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 1940

NAGPUR
GOVERNMENT PRINTING, C. P. & BERAR
1941

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No. 76-1934-X

GOVERNMENT OF THE CENTRAL PROVINCES AND BERAR

AGRICULTURE DEPARTMENT

Nagpur, the 16th January 1941.

READ—

Report on the working of the Department of Agriculture for the year ending the 31st March 1940

RESOLUTION

The main activities of the Agriculture Department can broadly be classed under three heads : (i) experimental work and research, (ii) economics and marketing and (iii) demonstration and propaganda. Government is pleased to note that in all the three departments there was substantial progress during the year. The agricultural season was on the whole favourable to kharif crops but not so favourable to rabi crops. The outturn of cotton was the best for many years and towards the end of the year the prices also showed considerable improvement.

2. Cotton research work was re-organized during the year and two separate schemes have been initiated at Nagpur and Akola to deal with the problems peculiar to each of these important cotton tracts. The campaign against the gangai pest of paddy carried out in twelve villages of Sakoli tahsil where it was causing heavy damage has proved very effective. The loss which had been of the order of 10 to 12 annas in 1938 did not exceed 2 to 3 annas in 1939. The efficacy of the "light trap" method of control has been fully brought home to the cultivators. An investigation which will be of great benefit to the rice growing areas is concerned with the eradication of karga (wild rice) which, it is estimated causes a loss, running into several lakhs to agriculturists every year. Government is glad to note that the investigations are well on the way to success and hopes that effective means of eradicating this weed will soon be devised. In other departments also experimental and research work has made satisfactory progress. The citrus research scheme has come to a standstill but action is contemplated to revive it.

3. The most notable achievement of the Agriculture Department under economics and marketing during the last few years is the introduction of Verum 434 cotton. The area under this variety showed a gratifying increase to 1.38 lakhs of acres against .62 lakh of acres in the previous year. Verum cotton sold through the pool organized by the Agriculture Department, fetched a premium of Rs. 23 over Broach and of Rs. 52 over Oomra varieties. The total output of Verum during the year was estimated to be 40,000 bales. It is clear, therefore, that the agriculturists enjoyed an increase in income running into several lakhs by the introduction of this variety. This increase alone more than covers the total expenditure on the Agriculture

Department during the year. This is a reply to the criticism sometimes levelled at the practical utility of the work of the Department. In order to popularise Verum still further seven seed stores have been opened in the selected area in the tracts where this variety is most concentrated with a permanent advance of Rs. 3,000 each. Adequate progress was made with the surveys of the marketing conditions of several agricultural commodities and it is hoped that the rest of the programme will be completed soon. Government will then be in a position to consider measures for the improvement of marketing. The establishment of regulated markets under the Central Provinces Agricultural Produce Market Act is already receiving the serious attention of Government.

4. The demonstration and propaganda work of the department was also carried on vigorously. A large number of demonstrations, many of them illustrated with lantern slides and cinema shows, were given in each circle, and one rally in the Saugor district was attended by His Excellency the Governor of the Province. The total quantity of pure seed distributed in the province amounted to 5.46 [5.33] lakhs maunds in addition to 49 lakhs of whole cane and 1.36 lakhs of fruit seedlings. The area under pure seed has risen to 21.39 [20.95] lakhs acres. Improved implements, etc., to the value of Rs. 1.81 [Rs. 1.42] lakhs were sold and Rs. 1.45 [Rs. 1.27] lakhs were distributed as taccavi for pure seed, etc. There was a gratifying sale of artificial and other fertilizers indicating appreciation by the public of their value in raising crops.

5. Government is pleased to note that sugarcane cultivation appears to be making steady, though, slow progress. In order to facilitate and encourage sugarcane cultivation in the area irrigated from the Maniari tank in the Bilaspur district Government has established a small factory at Lormi.

6. Government wishes to place on record its acknowledgment of the valuable assistance received from the Imperial Council of Agricultural Research and the Indian Central Cotton Committee for the carrying out of various research schemes.

7. Government is also pleased to express its appreciation of the zeal and industry of the Director of Agriculture, Mr. J. C. McDougall and his staff in their efforts to promote the activities of this nation building department.

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, C. P. & Berar,

K. B. L. SETH,

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

No. 7031

FROM

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

TO

THE REVENUE SECRETARY TO GOVERNMENT,
CENTRAL PROVINCES AND BERAR.

Nagpur, the 6th December 1940.

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 1940.

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 1940

PART I.—ADMINISTRATION

I was granted leave from the 24th June till the 19th October. During my absence Mr. R. H. Hill, Deputy Director of Agriculture, Economics and Marketing, held charge of the department. Mr. Hill's place in the Marketing Section was taken by Mr. P. D. Nair, Assistant Director of Agriculture, during the above period.

Mr. E. A. H. Churchill continued as Principal of the College of Agriculture. He was on leave between the 21st July and the 19th December. During his absence Mr. J. F. Dastur, Mycologist, took charge as Principal of the College in addition to his own duties.

Mr. S. G. Mutkekar continued to hold charge of the Western Circle throughout the year except for a short period of leave at the end of December when the Extra-Assistant Director of Agriculture, Amraoti, held charge of the Deputy Director's office in addition to his own duties.

Rao Bahadur D. V. Bal, Agricultural Chemist, was on leave for one month and 14 days from the afternoon of the 8th May. During this period Mr. J. F. Dastur, Mycologist, held charge of the office of the Agricultural Chemist, in addition to his own duties.

Rao Bahadur G. K. Kelkar, Deputy Director of Agriculture, Southern Circle, Nagpur, was on leave on average pay from the afternoon of 29th April till 31st July. Mr. J. S. Gurjar, Extra-Assistant Director of Agriculture, was appointed to officiate during his absence.

Rao Bahadur D. R. Moharikar, officiating Deputy Director of Agriculture, Eastern Circle, Raipur, was on leave from the 3rd May till the 2nd September. Mr. Abdul Aziz, Extra-Assistant Director of Agriculture, Raipur, held charge of the current duties till the 14th June when Mr. M. S. Barker, Extra-Assistant Director of Agriculture, Hoshangabad, was appointed to officiate in the vacancy.

Mr. P. D. Nair, Assistant Director of Agriculture, was attached to the office of the Director of Agriculture throughout the year, except for the period from the 24th June to the 19th October when he was in charge of the Marketing Section.

Miss R. R. Shah remained in charge of the Citrus Research Scheme till the 10th February when she was placed under suspension.

Mr. B. R. Phatak, Extra-Assistant Director (College and Research Branch), and Mr. N. G. Sule, Extra-Assistant Director (Field Branch), retired from service during the year.

Two vacancies of gazetted officers were filled during the year by Mr. R. C. Shrivastava and Dr. V. G. Vaidya.

