original *Heliothis obsoleta* scheme was submitted to the Indian Central Cotton Committee.

As usual, numerous enquiries regarding the control of various pests were received. These were dealt with mainly by correspondence. Wherever necessary, personal investigations were made by the Entomologist and his staff.

**18. Rice Research Scheme.**—The improved strains of early, medium and late varieties were crossed with American *Blue Rose* to evolve prolific strains with bold and translucent grain for the export market. Hybrids were raised in  $F_1$

and a study of grain and endosperm characters was made. In crosses of translucent and abdominal-white endosperm, the  $F_1$  plants showed segregation on the panicle in the ratio of 1 translucent : 1 abdominal-white.

The inheritance of aroma or fragrance in rice was studied in  $F_1$  generation of the crosses between scented and non-scented varieties. The  $F_1$  plants showed the presence of aroma.

The study of the inheritance of habit of growth was continued in  $F_2$  generation of the crosses between erect and spreading types. Varieties with erect habit do not lodge, when ripe, to the same extent as the spreading types and crosses were made to infuse the erect habit of growth in high-yielding spreading strains. The spreading habit was found dominant to the erect habit and segregated in  $F_2$  in a ratio of 3 spreading to 1 erect.

The inheritance of length of grain was studied in  $F_2$  generation. Crosses of very short kernels gave in  $F_1$  intermediate kernels and in  $F_2$  a 3 : 1 ratio of short and very short kernels. In crosses of very short and medium kernels the  $F_1$  was short and gave in  $F_2$  a 9 : 6 : 1 ratio of short, very short and medium kernels. Single-factor difference was found between short and medium kernels, short kernels behaving as recessive. In crosses between short and long kernels, the  $F_2$  distribution indicated a multiple factor inheritance.

The yield of 71 hybrid strains in  $F_4$  generation of the crosses—*Nagkesar* × *Bhundu*, *Nagkesar* × *Budhiabako*, *Nagkesar* × *Gurmatia* and *Nagkesar* × *Luchai* was tested against the parents in randomised blocks with ten replications. The cultures were on the whole uniform for colour of leaf-blade and size of kernels. The five best strains from each of the above crosses which were statistically equal to the more vigorous parent in yield have been retained for further tests.

Higher yielding and better quality strains, which can be distinguished from wild rice, have already been evolved at the research station and seed is being distributed to cultivators. The important hybrids under distribution are *Budhiabako* × *Parewa* No. 19, and *Bhundu* × *Parewa* Nos. 22 and 116.

Yield trials with 550 varieties carried out at Raipur, Waraseoni and Jubbulpore for the last five years have resulted in the isolation, by selection, of some 16 strains of uniform quality and good cropping power. These strains are now

being multiplied and distributed in all the three rice-growing tracts of the province.

A botanical survey of paddy varieties grown in the Central Provinces was continued and morphological characters of 710 different varieties have been fully described.

**19. Sann Hemp Research Scheme.**—Cultural and chemical experiments on sann hemp were carried out with a view to studying the effect of seed rate and other factors on yield of stalks and fibre, and the effect of the different methods of retting on the quality of fibre. The results obtained showed that a seed rate of 60 to 100 lb. per acre gives the best results and that the earliest sown crop gives the highest outturn per acre and the highest yield of fibre. Best yields are obtained when the crop is harvested at the flowering stage, highest yields of dry stalk being obtained when harvested at the dead ripe stage. It was observed also that fibre obtained by retting the stalks in running water was fairly clean, free from gunny material and better in colour than that obtained by retting the stalks in standing water.

Other investigations included the determination of the minimum quantity required to find out the yield of fibre per plot and results obtained indicate that 10 to 15 lb. of dry stalk per plot is necessary to determine the average percentage of fibre in stalk.

**Botanical.**—Out of 63 strains under observation, 13 have been selected for further examination. Yield trials of commercial varieties confirmed the previous year's results. Study of the biology of the flower was continued. Ordinarily, *Crotalaria juncea* does not set seed when the plant is bagged unless the stigma is artificially stimulated, but *Crotalaria retusa* does so profusely without stimulation. Crosses have been made between the two species with the object of transferring the pod-setting property of the *retusa* to the *juncea* species. Samples of *crotalaria* types from India and abroad have been added to the existing collection.

**20. Oilseeds Research Scheme.**—This five-year research scheme on linseed, sesamum, niger and safflower, financed by the Imperial Council of Agricultural Research, has completed its second year.

Collection of local types of oilseeds from different parts of the province was continued. These will be grown in single lines during the next season. Among the exotic strains obtained, eleven flax samples came from Australia

and one linseed and one sesamum variety from Cyprus. Isolations made during the previous year were grown in single lines and further selections were carried out with respect to economic characters. Selections in the year under report were 366 in linseed, 432 in sesamum, 15 in niger and 40 in safflower. The oil percentage of some of those was determined.

The problem of sterility in sesamum due to phyllody was investigated in detail. Segregations were studied in 98 cultures. Further research is required to discover the causes of sterility with a view to increasing the yield of the crop. The data also suggest that selection has been effective in reducing the percentage of phyllody.

In conformity with the dictum that the methods to be followed in the improvement of any crop depend on the degree to which that crop will tolerate self-fertilization, the percentage of natural cross pollination was determined in all the four crops under study. The result showed 5 per cent for linseed, 65 per cent for sesamum, 100 per cent for niger and 22.6 per cent for safflower. These investigations will prove helpful in suggesting methods for maintaining purity of strains in the cultivator's fields.

Experiments on the extraction of fibre from linseed straw were conducted in different parts of the province. The cost of preparing the fibre for commercial use varied from Rs. 50 to Rs. 80 per ton. A dry-scutching machine has been developed which permits of the fibre being extracted without any retting process. Certain Indian and foreign firms are showing keen interest in the product and arrangements have been made to ship five tons to America. As reported last year it can be spun into yarn after cottonization, either by itself or mixed with varying proportions of cotton, and woven into quite an attractive fabric.

**21. Citrus Research Scheme.**—This scheme has completed nearly two years of the five for which it has been financed by the Imperial Council of Agricultural Research. The requirements of the Improvement Trust have necessitated the relinquishing of the site originally selected for field experiments, and proposals for another site have been submitted to Government.