2. Expenditure on the department during the year amounted to Rs. 9,92,519 (Rs. 10,04,037). Towards this the Indian Central Cotton Committee and the Imperial Council of Agricultural Research contributed a sum of Rs. 77,999 to the schemes mentioned below :—

(*a*) Contributions from the Indian Central Cotton Committee—

	Rs.
(i) Cotton Extension and Marketing Schemes ...	21,698
(ii) Central Provinces and Berar Cotton Breeding Schemes ...	9,408
(iii) Heliothis Obsoleta Investigation ...	883
Total ...	31,989

(*b*) Contribution from the Imperial Council of Agricultural Research—

	Rs.
(i) Agricultural Marketing Surveys ...	16,298
(ii) Oilseeds Research Scheme ...	10,531
(iii) Citrus Research Scheme ...	10,512
(iv) Rice Research Scheme ...	6,956
(v) Sann Hemp Research Scheme ...	1,713
Total ...	46,010

Receipts during the year amounted to Rs. 2,42,301 (Rs. 2,14,763). The net expenditure on all branches of the department's activities thus amounted to Rs. 7,50,218. Deducting the contributions of Rs. 77,999 mentioned above, the net cost of the department to the province was Rs. 6,72,219 in 1939-40. The net cost in the previous three years was as follows :—

	Rs.
1938-39 ...	6,72,234
1937-38 ...	6,79,976
1936-37 ...	7,06,814

PART II.—AGRICULTURAL EDUCATION

3. The work of the College of Agriculture was severely dislocated from August onwards by the collapse of one of the porches of the Victoria Technical Institute building, the sequel to which was that the whole building was declared unsafe for occupation for the rest of the year and the college classes had to meet in the Science College, Law College and the farm and hostel buildings. The department is very grateful to the University and Science College authorities for the facilities they provided.

The expansion of the college has been hampered in recent years by two factors, namely, (1) relinquishing of land favourably situated for teaching purposes in favour of the Nagpur Town Improvement Trust and other institutions, and (2) the lack of laboratory accommodation.

The necessity for setting a limit to the amount of land to be relinquished has been recognized by Government and a policy has been framed which will ensure that the interests both of the Town Improvement Trust and the College will be served to the fullest extent which circumstances may permit. Certain adjustments of land to be made available to the Trust are therefore likely to be made.

The shortage of laboratory accommodation has been met in a considerable degree by the transfer of the office of the Director of Agriculture to a portion of the premises previously occupied by the High Court. This will make available for the college and research sections a commodious room which can be fitted up as a laboratory, and several other rooms in addition. The vacated rooms will be fitted up as funds become available.

For the first time the Nagpur University permitted candidates to appear privately for the Intermediate Science (Agr.) and B.Sc. (Agr.) examinations. This concession should not normally have taken effect before the examinations of 1941 but pressure on the college accommodation made it necessary to ante-date the measure by one year as it was not possible to find places in the college for all the candidates who had failed in previous examinations.

The demand for admission to the college was less than in the five previous years. The number of applications received was 72 (132); 42 candidates were called for interview and 39 were finally selected. The total strength of the College at the end of the year was 169 (172). This does not include 7 students who appeared privately for the University examinations.

Out of 34 students who appeared for the first year promotion examination, 29 qualified for entry into the second year class and two were permitted to apply for re-admission to the first year class. The strength of the second year class at the beginning of the year was 50, and 5 students joined after Diwali. Sixty-five students, including 5 compartmental pass candidates of the previous year and 5 who appeared privately, sat for the intermediate examination. Of those 8 passed in the first division, 15 in the second, 7 in the third and 13 passed without securing any division. All students in the third year were promoted to the final year class. Forty-five students including 2 private candidates appeared for the Final B.Sc. (Agr.) examination, of whom one passed in the first division, 12 in the second and 8 in the third; 6 obtained passes without securing a division and 3 secured compartmentals.

Mr. B. B. Dave, Officer-in-charge of the Rice Research Scheme, who submitted a thesis to the Nagpur University on research work on rice hybrids, was granted the degree of M.Sc. (Agr.).

The second year students visited Betul farm in January. The third year class visited Seoni, Powarkhera and Adhartal farms and the military dairy at Jubbulpore in February. The final year class toured in Chhattisgarh in October and visited Drug and Bilaspur farms.

The strength of the College contingent of the University Training Corps was 18 which included one sergeant, two corporals and a Lance Corporal. Three of the 4 non-commissioned officers secured prizes in Corps competitions. There were 7 admissions and 6 discharges during the year.

Three meetings of the College Council were held during the year. The College Magazine continued to issue regularly. Messrs. B. Subba Rao and S. K. Misra continued as Warden and Assistant Warden, respectively, of the hostel. The health of the students was on the whole satisfactory. The only serious illness was a case of meningitis in a non-resident student who made a good recovery.

4. The number of students on the roll of the Anglo-Hindi Agricultural Middle School, Powarkhera, on the 31st March 1940 was 68 as against 62 on the corresponding date in the previous session. A satisfactory feature was that only 4 boys left the school during the session as compared with 15 in the previous year. All the students are sons of men who possess land, the majority of them coming from Hoshangabad district. Nineteen boys appeared for the final examination and 17 passed. Instruction in smithy work has been added to the curriculum. Two messes were run as usual, one on a cash basis and the other on rations supplied by the boys themselves. Charges in the former mess were Rs. 4-4-0 per boy per month, and in the latter Re. 0-12-0 per month for extra items like vegetables and fuel. Produce to the value of Rs. 376 was obtained from an area of 6.5 acres allotted to the boys. Receipts from all sources amounted to Rs. 2,328 (Rs. 2,249).

5. The Anglo-Hindi Agricultural Middle School, Betul Bazar, completed its fourth year's working under the control of the department. Entries in the first year were affected to some extent by the fact that agricultural instruction has now been provided in the middle section attached to the Government High School, Betul, and an element of competition, particularly for boys who live near Betul, has arisen between these two institutions. Admission amounted to 31 (46) and the number on the roll on the 31st March was 83 (77). Eleven students appeared at the final examination and 9 passed. Instruction in carpentry and smithy work was introduced during the year under a separate teacher. Quarters for the Hostel Superintendent were erected. Twelve boys were in residence in the hostel. They provide their own rations and Government supplies a cook and *barua*.

The Buldana Peace Memorial School remained closed throughout the year as the society had no funds to keep it going.

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

PART III.—RESEARCH AND EXPERIMENTAL WORK

A.—Experimental Work in the Circles

7. **Northern Circle.**—On Adhartal farm, wheat varieties Ao 90 and A 115. Manurial trials on wheat at Kheri confirm the yields of 632 and 636 lb., respectively, from the standard varieties Ao 90 and A 115. Manurial trials on wheat at Kheri confirm the results of the previous year that the application, at sowing time, of Niciphos II at the rate of 15 lb. nitrogen per acre is profitable on unirrigated *haveli* land, and as this result has been obtained in a season when there was no winter rain the practice can be recommended with confidence for *haveli* conditions. Other experiments at Kheri have shown that it is possible to double-crop profitably paddy and gram provided organic manure is applied. Trials on Dindori farm indicate the possibility of growing potatoes without irrigation in the monsoon season and also of growing small Japan groundnut on well-drained *bharra* soil. If these results are confirmed they will provide new crops for the aboriginal tracts in that area. New types of sugarcane, *viz.*, Co 290, 300, 312 and 313 have given a higher yield than Co 237, the stock cane hitherto recommended.

Investigations with a view to evolving a satisfactory sampling technique for estimating crop yields continue. The possibility of estmating cotton yields from observations of plant population per unit length, number of bolls per plant and weight of kapas from a unit number of bolls is being explored. If this method is found practicable it will remove the necessity of visiting the fields at every picking and a wide area can be sampled in a comparatively short time.

8. **Southern Circle.**—In the varietal trials of unirrigated wheat at Chhindwara, Ao 49 has done best on the average of five years. The same strain came first in this year's unirrigated trial at Tharsa. Contrary to experience in the *haveli* tract of the north, the increased outturn derived from the application of Niciphos II to unirrigated wheat at sowing did not pay for the extra cost at Chhindwara.

Cane varieties were tested at Chhindwara, Seoni, Betul, Waraseoni and Sindewahi farms. Co 290 was the highest yielder at Chhindwara, but in all the other farms Co 312 and Co 313 proved superior. Co 290, being somewhat soft, proved liable to damage by pigs and jackals.

Local gram again gave the highest outturn at Chhindwara in the gram varietal series but in money value it was surpassed by D. 8. Similarly also, Raipur local groundnut gave a higher yield but a lower money value than Ak 8-11 selection. Tur No. 38 continues to hold the highest place among the *tur* varieties.

Fruit crops recently introduced in some of the farms of this circle are grape fruit, grapes and figs. The success of the grape fruit orchard at Chhindwara farm, which is giving very good fruit, has led to the planting of orchards on Tharsa, Seoni and Betul farms. Fig trees are in bearing on Chhindwara farm; a grape plantation started at Tharsa last year yielded a few bunches of good size and excellent quality.

9. **Eastern Circle.**—Hybrid rices Nos. 19, 22 and 116 bred at the Rice Research Station continue to be popular and are being multiplied on seed farms for distribution, and the demand for selections made from *luchai, gurmatia, surmatia* and *budhiabako* and from the finer varieties *kubrimohar, chattri* and *banspatri* is as keen as ever.

Wheat varietal trials show that, under ordinary conditions, P. 100 and A 115 are the most suitable varieties; under high fertility conditions P 101 gives the best yield, followed by P 52. Manurial tests confirm the results obtained in the north of the province, that Niciphos II drilled in with the seed is a profitable investment in embanked fields. The fertilizer also yielded a profit in unembanked land.

In the gram series Nagpur 1, closely followed by E. B. 62, gave significant results over all other varieties.

Co 312 cane proved to be the best yielder on all farms. Dry-planting of cane in *kachar* soil on Bilaspur farm was again a success. The working of the sugar factory at Lormi indicates that, with ordinary gur selling at Rs. 6 per maund, a cultivator gets Rs. 45 per acre more by turning his cane into sugar and molassine gur than by manufacturing gur alone.

10. **Western Circle.**—Experimental work in this circle is mostly conducted at the Akola experimental farm under the control of the Economic Botanist for Cotton. A certain amount of experimental work was also carried out by the Deputy Director on the seed and demonstration farms under his control with a view to determining the suitability of improved strains of crops under different soil and climatic conditions of the tract. These consisted of varietal and manurial experiments on cotton, *juar*, groundnut and *tur*.

B.—Experimental Work in the Sections

11. **Cotton Botanist's Section.**—Cotton research work has been reorganized with effect from the beginning of the year. In the old breeding scheme which had run since 1923, the research staff was centred in Nagpur, with Akola as an outlying station. Under the new arrangement there are two separate schemes, one located at Nagpur and the other at Akola. The staff at Nagpur will devote itself to the evolution of varieties suitable for the cotton tracts of Nagpur Division, while the Akola staff is concerned, broadly speaking, with cottons for Berar and the Nimar and Hoshangabad districts of Jubbulpore. The advantage of the new arrangement is that the problems confronting the two teams of workers will be more specific and better defined than was possible under the old scheme. Expenditure on the new schemes is being shared equally between the Indian Central Cotton Committee and the Provincial Government, and the schemes will run till 31st March 1944.

At Nagpur, the objective is to produce a cotton which will compete with the local "Oomras" in ginning percentage, yield and general hardiness and at the same time possess a staple capable of spinning between 20's and 25's counts. For Berar and the Jubbulpore districts, in view of the relatively higher ginning

percentage of the local type a somewhat higher ginning cotton is required even if this is to be obtained only by sacrificing a little of the staple quality of the present standard improved cotton V. 434. The Berar staff will also endeavour to breed Buri selections with a higher ginning percentage than the present standard Buri 107 for distribution in Burhanpur tahsil.

Much of the work in this, the first year of the new schemes, was concerned with the sorting out of selections available from previous research which are likely to be useful for the new research programmes and making fresh selections from cultivators' fields. More than 400 strains were grown at Nagpur and their progeny was examined in respect of purity, yield, ginning percentage and other characters. About 7,800 plants were so examined out of which 525 have been selected for further study. At Akola 260 old selections were grown from which over 400 plants were retained. In addition some 1,200 primary single-plant selections were made, mostly from ryots' fields, and some of this new material gives promise of conforming to the desired standards. In all there will be 945 single line cultures available for further study next season at Akola.

Verum 434 and Buri 107, the two improved cottons now under large-scale distribution, yielded well on Akola and Nagpur farms. The average outturn of Verum 434 was 960 lb. per acre at Nagpur and 660 lb. at Akola. Buri 107 yielded 830 lb. at Akola.

The Cotton Botanist is also responsible for research on groundnut, *juar* and *bajra* at Akola. Groundnut selections made in the previous year were tested and the best were retained. In *juar* the recently developed types E. B. 3 and 123 are competing closely with the standard improved Saoner. There is nothing definite to report about *bajra* selections.

12. **Second Economic Botanist's Section.**—Breeding work in this section continued on the lines of the previous year.

Wheat.—Types bred for rust-resistance, *viz.*, selection No. 76 and hybrid No. 281 (A 115 × Clarendon) were under trial with other strains on a field scale on Kheri Farm. It is reported that No. 76 gave the best results and the head of the section considers that it can now be recommended for distribution. Other hybrid strains, Nos. 311 and 312, bred from rust-resistant parents (A 115 × P 4) are reported to have given encouraging results at various experimental farms. Interspecific crosses between *T. dicoccum* and *T. vulgare* have produced promising strains.

Pulses—Tur.—Wilt-resistant *tur* No. 38 continues to gain popularity. A new white-seeded strain has been evolved by crossing E. B. 38 and E. B. 3, the object being to secure higher resistance to wilt.

Gram.—A new selection No. 28/13 has given statistically significant results over the local variety at Raipur. Attempts to combine the wilt-resistant capacity of Karachi and Cawnpore grams with the cropping power of No. 28 are in progress.

Urid and mung.—The aim of the work on these crops is to obtain high-yielding, bold-seeded types suited to the different tracts of the province. *Mung* selections Nos. 4 and 160 compared favourably with local types at Yeotmal. The most promising *urid* selections are Nos. 110-A and 126 which gave yields of 318 and 295 lb. per acre, respectively, at Buldana.

Soy bean.—Selection No. 53 gave a significantly higher yield than other selections. Samples of soy beans were obtained from abroad and promising plants from each have been selected.

Fodder grasses.—Work on the improvement of pasture has been undertaken in collaboration with the Forest Department in the Ambajheri and Telinkheri catchment areas. 125 plots were assesed to find out variation trends in the herbage. Five quadrats, each 10 × 10 links, were taken at random in each plot and data regarding density of vegetation, height and green weight of important and less important grasses and non-fodder species were collected.