Lack of harmony within the section has had a serious effect on the progress of the scheme, and there is little to report except that the work continued generally along the former lines to the limited extent which the peculiar conditions prevailing in the section permitted. The work of

this section and of the Oilseeds Section was inspected in detail during the year by the Agricultural Commissioner with the Government of India.

#### PART IV.—ECONOMICS AND MARKETING

22. The Marketing Section submitted to the Agricultural Marketing Adviser survey reports on groundnut, coconut, barley, maize, sugar, markets and fairs, potatoes and oranges during the year, and also a preliminary report on lac. Reports on butter and *ghee* are being drafted, and survey of gram, lac, rape and mustard are in progress. Supplementary enquiries in connection with reports previously submitted were attended to.

8,000 baskets of oranges were machine-graded in Nagpur market and sold at 6 to 8 per cent higher price than ungraded fruit. It is expected that equally good results will be got by hand-grading once the graders acquire practice.

Experiments in freezing orange juice, for sale as an ice, were made in collaboration with the Central Provinces Ice Factory, Nagpur, the object being to find a method of utilizing low-grade fruit which is not exported. The results are encouraging.

Further consignments of oranges were sent to Kirkee for cold storage experiments. These experiments show that fully ripe oranges kept their good outward appearance at temperatures ranging from 35°F. to 52°F. but at temperatures of 45° to 52°F. the inside pulp dried up quickly. At 35°F. the fruit could be kept for about two months. Experiments with green fruit showed that it did not ripen at 35°F. and 40°F. but became wilted. After a period it assumed a brown colour and showed signs of deterioration. At 45°F. and 52°F. it changed to a good yellow colour but during the period most of its juice was lost.

Other conclusions are that wrapping the fruits in waxed or unwaxed paper is of no advantage except that it isolates bad fruit, and that loss in storage is higher in *ambia bahar* than in *mrig bahar*. Further information is required as to the travelling capacity of fruit taken out of cold storage, *i.e.*, whether it would keep in good condition for any length of time if transported in ordinary wagons or whether refrigerator cars would be essential.



The possibility of establishing a ghee-grading station at Saugor was investigated and proposals were submitted. In this connection samples of *ghee* and butter were sent to Cawnpore for analysis.

The attention of the revenue authorities was called to the necessity for establishing regulated markets, particularly in the north of the province. Samples of various exportable commodities were sent to the Indian Trade Commissioner, Japan, for exhibition, and also to Trichur in Madras.

**23. Marketing of Verum Cotton.**—Arrivals of cotton in the pool commenced from the beginning of November in Nimar district and from the middle of November in Berar. 5,482 bales were disposed of. Sales during December amounted to 2,152 bales; 1,610 bales were sold in January, 937 in February, and the balance of 569 bales by the 10th of March. Very satisfactory premia were obtained up to the end of the first week in January but a sharp downward tendency was in evidence thereafter. The average price obtained for the total stocks worked out to Rs. 199 per khandi, f. o. r. Bombay basis. The average rate for Broach and Oomra on the same basis over the period during which the pool sales were effected, was Rs. 155-9-0 and Rs. 144-6-0, respectively. In other words, verum sold at an average of Rs. 43-7-0 over Broach and Rs. 55-10-0 over Oomra, equivalent to a premium of 27.75 per cent on Broach and 38.63 per cent on Oomra. Although the actual price obtained was not high, the premium over ordinary growths was extremely satisfactory.

Statistics collected from the district staff and the various mills show that, inclusive of the pool stocks, Verum cotton equivalent to nearly 22,000 bales was marketed up to the end of March.

The old arrangement under which the Indian Central Cotton Committee has been financing the cotton marketing operations will terminate at the end of the year under report. A new arrangement under which the Indian Central Cotton Committee will share expenses with the Provincial Government on a 50 : 50 basis for a further two years has been made. The new scheme will include the marketing of Buri 107 cotton which is to be introduced on a large scale in Burhanpur tahsil.

## PART V.—DEMONSTRATION, PROPAGANDA AND AGRICULTURAL ENGINEERING

**24. Character of the season.**—The monsoon commenced early and was in general heavy and continuous, and during the latter part very inopportune. *Kharif* sowings were done under very favourable conditions and germination was satisfactory. The continuous rainfall of July prevented the normal development of *kharif* crops in general. Cotton recovered during August and the prospects were again favourable in September. But the heavy rains of October resulted in a profuse shedding of buds and bolls which caused enormous loss, the full extent of which did not become apparent till late in the season. *Anthraxnose* and mildew appeared in certain places and took an additional toll. Heavy rain at the time of flowering interfered to some extent with fertilization in the paddy crop and retarded the development of grain, but the outturn was generally satisfactory although *gangai* and hoppers caused some loss in certain localities. *Juar* and groundnut also suffered on account of the continuous and heavy rainfall but not so severely as cotton.

The October rains which damaged *kharif* crops in general, were favourable for *rabi* and sowings were done under ideal conditions. Germination was very satisfactory and the crops progressed very well till towards the end of November. Absence of winter showers retarded subsequent growth and cloudy weather in January affected the outturn of linseed. Hailstorms reduced the yield of wheat almost everywhere, particularly in Bilaspur, Drug and certain parts of Jubbulpore and Mandla districts. *Rabi* crops were good in Saugor and Hoshangabad districts but only moderate elsewhere.

The cotton tract had another unfavourable year to contend with. The fourth cotton forecast puts the annawari estimate at 7.8 annas as against 9.1 annas for the previous year. It is, in fact, only rarely that there has been anything approaching a normal crop over a long series of years, and the effect of the sequence of short crops has been heavily accentuated by the fall in prices. It is, therefore, very necessary to take stock of the situation and to examine the future prospects of cotton cultivation in the province.