Other crops.—Selection work, combined with preliminary study of the biology of the flower, is in progress on the small millets—*kodon*, *kutki*, *sawan*, *rala*, and *ragi*. *Kharif* castor selections Nos. 16 and 31 are reported to have done well at Powarkheda and Nagpur, respectively. Four selections have been made in chillies for yield and pungency.

Experiments on live-fencing have been started at Richai farm in collaboration with the Deputy Director, Jubbulpore. In accordance with the recommendations of the Central Fodder and Grazing Committee, *Euphorbia neriifolia*, *Prosofis guliflora* and *Cassia siamae* are being tried and *Euphorbia cauducifolia* has also been included. Observations were made on the germination, flowering, pollination, and formation and dispersal of the fruits of *Xanthium strumarium*—a weed which is fast becoming a serious pest in many parts of the province.

13. **Chemical Section**—*General analytical and advisory work.*—482 samples of agricultural importance were analysed and reported upon. Analysis of samples of linseed from the manurial experiments conducted at the Powarkheda farm showed that applications of potassium sulphate either alone or in combination with nitrogen, and applications of nitrogen alone, lower the oil percentage of the seed. Analysis of samples of green and dry linseed stalks showed that on account of the presence of cyanogenetic glucosides, the former are definitely dangerous and can even be fatal to cattle, depending upon the quantity consumed, but that dry stalks fed in quantities of 5 to 10 lb. per head per day may not be injurious.

Special investigations.—In view of the increasing interest in sugarcane cultivation in the province, particular attention was paid to the various problems connected with this crop. It was found that this year all the varieties grown on the different farms reached their maximum sucrose content about the middle of February. The varieties Co 312 and Co 313 were again found to give the highest percentage of sugar on all farms, like last year. Out of the six new varieties which were under trial at the Waraseoni farm, Co 511 and Co 519 were found to compare

favourably with the two varieties Co 312 and Co 313. Analysis of cane varieties at Bilaspur was continued till the middle of April in order to determine when deterioration in quality begins to set in. No appreciable deterioration was in evidence till about the end of March, but thereafter quality fell off rapidly. Canes planted by the "Dry" and "Wet" methods did not show any appreciable variation in the sucrose and invert sugar content of the juice.

In view of the importance of butter and *ghee* as sources of vitamin "A", a study of the periodic fluctuations, if any, in the carotenoid content of cow and buffalo butter was undertaken. It was found that cow butter is considerably richer in carotenoids than buffalo butter. A change in the roughage is almost invariably associated with a change in the carotenoid content of cow butter.

Other activities.—At the instance of the Deputy Director of Agriculture, Economics and Marketing, samples of oranges were analysed periodically for acidity. It was found that acidity was at its maximum in the month of February and gradually diminished as the season advanced till it reached the minimum in May.

Trials conducted during the last two years with cultures of gram nodule bacteria have shown definitely that inoculated gram seed produces a better crop and gives remarkably higher yields than those obtained from uninoculated seed.

Suitable exhibits were prepared and arrangements for holding demonstrations were made at the exhibitions held at Nagpur and Harda in December and February, respectively. These exhibitions provided useful opportunities for demonstrating to the urban and rural population the work done by this section.

Research work of two post-graduate students was supervised, and one student received post-graduate training in analytical work.

Under arrangements made by the Chemical Section a meeting of the Indian Society of Soil Science was held at the Agricultural Research Institute, Nagpur, on the 2nd November. Papers embodying certain aspects of soil work done by this section were read.

14. **Mycological Section**—*Cotton.*—Dusting of cotton seed with certain fungicides has again produced a good effect on yield in experiments conducted on four farms. Increased yields varying from 8 per cent to 26 per cent were obtained. Manurial experiments on cotton wilt were continued. Plots manured with (*a*) nitrate of soda, (*b*) nitrate of soda + superphosphate, (*c*) nitrate of soda + superphosphate + potassium muriate were much superior to the control plots. Plots manured with kainit or superphosphate did better than plots which had not received these manures.

Juar.—Experiments of the past two years have proved that although exposure of the seed to the hot summer sun helps considerably to control the incidence of juar grain smut, it does

not dispense with the necessity of dusting infected seed with fungicides like copper carbonate and sulphur. Further work on the head smut form (Sorosporium reiliana) point to the conclusion that the spores do not retain their viability in infected soil for a long time. Potted soil inoculated with the fungus in 1937 gave 37 per cent infected heads; in 1938 the percentage was reduced to 3, and this year all cobs were healthy. In field experiments conducted over the same period the results have not been so conclusive as in the pot experiments, although there has been a decrease in the incidence of smutted heads. This may be due to fresh infection in the field from wind-borne spores.

Wheat.—The survey and study of wheat-rust epidemiology financed by the Imperial Council of Agricultural Research continued during the year. Fortunately, however, it was not a "rust" year, and in the few places where it occurred at all the infection was very slight and appeared in February when the crop was mature. Three years' experiments on loose smut (Ustilago tritici) show that the summer temperature in Nagpur is not high enough, as it is in the Punjab, to kill the dormant mycelium inside the infected wheat seed by exposure to the sun, and that the soil conditions, such as temperature and humidity, at sowing time retard the development of the dormant mycelium in the seed and the infection of the seedling.

Groundnut.—It has now been definitely established that spraying the crop with Bordeaux mixture *cum* linseed oil as a preventive of *tikka* disease increases the yield considerably even when the crop is not affected by *tikka.*

Pan.—Gardens at Kheri, Hirdenagar, Binaka and Bahmnibanjar in Mandla district were treated by the owners for footrot and anthracnose according to the instructions given by the section. The treatment was successful and the growers were convinced of its efficacy.

Citrus.—"Pink" disease (Corticium salmonicolor) is causing more and more damage each year. The fungus mycelium lies dormant in cankers formed by the disease and becomes active under favourable moist conditions. Systematic removal of all cankered and diseased branches is essential, and spraying with Bordeaux mixture helps to prevent further infection. Mango and jackfruit trees have been found to be sources of infection.

Sann hemp.—The new disease (black blotch) discovered on the College Farm in the previous year was investigated further. The predominant fungus isolated from the black lesions was Fusarium sp. This and other fungi isolated from the dead parts of the bark failed to infect healthy tissues. Blackening of the bark was found to be due to the action of water; the fungi infect the tissues through the blackened areas and destroy the fibres.

Safflower.—A new powdery mildew (Erisyphe sp.) was observed. It is controlled by dusting with sulphur.

15. **Entomological Section**—*Orange pests.*—Laboratory observations on the life history of Indarbela and Stromatium were made. Indarbela was reared on different food plants to determine whether there is only one species, or a number of species which attack different host plants. A cheaper effective control than chlorasol for Indarbela has been found in a mixture of petrol and chloroform in the proportion of 10 to 1. The cost of this mixture is 5 annas per lb. as against 11 annas per lb. of chlorasol.

Gangai pest of rice.—A regular campaign against this pest was carried out in 12 villages of Sakoli tahsil, where it had done extensive damage in recent years. Crop protection societies were organized by the Revenue Department and with their help the Section set up "light traps" regularly throughout August and September with the result that damage which had been of the order of 10—12 annas in 1938 did not exceed 2—3 annas in 1939. The efficacy of the "light trap" method of control has thus been fully brought home to the cultivators.

Sugarcane pests.—Reports were received from several places of damage by the sugarcane fly (Pyrilla sp.) and mealy wing (Aleurolobus barodensis). The usual sprays were applied effectively. As the eggs of pyrilla are heavily parasitized, collection of the egg masses and liberation of the parasites was advocated.

A swarm of tobacco caterpillars (Prodenia litura) attacked the berseem crop at Telinkheri in April. Spraying with kerosene oil emulsion, trenching and burning with the "locust flame" completely exterminated the pest.

Last year's experiment on the effect of weekly applications of paris green on the anopheline larva population and on the yield of rice was repeated at Labhandi, but the only result which has emerged so far is that yield is not injured by the treatment. The number of larvæ found in the treated and control plots alike was again insignificant. This year the experiment will be transferred to another locality.

Bee-keeping.—Encouraging progress has been made in stimulating public interest in this attractive side industry with the active help of the Nagpur District Village-Uplift Committee. Several colonies of apis indica were captured and established. Two classes of instruction in bee-keeping methods were organized and attended by 62 students. A Provincial Bee-keepers' Association has been formed with Col. Sir K. V. Kukday, Kt., C.I.E., as Chairman, and the Entomologist as Secretary.

16. **Rice Research Scheme**—*Selection and Breeding.*—As a result of replicated yield tests with 550 varieties, carried out at Raipur, Waraseoni and Jubbulpore, sixteen high-yielding varieties of early, medium and late rices have been isolated. Seven of these belong to the fine and scented class. No further reduction in the number of selected varieties is likely to be made. On an average of five years, the variety *ajan* has given an increased yield of about 24 per cent over *surmatia* which is the standard late variety of the Chhattisgarh tract. Similarly the variety *sultugurmatia* has given 23 per cent more yield than the standard medium ripening variety *surmatia.*

Strains of uniform quality and improved cropping power have been isolated from most of the selected varieties. Pure line selection in *sultugurmatia, ajan, badshahbhog,* and *chinoor* is in progress.

Further improvement in the yield of selected strains is being sought by hybridization. With this aim and also to bring about a combination of desirable characters the following crosses were studied in the F_2 and F_3 generations :—

R 8-*Luchai* × R 6-*Budhiabako* and R 8-*Luchai* × R 7-Gurmatia. F_3 .—These crosses have been made to improve the strength of straw of high-yielding strains.

R 10-*Chhatri* × R 2-*Nungi* (No. 17) and R 6-*Budhiabako* × R 10-*Chhatri*. F_2 .—These crosses have been made to improve the yield of fine and scented varieties and to evolve early scented strains.

R 2-*Nungi* (No. 17) × *Blue Rose* and Cross No. 22 (Bhondu × Parewa) × *Blue Rose*. F_2 .—These crosses have been made with a view to evolve prolific strains with bold and translucent grain.

The prevalence of wild rice (*karga*) as a weed in the biasi paddy fields of Chhattisgarh constitutes a serious economic problem. During the period of vegetative growth wild rice is indistinguishable from most of the cultivated forms and cannot therefore be weeded out in time to allow the legitimate crop to tiller and fill in the gaps. In badly infested fields the percentage of *karga* is sometimes as high as 30, but even if the average infestation be taken to be only 3 per cent, the loss it causes over $3\frac{1}{2}$ million acres of biasi paddy amounts to many lakhs of rupees every year. Reduction of this loss is one of the objectives of the Rice Research Station, and it has already been attained to some extent by the production of hybrid rices with dark-purple auricles which distinguish them from *karga* in the seedling stage. One of the hybrids (No. 116) has been proved by trials extending over five years to be the highest yielding strain in the province. A more complete solution of the *karga* problem is hoped for from another set of hybrids of which the purple-leaved *Nagkesar* variety is one parent. The seedlings of these hybrids are entirely purple and can thus be very easily distinguished from the green *karga* seedlings. In yield, however, the hybrids are not all that is wanted, but it is hoped that this can be improved by back-crossing with the higher yielding parent.

Other work includes genetical studies of inheritance of scent in certain varieties, and of endosperm characters, habit of growth and length of kernel.

17. **Sann Hemp Scheme.**—On the chemical and cultural side experiments were carried out to study the following factors :—

(*a*) Effect of seed-rate, time of sowing and time of harvesting on the yield of stalks and fibre.

(*b*) Effect of water temperature on the retting of the stalks.

(*c*) Effect, on the quality of the fibre, of retting the stalks in running and standing water.

As regards the yield of stalks it was found that a seed rate of 80 to 100 lb. per acre gave high yields than did the lower seed rates and that there was a significant interaction between dates of sowing and stages of maturity at harvesting. The earliest sown crops when harvested at the second or third stage of maturity gave significantly higher yields than were obtained when harvesting was done at the first stage of maturity.

As regards yields of fibre it was found that the crop harvested at the second stage of maturity gave significantly higher yields than when harvested either at the first or the third stage of maturity. The highest yield was got from the first sown crop harvested at the second stage of maturity.

Retting was observed to take place more quickly in standing than in running water. Samples of fibre obtained from cold weather retting were better in colour than samples retted in the hot weather. In the cold weather retting took 8 to 9 days, while in the hot weather 5 to 6 days was sufficient.

The germination capacity of seeds obtained from fully matured and dead ripe samples was 85 and 94 per cent, respectively.

On the botanical side mass selections and single plant selections were continued. 31 cultures from mass selection and 52 individual plant selections were under observation during the year. The percentage of fibre to stalk in the different cultures was determined and was found to vary from 5.4 to 12.7 in different individuals.

Attempts were made to obtain self-fertilized seeds by mechanical and biotic agencies. With the former method the percentage of setting was 38 and with the latter 23.

Five commercial types, *viz.*, Belgaum, Jubbulpore, Chhindwara, Cawnpore No. 12 and Pusa were sown in randomized blocks. The Belgaum variety gave the highest yield of fibre, namely, 778 lb. per acre. The lowest yield, *i.e.*, 503 lb. per acre was obtained from the Pusa type. There was no significant difference in the fibre yields of the other three types.

Statistical analysis of correlation data between height of plant and yield of fibre and between diameter of the stem and yield of fibre indicated positive results.

18. **Oilseeds Research Scheme.**—Progress was made in the selection and acclimatization of the four oilseeds crops with which this section is concerned—linseed, sesame, safflower and niger.

Linseed.—Ninety-seven strains which bred true for various economic characters were selected from 366 cultures grown. Oil percentage of 30 strains and 4 Cawnpore vareties were determined. Fresh selections were made from improved departmental strains and from cultivators' crosses. Nine Australian strains selected last year from the original material proved very unsatisfactory and were therefore rejected. Four late maturing Cawnpore types grew well under irrigation, but when grown under the normal dry conditions they proved a complete failure.

A number of hand machines for the extraction of fibre from linseed straw by the dry scutching process were designed and tested. Experiments in the manufacture of various fabrics from linseed fibre yarn were continued.

Sesame.—432 kharif cultures were raised and 200 of them have been retained for further investigation. From the rabi cultures 67 strains have been selected. Acclimatization of the Burma varieties was continued. Five of them promise well and further selections have been made. Cyprus material with a very high oil content also grew well and has been retained for further work; Bhopal material proved a failure.

Safflower.—Thirty-six strains have been isolated. Oil percentages of 25 strains have been determined. Two Cawnpore varieties were tried for the first time and appeared promising.