In recent years the cotton acreage in India has shown a downward trend; compared to 1925-26 the total area in 1938-39 shows a reduction of 17.3 per cent. During the

same period the area under Oomra cotton has fallen by 21 per cent. This contraction in acreage is particularly noticeable in the Central Provinces and Berar tract of the Oomra area which has recorded a fall of 30.5 per cent during the past 13 years. In this province, the reduction in area has been brought about by a combination of two factors, *viz.*, a succession of sub-normal outturns and the downward trend of prices. The drop in prices is a common factor operating throughout India but not so the climatic factor. Tracts of low rainfall where irrigation is applied have had only the price factor to contend with. Other tracts, and particularly the Oomra tract, have been hit hard by both the factors. Apart from the question of low prices and unfavourable seasons there is the problem of the future market for the Oomra cotton. While the consumption of this cotton in Indian mills has shown a slight increase since 1931-32 the foreign market has remained steady, absorbing roughly half to two-thirds of the annual supply. In recent years Japan has been the principal buyer and has taken from 40 to 48 per cent of the total available surplus. There is, however, a danger that Japan may not continue to be a buyer of Oomra cotton in the future to the same extent as in the past and it is necessary to take steps to meet the situation which would be created if she went out of the market.

From what has been said above it appears that a permanent reduction in the cotton acreage is inevitable, and that the sooner the cultivators realize this situation the better. An examination of the cropping practices in Berar during the latter part of the 19th century shows that in 1876-77 cotton occupied less than one-third of the total cropped area, but in 1928-29 this proportion rose to almost 50 per cent. In 1895-96 there were 14.1 lakhs of acres under *rabi*, but with the increase in the area under cotton the *rabi* area reached the lowest level of 3.2 lakhs of acres during the quinquennium ending 1922-23. With the increase in rainfall the *rabi* area has again gone up and it is now over five lakhs. If cotton continues to be unremunerative the cotton tract will have to revert to the crops which were grown previous to the boom period. If Berar went back to the *rabi* acreage of the quinquennium ending 1895-96, it would mean withdrawing about  $8\frac{1}{2}$  lakhs of acres from cotton cultivation, or approximately one-third of the area under cotton in the year 1938-39.

Apart from a partial reversion to *rabi* crops, what other crops can be grown in place of cotton? Groundnut has shown a distinct tendency to expand in Berar and in the last 25 years the area has increased from 4,000 to over two lakhs of acres. There is scope for still further expansion to the extent of another couple of lakhs. Other possibilities in the way of substitution are crops suitable for intensive cultivation, like fruits, vegetables, spices and sugarcane. Expansion under those crops is not, however, likely to reach a large figure on account of the lack of irrigation facilities, but a certain amount of expansion may be possible in tracts where the water level is reasonably close to the surface. Alteration of cropping in the directions indicated above will tend to re-adjust the present lop-sided economy under which an enormous area is being devoted to a money crop which no longer brings in money. It will mean a switch-over in the direction of subsistence farming under which the cultivator will grow more of what he can consume himself in the form of cereals, pulses, edible oils and spices, and he will be in a position to meet more of his expenses by payments in kind instead of in cash, thus reducing his need for money.

**25. Vidya Mandirs.**—The special feature of the year was the inauguration, early in April, of the Vidya Mandir scheme drawn up by the Hon'ble the Prime Minister when in charge of the Education portfolio. The Agriculture Department was entrusted with the onerous task of examining all offers of land made in connection with the scheme with a view to determining whether they were capable of yielding an income sufficient to support the Vidya Mandir teacher. 398 offers were examined by the staff, out of which 98 were recommended by the department for final acceptance. In every case the land had to be examined in detail, estimates of present and future cropping potentialities had to be prepared, and details of probable income and expenditure had to be worked out. In respect of such offers as were recommended for acceptance, prompt arrangements had to be made for the purchase of live-stock and implements and the construction of the farm buildings, and as much as possible of the land was put under crop during the season. Special credit must be given to all ranks of the staff for the admirable way in which they responded to the heavy additional calls made on their time and energies at such short notice. It is hoped that the Vidya Mandir farms will develop into ideal demonstration centres and be a potent influence in raising the standard of cultivation

in their neighbourhood. There are immense possibilities in the scheme, not only as a means of providing education for rural children but also as an instrument for the economic betterment of their parents.

**26. Northern Circle.**—The selection and management of Vidya Mandir School plots was one of the principal activities of this circle in which a larger number (37) have been established than in any other circle. The working results on some of the plots have not come up to expectations, largely due to delay in getting possession of the land. Unfavourable weather conditions, particularly hailstorms, also reduced the outturn in some plots.

The Deputy Director of Agriculture arranged a special agricultural exhibition at Tripuri during the session of the Indian National Congress. Almost all sections of the department co-operated and the exhibition was a distinct success.

The quantity of pure seed distributed from all sources during the year was 2.62 [2.66] lakhs of maunds. The slight fall compared with the previous year was mainly due to the smaller quantity of cotton and groundnut seed distributed in Nimar and Hoshangabad districts. Verum pooling was discontinued from this year at Harda centre as the climatic conditions prevailing in recent years in that tract have not been favourable to cotton. The total area under verum strains was 23,308 [20,887] acres in Nimar district. Cotton was pooled at six centres and 2,089 [1,445] bales were marketed. 266,254 [679,407] whole canes and 31,622 [53,953] fruit plants were distributed. The demand for sugarcane sets was not so keen owing to the low prices of *gur* in the previous season.

Improved implements worth Rs. 38,418 [Rs. 35,210] were sold. The sales included 344 ploughs, 32 sugarcane mills, 31 winnowers and 29 water lifts. Taccavi loans amounting to Rs. 17,441 [Rs. 17,050] were granted for the purchase of improved implements, seeds and manures.

The working accounts of the Saugor and Khandwa farms showed a profit of Rs. 1,884 [Rs. 1,764] and Rs. 3,441 [Rs. 1,078] respectively. The total receipts of the Dindori farm, for which the initial capital expenditure was provided out of the Government of India grant three years ago, amounted to Rs. 1,505 [Rs. 1,353] against an expenditure

of Rs. 3,864 [Rs. 3,992]. It is expected that the farm will run at a profit when the whole area has been ploughed and much-needed improvements carried out. The Damoh farm which had previously been leased out, was taken over by the department in May 1938. The farm incurred a loss of Rs. 595 during the year, including depreciation and interest charges. This was due largely to the deterioration which occurred as a result of giving the land on lease.