Niger.—At Nagpur observations were made on the progenies of 13 different cultures raised from the selfed seeds of single plant selections grown in the previous years at Dindori. The plants exhibited marked deterioration in vigour and at a later stage suffered from a severe insect attack and yielded no seed. All the cultures were thus lost. In future work on this crop will be done exclusively at Dindori Farm.

Further tests of purity of five selections of the previous year were made.

The scheme has now been in operation for three out of the five years for which it has been sanctioned. It is anticipated that definite results will begin to emerge from the breeding work in the next two years. The work on utilization of linseed fibre has already attracted considerable attention.

PART IV.—ECONOMICS AND MARKETING

19. Survey reports on (1) ghee and butter, and (2) lac were submitted to the Agricultural Marketing Adviser to the Government of India and reports on gram, rape and mustard are being drafted. Surveys of mangoes, sheep and goats, wool and hair, and fish are in progress. Abridged reports of the provincial marketing surveys on wheat and linseed are also under preparation.

In the Nagpur orange market some 2,700 baskets of oranges were graded by the F. W. Grader and some 3,000 were graded by hand in the month of April. Towards the end of the year the Nagpur Orange Growers' Association and a firm in Nagpur were granted certificates of authorization under the Agricultural Produce (Grading and Marking) Act, 1937, the former for wholesale trade and the latter for retail.

Numerous samples of the fine and medium rices "Chinoor" and "Hansa" were physically analysed with a view to drawing up grade specifications. Draft specifications were forwarded to the Agricultural Marketing Adviser for approval and have been provisionally accepted. Two egg grading stations were in operation in Nagpur and nearly 23,000 eggs were graded. Grade specifications for Verum cotton have been

drafted and forwarded to the Agricultural Marketing Adviser for approval. Four typical samples of Ak 10 groundnut from different producing centres in Berar were analysed by the Agricultural Marketing Adviser and were reported to come within the Agmark grade specifications. This variety is reported to be the highest quality edible groundnut produced in India. Fourteen samples of producers' ghee collected from different places in Berar and Wardha were analysed at the Harcourt Butler Technological Institute, Cawnpore. Fifty per cent of the samples were found to be heavily adulterated with hydrogenated products. This points to the necessity for examining many more samples before provincial ghee-grading standards can be prescribed.

Consignments of oranges were sent to the Cold Storage Research Laboratory, Kirkee, for a study of their Vitamin 'C' content. The Vitamin 'C' content was not affected by cold storage. To test the capacity of the fruit to withstand transport after storage one lot was sent back to Nagpur and another to Delhi by passenger train in June. The fruit deteriorated seriously in transit in appearance, flavour and juice content. These preliminary trials indicate that refrigerated cars will be necessary to transport oranges cold storaged at Nagpur to distant markets and that a cheaper and more practical method might be to export the fruit in the normal way and put it into cold storage at large consuming centres.

The Berar Cotton and Grain Markets Law, 1897, has been repealed and the Central Provinces Cotton Markets Act, 1932, and the Central Provinces Agricultural Produce Markets Act, 1935, have been made applicable to Berar, thereby bringing the whole province under uniform market legislation. The rules framed under these Acts are being examined by Government with a view to making the necessary changes to suit local conditions in Berar. The establishment of regulated markets under the Central Provinces Agricultural Produce Markets Act is receiving the close attention of Government but progress has been slow on account of the many difficulties and diverse interests involved. A number of cases are under investigation and it is hoped that the Act will soon be applied more widely.

20. **Extension and Marketing of Verum 434 and Buri 107 cottons.**—The Verum 434 scheme which the Indian Central Cotton Committee is helping to finance is concerned with the extension of this cotton in a definite area consisting of two tahsils in Nimar district and five taluqs in Berar. In the previous year the area under this cotton was just over 62,000 acres. In 1939-40 it went up to over 86,000 in the selected taluqs and in addition there were upwards of 52,000 in other parts of the province, bringing the total area to some 138,425 acres. Seven seed stores with a permanent advance of Rs. 3,000 each were opened in the special areas. As a result of the year's pooling operations 7,081 khandis of pure seed were collected out of which 1,148 khandis were taken over by the Government seed depôts, and almost double that amount by taluq associations, for distribution. These stocks, together with the seed returned to the growers, will provide ample seed for expansion in 1940.

The total number of verum bales of all strains pooled and sold by the department was 8,246½ out of which 7,744 bales were of the Verum 434 strain. Of the latter total, the special blocks contributed 4,936. The average price at which the 8,246½ bales were sold worked out to Rs. 298-7-0 f. o. r. Bombay basis. The average rates for Broach and Oomra during the corresponding period of sale were Rs. 275-7-0 and Rs. 246-8-0, respectively, so that Verum fetched a premium of Rs. 23 on Broach and Rs. 51-15-0 on Oomra. It is estimated that the total quantity of Verum produced in the province in 1939-40 was 40,000 bales. The crop was satisfactory and even though stocks sold outside the pool did not command quite the same premium on the average, it is obvious that cultivators must have benefited considerably by growing Verum 434.

The Buri 107 extension scheme is concerned solely with the Burhanpur tahsil. Before the extension scheme commenced this year the area under Buri 107 was 2,000 acres. The object of the scheme was to cover 10,000 acres in 1939-40 and 30,000 acres in 1940-41. The first year's objective was secured, the actual acreage being just over 10,000 acres. The pool transactions were small owing to the strong competition for Buri 107 kapas in the Burhanpur market. 408 bales were pooled and sold at an average premium of Rs. 34 on Broach and Rs. 60-11-0 on Oomra. 492 khandis of pure seed were available for distribution in 1940 out of which 154 khandis were taken over by the Burhanpur Government seed depôt, the remainder being left for distribution direct from seed farmers or from the taluq associations. The stocks will be more than sufficient to cover 30,000 acres in 1940. There were no complaints regarding outturn.

PART V.—DEMONSTRATION AND PROPAGANDA

21. **Character of the season.**—Although the monsoon started about the normal time in the middle of June it was very feeble till the beginning of July. The rainfall was, in general, short and irregular throughout the season and was unevenly distributed. Kharif sowings were late and continued till after the middle of July. Germination was on the whole satisfactory although resowings had to be done in certain areas. A break which ensued from the middle of July gave good opportunities for interculture and weeding. But it lasted so long that it began to cause great anxiety in the paddy and cotton tracts, and relief works were actually started in certain districts in the north of the province and Berar. Opportune precipitations in the middle of August saved the situation, however, and thereafter conditions were fairly favourable for kharif crops. The cotton crop was the most satisfactory for many years but paddy was somewhat below normal.

The prolonged drought of July-August helped in the preparation of rabi land, but owing to the early cessation of the monsoon rabi sowings were done earlier than usual. In most areas there were no winter showers and this, combined with the early withdrawal of the monsoon, resulted in rabi crops which were in general below normal. Rain and hail in March caused damage in Saugor and Jubbulpore districts.

22. **Northern Circle.**—The quantity of pure seed distributed from all sources was 2.64 (2.62) lakhs of maunds, exclusive of 4.4 lakhs of whole canes and 41,000 fruit seedlings. The estimate of area sown with improved seed is 5.99 (5.87) lakhs of acres. 26,300 acres were under the two standard cotton strains, Verum 434 and Buri 107. Of this area, 24,098 acres were rouged out under departmental supervision. The cotton pool handled 2,119 (2,089) bales, of which 1,711 were Verum and 408 were Buri 107.