Out of the seven Government demonstration plots, five showed profits on the year's working. The two plots in Saugor district, *viz.*, Patharia and Amarwara, showed a loss of Rs. 56 and Rs. 35, respectively, after taking into account depreciation and interest charges. The Amarwara plot is under the command of the Chandia Tank and is double cropped with paddy and wheat. Vegetable and garden crops will be tried on this plot in future. The possibilities of growing chillies and tobacco are being explored. The introduction of tobacco, if successful, will be a great boon to the cultivators in view of the fact that the *bidi* factory at Saugor has to import a large quantity of tobacco at present. Four demonstration plots will be closed from the present year and the demonstration work will be concentrated on the Vidya Mandir plots.

The number of private demonstration plots rose from 24 to 34 during the year. Seven were located in Jubbulpore, five in Saugor, nine in Mandla, eight in Hoshangabad and five in Nimar. Government has made provision for certain implements and equipment, the use of which will be demonstrated on these plots.

Other forms of demonstrations included 1,803 [1,801] practical demonstrations, 56 lantern and cinema lectures and the holding of "Farmers' Days" at Khandwa and Adhartal farms and the Government demonstration plot at Kuan. Mention has already been made of the Tripuri exhibition. Another agricultural show was arranged at Kareli in the Hoshangabad district at the time of the Provincial Political Conference. Extensive propaganda regarding the extraction of fibre from linseed was carried out and demonstrations were given at various centres.

There are 21 agricultural associations in the circle, four in Nimar, six in Hoshangabad, four in Jubbulpore, six in Saugor and one in Mandla. All the four associations in the Nimar district helped the Verum cotton pooling work

by providing a temporary staff of jamadars for roguing cotton and by advancing money to meet the contingent expenditure of the marketing work. The Sohagpur Association in the Jubbulpore district purchased 1,090 maunds of seed potatoes for supplying to cultivators. The Jubbulpore Association introduced the system of hiring-out sugarcane mills and *gur* boiling pans.

Advice was given in the management of the Court of Wards home-farms of the Chichli, Jhanghankheda and Pantalai estates in the Hoshangabad district and Mohanai and Bakal estates in Jubbulpore district. District village uplift committees were formed during the year with sub-committees at tahsil headquarters.

The steam tackle outfit commenced work towards the end of February. The total area ploughed up to the end of the hot weather was 503 acres, which is a very satisfactory performance over such a short period.

**27. Southern Circle.**—Sixteen Vidya Mandir plots were opened in this circle and work was started on all of them. The demand for improved seed was met from Government farms, plots and private agencies like seed farms and seed stores. 101,084 [93,514] maunds of improved seed, 1,386,975 [1,816,765] whole canes and 27,662 fruit plants were distributed during the year.

Pooling of verum cotton was continued on the usual lines at six ginning centres. 176 [362] bales were sold at a premium ranging from Rs. 12-6-0 to Rs. 24 per *khandi* of *kapas*.

The demand for fertilizers is steadily increasing and 8,684 [6,198] maunds, mostly of ammonium sulphate, were sold during the year. The major portion of the sale was in the Balaghat and Bhandara districts. There was a decline in the sale of improved implements owing to the depressed financial conditions. Sales to the value of Rs. 44,819 [Rs. 46,662] were effected. Taccavi for pure seed, manures and implements continued to be in demand and loans to the extent of Rs. 84,811 [Rs. 91,679] were recommended during the year.

The four seed and demonstration farms continued to be important centres for the production and distribution of pure seed and for the demonstration of improved methods of agriculture. Seoni farm had a very successful year, the working account showing a record profit of Rs. 3,191.

The Betul farm showed a profit of Rs. 276, and the Waraseoni and Sindewahi farms showed profits of Rs. 871 and Rs. 349 respectively. Eleven [5] Government demonstration plots and 49 [31] private plots were run under the supervision of the department. Demonstrations were given at 1,611 [1,817] centres. Cinema demonstrations were arranged at Ramtek during the annual fair, at Chhindwara during the gathering of teachers and students of district council schools, and at Nagpur. "Farmers' Day" demonstrations were arranged at the Waraseoni and Betul farms. Ploughing matches arranged on these days proved a source of great attraction to cultivators. An agricultural exhibition on a large scale was arranged on the Nagpur College farm for the benefit of people attending the Malguzars' Conference in February.

There is an agricultural association in each tahsil in this circle and 15 of them have been registered as co-operative agricultural associations. The Waraseoni Association did the best business. Further extension of the activities of these bodies depends on increasing the share capital and also on the interest taken by the members in their working. Special propaganda regarding agricultural improvements was carried out by the staff in the centres selected for village uplift work in the seven districts of the circle. The tendency to devote larger areas to garden crops is increasing and necessary advice in this direction was given by the staff. Nurseries for fruit plants have been established on most of the Government farms to meet the growing demand. Advice and assistance were given to the Courts of Wards home-farms regarding the management of fruit gardens and other items of agricultural improvement.

The Nagpur District Orange Growers' Association made some progress; share capital increased to Rs. 4,325 [Rs. 3,775] and membership to 122 [100]. Advances amounting to Rs. 6,125 were made as taccavi to orange growers during the year. The work of the association was conducted at three centres—Kohli, Katol and Kalamba. The association has acquired an acre of land at Kohli and a godown has been constructed on it from the Government of India grant. A similar arrangement is likely to be made at Kalamba. Thirty-three [15] wagon loads of fruit were sent to Madras, Delhi, Calcutta and Lucknow. The prices secured were generally satisfactory except in one or two cases where the fruit had deteriorated owing to damage by rain. The association has to face keen competition from



*dalals* and middlemen. This year's work has, however, given hopes of a brighter future. The necessity for additional staff for carrying out the work of the association is keenly felt.

**28. Eastern Circle.**—Twenty-nine Vidya Mandir plots were approved and work was started on 22 plots.

Improved seed amounting to 1.9 [1.12] lakhs of maunds and 1,312,788 [623,964] whole canes were distributed for seed purposes from private seed farms and seed unions. The seed unions numbered 288 [296] with a membership of 6,067 [6,051] whose total contributions increased to 30,745 [28,182] maunds of paddy. The aim has been to consolidate the unions rather than to increase the number. The experience at Baghmarra shows that success depends on the presence of literate workers in the village.

Progress in fruit and vegetable cultivation has been very satisfactory and planting has been extended to 613 [489] villages. 43,474 [40,259] fruit trees of different sorts were supplied during the year ; of these 11,305 [8,582] were supplied free from nurseries maintained by agricultural assistants in private gardens at 40 [26] centres. Vegetable cultivation has also been started at 311 [198] villages. Progress has been so rapid in this direction that it is now very difficult to meet all the demands from the cultivators. Khaperkheda peas, potatoes, maize and hot weather vegetables were successfully introduced at various centres. Nine small flower gardens were laid out for malguzars.

*Tur* and groundnut, which have been recently introduced into this circle occupied 963 and 10,427 acres, respectively. Line sowing of *tur* was demonstrated at 230 centres. The early variety of groundnut, AK 12-24, grows without irrigation and this has helped to extend the area.

Implements of the value of Rs. 19,252 [Rs. 15,113] were sold during the year. Sales of fertilizers and oil cakes amounted to 2,564 [5,673] maunds and 2,123 [1,348] maunds, respectively. Taccavi loans amounting to Rs. 16,607-12-0 [Rs. 20,997] were given for the purchase of improved seeds, manures, etc. It seems necessary to modify the rules governing the grant of taccavi loans for the purpose of encouraging an increase in the area under cane. According to existing rules, a fresh loan will not be granted unless the previous loan is completely repaid. But for extending the area under cane a fresh loan is necessary before the previous loan can be paid up.

The seed and demonstration farms continued to attract attention as demonstration centres. Although the paddy crop suffered from *gangai* pest on all these farms and *kharij* crops in general did not come up to standard owing to heavy rain, the improvement in the price of *gur* helped to maintain the financial position of the farms. Bilaspur farm yielded a surplus of Rs. 987 [Rs. 186] and Drug farm Rs. 261 [Rs. 110] as per working account. In both cases the surplus did not meet the depreciation and interest charges, but Chandkhuri farm surplus amounted to Rs. 1,856-12-8 which left a clear net profit of Rs. 1,019-5-0 after meeting all charges in full.

Out of five Government demonstration plots, four were run at a profit. All the Government plots excepting two, namely, those at Lormi and Mohtara, will be closed from next year. The latter will be continued as centres for popularizing cane cultivation under Government tanks.

Including the 22 Vidya Mandirs, there are now 60 centres functioning or about to function as private demonstration plots. Actual cultivation was taken up on 44 plots and preliminary work was started on 16 others. Ten of the former are located in backward tracts. All the working plots were run at a profit.

4,263 [3,736] demonstrations were carried out by the staff to show the advantages of the different items of propaganda; 69 [116] magic lantern lectures and 18 [75] cinema demonstrations were arranged; 14 [17] rallies organized by the co-operative central banks were attended by the staff of the department who delivered lectures on important agricultural subjects; 348 [619] books and bulletins were sold. Home-farms under the Court of Wards, which are under the direct supervision of the department, are paying concerns. Improved methods of planting sugarcane were demonstrated at 242 [221] centres. The area under cane under Government tanks in the Bilaspur district has gone up this year by at least 150 acres due to the high prices of *gur*. Silage-making demonstrations were arranged at 51 centres, and help was given to the Forest Department in preparing silage at Dhamtari. Under the Maniari and Hardi tanks the sugarcane area reached the highest figure in 1937-38 but has since declined. One of the chief causes of the decline is the difficulty experienced in getting the cane crushed in time. The working of the open pan sugar factory at Chandkhuri has proved that the difficulty about crushing can be easily tackled and the

opening of a sugar factory in the Maniari area, which has now been sanctioned by Government, will help to improve the position. It is hoped that private enterprise will come forward to open a factory in the Kharung tract.

The four registered tahsil agricultural associations worked satisfactorily during the year. Mungeli association is carrying on good business in the hiring out of implements for cane cultivation. With a view to encourage the co-operative marketing of produce, growers' associations have been organized in all the three districts, and godowns have been constructed at Raipur, Bilaspur and Drug for storing the produce pending sale. The co-operative central banks have agreed to advance to members three-fourths of the current value of the security of the stored produce at  $4\frac{1}{2}$  per cent interest. The Raipur godown received  $608\frac{1}{2}$  maunds of grain for storage during February and March. It has been decided for the present to concentrate marketing work on a few varieties of paddy like *budhiabako* and *gurmatia*. These organizations require special attention and care in the early stages to ensure their development on right lines.

The co-operative dairy at Drug has had a very successful year and now possesses a pure herd of 25 [19] Murrah buffaloes. It supplied 22,579 [20,210] seers of milk to Drug town during the year and the members earned a net profit of Rs. 971 [Rs. 956]. A dairy on the same lines was organized at Bilaspur during the year with the help of the staff of the Co-operative Bank and interested persons of Bilaspur town. Milk distribution was started in November, and 12,287 seers of milk was supplied to Bilaspur town up till the end of March, by which time the dairy had made a profit of Rs. 476. The organization of a dairy on similar lines at Raipur is under consideration and the handing over of the Dumartarai forest reserve to the Agriculture Department has paved the way for its early establishment.

**29. Western Circle.**—Ninety offers of land for Vidya Mandirs were investigated, and 16 were finally selected. Some of the plots offered by the co-operative central banks could not be taken possession of owing to certain legal difficulties which necessitate the amending of the Co-operative Societies Act.

The demand for improved seed continued to be keen. The total amount distributed through the agency of the

department was 59,982 [52,561] maunds. This included 9,530 [5,252] maunds of verum 434 cotton and 39,947 [32,219] maunds of groundnut. The latter crop appears to be acquiring a permanent footing in Berar. This is all to the good from two points of view—

- (a) as a substitute for cotton which has given very low returns for a series of years, and
- (b) as providing a sound rotation.