The value of improved implements sold was Rs. 48,409 (Rs. 38,418). Sales included 488 iron ploughs, 35 cane mills, 46 winnowers and 15 rahats. Taccavi amounting to Rs. 24,523 (Rs. 17,411) was given for the purchase of implements, seeds, manure and power plant.

The Damoh farm which was resumed by the department two years ago showed a profit of Rs. 786 this year, as against a loss of Rs. 595 in the first year. The Dindori farm, established in 1936, is now coming into working order and made a small profit for the first time. The working accounts of Saugor and Khandwa farm showed profits of Rs. 1,659 (Rs. 1,884) and Rs. 3,332 (Rs. 3,441), respectively.

Four Government demonstration plots were closed during the year in pursuance of the policy of concentrating demonstration work on vidya mandirs and private plots. Of the three Government plots, Amarmau made a profit of Rs. 176 (−Rs. 36), Silari a loss of Rs. 91 (+Rs. 237), and Kuan a profit of Rs. 15 (Rs. 237). The other demonstration centres were 27 private plots and 34 vidya mandirs. All the private plots ran at a profit. The financial aspect of some of the vidya mandir farms in Mandla and Hoshangabad districts was unfortunately far from satisfactory, partly on account of the unfavourable rabi season and partly also because of faulty selection in Hoshangabad district where five of the farms have had to be recommended for closure as being unlikely to yield the required income even in an average season.

Full advantage was taken, within the capacity of the staff, of all occasions for holding practical demonstrations which included 2,390 (1,803) demonstrations and 144 (56) cinema and lantern lectures. Special features were the rally at Saugor farm at which His Excellency the Governor was present, and participation in the Industrial and Agricultural Exhibition at Harda. Silage making was demonstrated at various centres in co-operation with the Forest Department. Measures to combat "foot rot" and "anthracnose" in pan were undertaken successfully in Mandla and Hoshangabad districts.

The four agricultural associations in Nimar district continued to do useful work in providing staff for cotton extension work and in advancing money to meet contingent expenditure on marketing. Two associations in Jubbulpore district were handicapped by their funds being locked up in the Jubbulpore Co-operative Bank. Such other associations as were active confined themselves mainly to hiring out of implements and stocking improved seed and implements for sale on a limited

scale. With a view to promote co-operation in the villages in regard to seed supply panchayat kothis have been organized at some centres in Jubbulpore, Saugor and Mandla districts. Under this system seed will be collected at harvest time for distribution at sowing time on the *barhi* system. If the seed is impure it will be exchanged for pure seed. Two co-operative sugarcane growing societies have also been organized in Jubbulpore district. Their progress is being watched with interest. The steam tackle outfit operated in this district from the end of January. By the end of the ploughing season it had dealt with 628.14 acres. The charge was Rs. 9 per acre as formerly.

23. **Southern Circle.**—Pure seed amounting to one lakh (1.01 lakh) of maunds was distributed from all sources. Whole canes amounting to 17.60 (13.86) lakhs were also distributed for planting. The estimate of area sown with improved seed is 4.63 (5.15) lakhs of acres.

The demand for fertilizers for application principally to paddy and sugarcane continues to be substantial. 9,063 (8,684) maunds were distributed, mainly in Balaghat and Bhandara districts. Sales to the value of Rs. 47,167 (Rs. 44,819) were made in respect of implements, cane mills, water-lifts and fencing material. Taccavi loans for purchase of improved seed, manure and implements amounted to Rs. 78,052 (Rs. 84,811).

The four demonstration farms at Betul, Seoni, Waraseoni and Sindewahi all had a successful year financially. According to the farm working accounts, Seoni farm made a profit of Rs. 4,790 (Rs. 3,191); Betul also had a very substantial margin of profit, *viz.*, Rs. 3,096 (Rs. 2,276); the Sindewahi and Waraseoni farms showed profits of Rs. 2,211 (Rs. 350) and Rs. 1,549 (Rs. 872), respectively. The Seoni farm crops were particularly good. Wheat averaged 805 lb. per acre, gram 886 lb. and linseed 860 lb. while the gross value of the sugarcane crop was as much as Rs. 469-12-4 per acre. In the two most successful farms, *viz.*, Betul and Seoni, irrigation is entirely from wells. These farms afford an excellent example of the potentialities of well irrigation combined with improved methods of agriculture. Ten Government demonstration plots and 45 private plots were run under the supervision of the department. Seven of the Government plots and 40 private plots made a margin of profit. Seventeen vidya mandir farms have been established, but on account of the unfavourable season only six of them gave the desired margin of profit.

Practical demonstrations were given at 1,879 (1,611) centres. A cinema outfit toured the plateau districts and gave shows at 24 centres. "Farmers' Days" were organized at Betul, Seoni and Waraseoni and were very well attended.

There are now 17 registered co-operative agricultural associations in the circle, all of which except one worked at a small profit. As in other circles, these associations are inclined to lean too much on the agricultural assistants, and a lack of active interest on the part of members is in evidence in many cases. Special propaganda was organized in centres selected for village-uplift work. Demonstrations were arranged for the benefit of

students of the village-uplift classes held at Bhandara and Betul. Increasing interest in fruit cultivation is in evidence in the circle, and special attention is therefore being devoted to fruit cultivation on the Government farms at Seoni, Betul and Tharsa. 36,750 (27,622) fruit plants were distributed during the year. Sale transactions of the Nagpur Orange Growers' Association were disappointingly small, only 9 wagons having been despatched as compared with 33 in the previous year. This is ascribed to the fact that prices in the local markets were generally favourable.

24. **Eastern Circle.**—The quantity of improved seed given out from all sources amounted to 1.21 (1.09) lakhs of maunds. In addition to this, 27.4 lakhs of whole canes were distributed, which is more than double the number of the previous year. The approximate area sown with improved seed was 6.55 (5.91) lakhs of acres.

Implements to the value of Rs. 22,825 (Rs. 19,252) were sold, mostly for horticultural purposes. There was a very large demand for fertilizers, 7,056 (2,564) maunds having been sold. 2,044 (2,123) maunds of oil cake were also sold for manurial purposes. Taccavi loans amounting to Rs. 27,415 (Rs. 16,607) were advanced for the purchase of improved seed, manures, water-lifts, etc.

All three demonstration farms worked at a profit. The working account of the Chandkhuri farm showed a profit of Rs. 2,200, Bilaspur farm Rs. 1,291 and Drug farm Rs. 894.

Two Government demonstration plots were run at a substantial profit. The other centres were 36 private plots and 26 vidya mandir farms. All these plots have been run with a profit although the average net income from the vidya mandir farms worked out at only Rs. 162, instead of the desired net income of Rs. 200. Considering that many of these farms started late in the season and that sowing had therefore to be done without adequate cultivation, manuring or land improvement, the results are not unsatisfactory, and given average conditions all the vidya mandir farms are likely to produce the required income of Rs. 200 per annum.

Other forms of propaganda included 4,343 (4,263) practical demonstrations and 61 (87) lantern lectures. Fourteen co-operative rallies were attended. "Farmers' Days" were organized at Lormi and Drug and exhibitions were held at eight centres. 334 books and bulletins were sold.