The area under groundnut in the past season rose to 2.01 lakhs of acres as compared with 1.57 lakhs in the previous year. Taccavi to the extent of Rs. 20,000 was issued in Akola district for financing the purchase of seed. Unfortunately, the price of groundnuts fell to a hitherto unknown low level at harvest time and the fodder was severely damaged by rain, but the net result was substantially better than in the case of cotton because of the more satisfactory outturn. The varieties most commonly grown are Spanish peanut and small Japan. New varieties have recently been introduced and one of them, AK. 12-24, is spreading very rapidly.

Implements and spare parts to the value of Rs. 39,131 [Rs. 40,306] were sold during the year. The implement in greatest demand is the iron plough of which 509 [621] were sold. Unsatisfactory economic conditions are responsible for the drop in the figures.

Various methods of augmenting the supply of organic manures are being recommended to the cultivators and are gradually being adopted. Fertilizers to the extent of 6,591 maunds were sold, mostly for orchards and garden crops. Taccavi amounting to Rs. 28,364 [Rs. 5,232] was issued for purchase of pure seed, implements and manures.

The circle has five seed and demonstration farms. On the working account, Basim farm showed a profit of Rs. 1,342, Bergaon a profit of Rs. 1,458 and Buldana a profit of Rs. 647. Ellichpur and Yeotmal farms sustained losses of Rs. 588 and Rs. 420, respectively. Expenditure on the breeding herd was mainly responsible for the loss in the former; in Yeotmal the climatic conditions were particularly unfavourable.

Six Government demonstration plots were run, two in the Yeotmal district, at Pusad and Kelapur, and four in the Amraoti district—one near Amraoti and three in the Dharni tract. The plots at Amraoti, Dupi, Pusad and Kelapur gave a net profit of Rs. 16-10-4, Rs. 6-12-5, Rs. 3-15-6 and Rs. 5-2-3 per acre, respectively, while those at Kalamkhar and Zilpi sustained a loss of Rs. 9-1-0 and

Rs. 6-5-2 per acre. The land at Zilpi and Kalamkhar was in a very neglected condition and infested with thick patches of *kunda* and other perennial weeds. Those plots also are expected to pay in future years. Two seed depots have been opened in the Melghat tract, one at Dharni and the other at Zilpi.

Private demonstration plots numbered 34 [25]. Out of these, two worked at a loss while the remaining 32 showed a reasonable margin of profit.

The departmental staff organized 3,377 [3,256] demonstrations, 41 [43] agricultural shows and 10 [7] ploughing matches. Magic lantern lectures and cinema shows were given at 255 [280] centres. The "Farmers' Day" functions organized on Government farms and plots attracted considerable attention and gave the cultivators an opportunity of meeting the departmental staff and discussing with them the local agricultural problems.

There are 23 taluq agricultural associations and 29 branch associations in the circle. All these associations run shops for the supply of pure seeds, implements and spare parts. The total profits earned by them during the year were Rs. 9,085 [Rs. 10,499] which work out to 13 per cent on their share capital. Hiring out of ploughs is the most prominent feature of the associations' activities. 1,325 [1,130] ploughs were given on hire and the income so earned was Rs. 5,683 [Rs. 7,382], the fall in income being due to a reduction in the rate of hire.

The departmental staff has given programmes of agricultural work to District Rural Village Uplift Committees which have selected 61 villages for intensive propaganda. Out of these, 27 are in Amraoti district, 15 in Yeotmal, 9 in Akola and 10 in Buldana. Considerable progress has been made in getting people to dig manure pits, prepare compost manure, and use improved seeds and implements.

**30. Agricultural Engineering.**—Demonstrations were given with a bullock-driven small No. 10 chaff cutter in the Ashram at Shegaon. Sugar centrifugal and centrifugal pump of Kirloskar make were worked at the exhibition put up for the Malguzars' Conference at Nagpur and films relating to agriculture were shown in the Regent Theatre on the same occasion. A gas engine running on charcoal gas and a suction gas producer were demonstrated at Tripuri. A six-inch bore was drilled to a depth of 100 feet in hard

trap rock at Telinkheri in the hope of striking water; the boring still continues. The mechanical equipment belonging to other branches of the department was kept in working order.

## PART VI.—HORTICULTURAL GARDENS AND ARBORICULTURE

31. Both monsoon and cold weather flowers were a good show at the Government gardens in Nagpur, and continued to attract a large number of visitors. The big variety of zinnia again suffered from leaf-curl; it will not, therefore, be grown for a couple of years, in the hope that the trouble will be got rid of in the interval. The display of chrysanthemums was particularly good. Dahlia bulbs imported from Holland in 1936 now require replacement but this could not be done owing to lack of funds. If funds permit, bulbs of good flowering varieties will be obtained from Europe next year.

The total receipts of these gardens amounted to Rs. 9,630 [Rs. 10,620] against an expenditure of Rs. 36,631-10-8 [Rs. 28,677-14-4]. The drop in receipts is due to unusual rains which did a great deal of damage to flowers and plants raised for sale.

Weather conditions at Pachmarhi were very favourable for gardening operations. Timely weather telegrams enabled precautionary measures to be taken to minimize damage by frost. The seasonal annuals were, as usual, a fine display, more particularly dahlias and sweet peas for which many orders came from Bombay and elsewhere. Grape-fruit, peach and plum trees imported from Sikkim and Baluchistan are making satisfactory progress. There was a slight drop in receipts which were Rs. 6,132-5-9 [Rs. 6,238-6-9], for which the poor mango crop was responsible. Cheap transport charges on fruits and vegetables from Pipariya and Chhindwara by motor bus have made it difficult to maintain the receipts obtained some years ago.

Ten district gardens were under the direct management of the department, four were leased out and two were managed by the Revenue Department. These gardens are becoming increasingly popular as public resorts. The Amraoti garden has recently been very considerably improved and is now a definite asset to the locality. These gardens also serve as centres for demonstrating methods of fruit culture and for propagating and supplying fruit

seedlings. Every effort is made to put the gardens on a paying basis, but it is not easy to do this and at the same time keep the ornamental portions as they should be kept.

**32. Acknowledgments.**—The department is much indebted to the Indian Central Cotton Committee, which has continued to finance research on cotton and the distribution and marketing of improved varieties. Grateful acknowledgment is also made of the substantial contributions given by the Imperial Council of Agricultural Research for research on paddy, oilseeds, sann hemp and citrus and for financing the investigation into the methods of marketing agricultural produce. To the Government of India the department is indebted for providing funds during the current and previous years, for storage accommodation for cultivators' produce, well-boring plants, cinema outfits for demonstration work, opening of a new farm at Dindori to serve a backward tract, and for the experiments in poultry farming at Telinkheri and Borgaon.

J. C. McDOUGALL,  
*Director of Agriculture,*  
*Central Provinces and Berar.*

## PUBLICATIONS

- (1) The use of nitrogenous fertilizers for cotton grown on black soils, by D. V. Bal. (*Proc. first International Fertilizer Congress, Rome, 1938.*)
- (2) A study of the effect of different types of rations on the quality of milk, milk yield and the general condition of milch buffaloes, by D. V. Bal and S. K. Misra. (*Proc. Ind. Acad. Sci., 9, 117—125, 1939.*)
- (3) Cheap and simple methods of converting bones into a useful phosphatic manure, by D. V. Bal. (Leaflet No. 26 of 1939, Department of Agriculture, Central Provinces.)
- (4) A new variety of "khapli emmer" wheat from India, and its bearing upon the place of origin of Emmer wheats, by G. S. Bhatia. (*Journal of Genetics, Volume XXXV, No. 3, February 1938.*)
- (5) Cytology of Some Indian Wheats, by G. S. Bhatia. (*Annals of Botany, New Series, Volume II, No. 6, April 1938.*)
- (6) An Octoploid Amphidiploid F. Hybrid from *Triticum Vulgare* Var. *Graecum* Kcke x *T. Dicoccum Indicum*, by G. S. Bhatia. (*Journal of Genetics, Volume XXXV, No. 3, February 1938.*)
- (7) "Spodoptera mauritia" pest of rice by G. R. Dutt. (Leaflet No. 23 of 1938, Department of Agriculture, Central Provinces.)
- (8) Statistical Investigations on Crop-weather Relationship in India, by L. A. Ramdas and R. J. Kalamkar. (*Sankhya, Volume III, Part III.*)
- (9) Green-seeded Gram (*Cicer Arietinum* L) in Central Provinces, by R. H. Richharia and R. J. Kalamkar. (*Current Science, Volume VII, No. 6, 1938.*)
- (10) Government Demonstration Plot, Amarmau, tahsil Banda, district Saugor, Central Provinces, by R. J. Kalamkar and A. L. Shrivastava. (*The Nagpur Agricultural College Magazine, Volume XIII, No. 2, October 1938.*)
- (11) A note on the effect of amount of feeding of sugarcane in the Mills on the extraction of juice, by R. J. Kalamkar and W. S. Dehadrai. (*The Nagpur Agricultural College Magazine, Volume XIII, No. 4, May 1939.*)



## STATEMENT A.

## Number of private seed farms and unions

| Name of circle             | Wheat | Rice  | Cotton | Juar  | Groundnut | Sugarcane | Other crops | Total for 1938-39 | Total for 1937-38 |
|----------------------------|-------|-------|--------|-------|-----------|-----------|-------------|-------------------|-------------------|
| (1)                        | (2)   | (3)   | (4)    | (5)   | (6)       | (7)       | (8)         | (9)               | (10)              |
| Northern circle ..         | 4,329 | 1,522 | 1,751  | 725   | 867       | 483       | 2,733       | 12,410            | 10,609            |
| Southern circle ..         | 967   | 1,027 | 377    | 140   | 289       | 566       | 264         | 3,630             | 3,788             |
| Eastern circle ..          | 690   | 3,002 | ..     | ..    | 417       | 350       | 607         | 5,066             | 4,662             |
| Western circle ..          | 406   | ..    | 4,045  | 1,148 | 4,057     | ..        | 958         | 10,614            | 7,981             |
| Total ..                   | 6,392 | 5,551 | 6,173  | 2,013 | 5,630     | 1,399     | 4,562       | 31,720            | ..                |
| Total for previous year .. | 5,787 | 5,351 | 5,725  | 1,441 | 3,616     | 1,483     | 3,637       | ..                | 27,040            |

## Seed distributed in maunds and cans

| Name of circle          | Wheat   | Rice    | Cotton | Juar  | Groundnut | Whole canes | Other crops | Total for 1938-39 (excluding whole canes) | Total for previous year |
|-------------------------|---------|---------|--------|-------|-----------|-------------|-------------|---|-------------------------|
| (1)                     | (11)    | (12)    | (13)   | (14)  | (15)      | (16)        | (17)        | (18)                                      | (19)                    |
| Northern circle ..      | 200,249 | 15,575  | 19,858 | 4,769 | 7,131     | 451,400     | 14,590      | 262,172                                   | 266,254                 |
| Southern circle ..      | 45,508  | 41,775  | 4,118  | 1,673 | 7,219     | 1,386,975   | 1,275       | 101,568                                   | 91,233                  |
| Eastern circle ..       | 9,661   | 97,059  | ..     | ..    | 1,407     | 1,312,788   | 903         | 109,030                                   | 111,925                 |
| Western circle ..       | 3,383   | ..      | 14,547 | 1,547 | 39,947    | ..          | 558         | 59,982                                    | 53,875                  |
| College Farm, Nagpur .. | 200     | ..      | 164    | 38    | 13        | ..          | 114         | 529                                       | 575                     |
| Total ..                | 259,001 | 154,409 | 38,687 | 8,027 | 55,717    | 3,151,163   | 17,440      | 533,281                                   | ..                      |
| Total for previous year | 257,469 | 153,232 | 41,525 | 4,570 | 52,253    | 3,120,136   | 14,813      | ..  | 523,862                 |

Approximate area in acres sown with improved seed from private seed farms and other sources

| Name of circle<br>(1)      | Approximate area in acres sown with improved seed from private seed farms and other sources |             |               |             |                  |                    |                  |  |
|----------------------------|---|-------------|---------------|-------------|------------------|--------------------|------------------|--|
|                            | Wheat<br>(2)  | Rice<br>(3) | Cotton<br>(4) | Juar<br>(5) | Groundnut<br>(6) | Other crops<br>(7) | Sugarcane<br>(8) |  |
| Northern circle .. ..      | 350,033   | 59,854      | 61,709        | 29,211      | 7,648            | 75,967             | 2,858            |  |
| Southern circle .. ..      | 224,655   | 170,686     | 70,336        | 27,491      | 10,795           | ..                 | 11,122           |  |
| Eastern circle .. ..       | 24,437  | 550,500     | ..            | ..          | 10,427           | 2,204              | 3,922            |  |
| Western circle .. ..       | 7,194   | ..          | 168,335       | 139,696     | 155,366          | 5,698              | ..               |  |
| Total ..                   | 606,319   | 781,040     | 300,380       | 196,398     | 184,236          | 83,869             | 17,902           |  |
| Total for previous year .. | 568,415   | 702,562     | 389,773       | 166,302     | 151,466          | 52,578             | 19,026           |  |

Approximate area in acres sown with improved seed from private seed farms and other sources

Approximate value of the increased outturn resulting from use of improved seed for

| Name of circle<br>(1)      | Approximate area in acres sown with improved seed from private seed farms and other sources |                                 | Approximate value of the increased outturn resulting from use of improved seed for |       |                 |       |
|----------------------------|---|---------------------------------|--|-------|-----------------|-------|
|                            | Total for 1938-39<br>(9)  | Total for previous year<br>(10) | 1938-39<br>(11)  |       | 1937-38<br>(12) |       |
|                            |   |                                 | Rs.  | a. p. | Rs.             | a. p. |
| Northern circle .. ..      | 587,280   | 541,003                         | 11,74,425  | 0 0   | 11,13,680       | 0 0   |
| Southern circle .. ..      | 515,085   | 496,246                         | 23,47,733  | 0 0   | 23,26,660       | 0 0   |
| Eastern circle .. ..       | 591,490   | 530,826                         | 16,75,081  | 8 0   | 14,91,863       | 0 0   |
| Western circle .. ..       | 476,289   | 482,047                         | 10,32,880  | 0 0   | 9,85,156        | 0 0   |
| Total ..                   | 2,170,144   | ..                              | 62,30,119  | 8 0   | ..              | ..    |
| Total for previous year .. | ..  | 2,050,122                       | ..   | ..    | 59,20,359       | 0 0   |

**STATEMENT C**

| Name of circle                    | Ploughs      | Cane mills | Fodder cutters | akola hoes | Other implements | Spare parts   | Total number  |
|-----------------------------------|--------------|------------|----------------|------------|------------------|---------------|---------------|
| (1)                               | (2)          | (3)        | (4)            | (5)        | (6)              | (7)           | (8)           |
| Northern circle .. ..             | 344          | 32         | 1              | 6          | 1,231            | 2,477         | 4,091         |
| Southern circle .. ..             | 209          | 74         | 5              | 6          | 298              | 797           | 1,389         |
| Eastern circle .. ..              | 110          | 29         | ..             | 19         | 356              | 133           | 647           |
| Western circle .. ..              | 509          | ..         | 3              | 38         | 30               | 13,928        | 14,508        |
| College Farm, Nagpur ..           | 2            | ..         | ..             | ..         | ..               | 36            | 38            |
| <b>Total</b> .. ..                | <b>1,174</b> | <b>135</b> | <b>9</b>       | <b>69</b>  | <b>1,915</b>     | <b>17,371</b> | <b>20,673</b> |
| <b>Total for previous year</b> .. | <b>1,279</b> | <b>193</b> | <b>4</b>       | <b>44</b>  | <b>1,569</b>     | <b>17,090</b> | <b>20,179</b> |

| Name of circle                    | Total value in rupees |             | Total value in rupees for previous year |            | Books sold | Bulletins sold | Total        | Total for previous year |
|-----------------------------------|-----------------------|-------------|---|------------|------------|----------------|--------------|-------------------------|
| (1)                               | (9)                   |             | (10)                                    |            | (11)       | (12)           | (13)         | (14)                    |
|                                   | Rs.                   | a. p.       | Rs.                                     | a. p.      |            |                |              |                         |
| Northern circle .. ..             | 38,418                | 0 0         | 36,210                                  | 0 0        | 23         | 109            | 132          | 318                     |
| Southern circle .. ..             | 44,819                | 6 6         | 46,662                                  | 5 3        | 37         | 210            | 247          | 137                     |
| Eastern circle .. ..              | 19,252                | 10 0        | 15,113                                  | 10 6       | 78         | 270            | 348          | 619                     |
| Western circle .. ..              | 39,131                | 0 0         | 40,306                                  | 0 0        | 101        | 947            | 1,048        | 1,300                   |
| College Farm, Nagpur ..           | 78                    | 12 1        | 37                                      | 5 6        | ..         | ..             | ..           | ..                      |
| <b>Total</b> .. ..                | <b>1,41,699</b>       | <b>12 7</b> | <b>..</b>                               | <b>..</b>  | <b>239</b> | <b>1,536</b>   | <b>1,775</b> | <b>..</b>               |
| <b>Total for previous year</b> .. | <b>..</b>             | <b>..</b>   | <b>1,38,329</b>                         | <b>5 3</b> | <b>146</b> | <b>2,228</b>   | <b>..</b>    | <b>2,374</b>            |

## 37

## STATEMENT D

| Name of circle                    | Number of<br>Agricul-<br>tural shows<br>and fairs<br>held | Number of<br>practical<br>demon-<br>strations<br>carried out<br>by the<br>district<br>staff | Number of<br>illustrated<br>lectures<br>given |
|-----------------------------------|---|---|---|
| (1)                               | (2)   | (3)   | (4)   |
| Northern circle ..                | 23  | 1,803   | 56  |
| Southern circle ..                | 24  | 1,611   | 41  |
| Eastern circle ..                 | 0   | 4,263   | 87  |
| Western circle ..                 | 41  | 3,377   | 250   |
| College Farm, Nagpur ..           | ..  | ..  | ..  |
| <b>Total</b> ..                   | <b>97</b>   | <b>11,054</b>   | <b>434</b>                                    |
| <b>Total for previous year</b> .. | <b>86</b>   | <b>10,608</b>   | <b>710</b>                                    |