There had been a rapid increase in fruit and vegetable cultivation in the circle. Orchards have been extended to 709 (613) villages. 58,227 (43,474) fruit trees were distributed for planting in *baris*. Of those, 22,661 were given free of cost. The number of fruit nurseries rose from 40 to 97. Vegetable cultivation has been extended to 437 (311) villages.

The four registered tahsil agricultural associations continued to do business in supply of agricultural requisites and hiring out of implements. The Co-operative Growers' Associations

at Raipur, Drug and Bilaspur are now getting into working order. The three associations between them have a membership of 818 and 5,418 maunds of paddy were stocked in the associations' godowns for sale. Raipur association sold at prices 18½ per cent higher than the value of the grain on the date of deposit in the godown, while the Drug association secured 7½ per cent extra. Strenuous propaganda is being undertaken to interest small cultivators in the scheme. Seed unions which numbered 285 (288) held paddy stocks to the extent of nearly 28,000 maunds. Some unions which were not working properly were closed down. Twelve were registered under the Co-operative Credit Societies Act. The Baghmarra union continues to serve as a model of what can be achieved through co-operation. The co-operative dairies at Drug and Bilaspur worked successfully and supplied 20,345 and 35,909 seers of milk, respectively. Towards the end of the year a third dairy was opened at Raipur. The Co-operative Cultivation Society at Raipur made a profit of Rs. 1,200 on an investment of Rs. 1,480.

Good progress has been made in the extension of sugarcane, particularly under the Kharung and Maniari tanks where the area has increased from 300 to 900 acres. This rise is due partly to the establishment of the sugar factory at Lormi and partly to satisfactory *gur* prices. A comprehensive scheme for rapid development of cane under these tanks is under consideration. Grass reserves under the control of the department are being steadily improved by the introduction of *Ischaemum laxum* seed. Ensiling of grass was demonstrated at 39 centres, and silage from some centres was given free to cultivators.

25. **Western Circle.**—The total amount of improved seed distributed through departmental agencies amounted to 61,232 (59,892) maunds. This included 30,946 (39,947) maunds of groundnut and 24,575 (14,547) maunds of cotton seed. Verum 434 continues to be the best of the improved cottons so far evolved in point of outturn, hardiness and price. As it has proved more popular in the *ghat* taluqs than elsewhere in the circle, efforts have been concentrated on the four *ghat* taluqs, namely, Basim, Pusad, Chikhli and Mehkar and also in the Ellichpur taluq. The area covered by this strain throughout the circle amounted to 115,009 acres, the total area under verum of all strains being 133,807 acres. The infiltration of verum is however considerably greater than the figures just quoted as is apparent from the gradual improvement in the quality of the ordinary *jadi* crop which has accompanied the introduction of verum strains. 6,184 (3,191) bales of verum were sold through the departmental pool.

The total area occupied by improved varieties of all crops was 4.22 (4.02) lakhs of acres. These figures exclude the area under roseum cotton in both years.

Implements worth Rs. 62,835 (Rs. 39,131) were sold. These included 722 (509) ploughs. Taccavi loans to the extent of Rs. 14,941 (Rs. 8,364) were issued, mostly for the purchase of improved seed and implements.

All Government seed and demonstration farms made good profits during the year. On the working account, Ellichpur farm made a profit of Rs. 4,649, Yeotmal Rs. 1,778, Borgaon Rs. 2,813, Basim Rs. 1,632 and Buldana Rs. 3,483.

The six Government demonstration plots made profits ranging from Rs. 6 to Rs. 32 per acre. The three plots at Duni, Kalamkhar and Zilpi in the Melghat are reported to be having a noticeable effect in improving the standard of cultivation in that area.

The private demonstration plots numbering 29 (34) also showed reasonable profits. Some of those which had been in operation during the previous year had to be closed down on account of lack of interest on the part of the owners. Ten vidya mandir plots were under cultivation and the pooled profits from those were sufficient to meet the pay of the gurus.

Propaganda activities organized by the department included 33 (41) shows, 3,053 (3,377) demonstrations and 287 (250) lantern lectures. Exhibitions of agricultural cinema films were very popular.

There are in all 22 agricultural associations in the circle and 29 agricultural societies or branch associations. All these associations run shops of their own, the main business of which is the sale of seeds, implements and fertilizers and the hiring out of implements. Some of these institutions are doing valuable work in rural development but there are others the management of which is so inefficient that they may have to come into liquidation. The total profits realized by the associations amounted to Rs. 12,534 (Rs. 9,085) representing over 19 per cent on their share capital. The hiring out of 1,354 (1,325) iron ploughs produced an income of Rs. 7,908 (Rs. 5,663). The Basim, Mehkar and Khamgaon associations have built their own godowns and it is hoped that other associations will follow their example.

The departmental staff has done all it could in the way of planning and carrying out programmes of improvement for the benefit of the district rural uplift committees and it is satisfactory to note that the department has become much better known through these uplift activities. Unfortunately, however, the enthusiasm which was in evidence, both among the workers and the people, when the village uplift movement was started is on the wane and reorganization of the district committees appears to be necessary if effective progress is to be maintained.

Cactus which used to be of considerable nuisance in many parts of the Western Circle has been effectively eradicated by the introduction of the cochineal insect.

26. Agricultural Engineering.—The Assistant Agricultural Engineer visited Ellichpur, Bilaspur, Chandkhuri, Lormi and Powarkheda farms and investigated and advised on pumping and cane-crushing schemes. He also prepared estimates for a number of power plants, water lifts and other agricultural machinery.

The Section erected a small sugar factory at Lormi in Bilaspur district and installed the necessary plant. Other works were the overhaul of Government and private power plants, and tractor cultivation at Dindori and Dewal farms.

A steel structure measuring 40′ × 48′ was fabricated for the Southern Circle, and a stores godown 20′ × 12′ was erected for the Second Economic Botanist.

Two bores were put down at Telinkheri, one 4″ in diameter to a depth of 75 feet and another 6″ in diameter to a depth of 97 feet. Water was found in both cases.

Seven men were trained in engine and machinery work and five of them secured proficiency certificates.

PART VI.—HORTICULTURAL GARDENS AND ARBORICULTURE

27. The Government gardens in Nagpur put up a good display of monsoon and cold weather flowers. Double nasturtiums were particularly good. Among new cold weather annuals tried during the year two, *viz.*, chrysanthemum snowball and *Gaura lindheimeri* were found to suit local conditions. Vegetable crops in the Maharajbagh were satistactory in both seasons, except that the cold weather crop finished earlier than usual because of water shortage. A variety of sour lime (citrus acida) planted in 1934 came into bearing this year. A characteristic of this variety is that it fruits continuously throughout the year. If it runs true to type it will be propagated for sale.

Seven demonstration jamadars of the department were given a six months' course in fruit and vegetable culture at the Maharajbagh.

The water-supply from Telinkheri tank to Telinkheri garden has been hampered by frequent chocking up of the pipe. The garden well has accordingly been provided with a rahat. Improvements in the layout of the garden suggested by His Excellency the Governor are being carried out.

Receipts from the Nagpur gardens, exclusive of free supplies to the extent of Rs. 364-13-3 to departmental institutions, amounted to Rs. 9,788-5-3 (Rs. 9,630) against an expenditure of Rs. 37,605 (Rs. 36,631).

Shortage of water was acute in the Secretariat and other office gardens in the cold weather, but shrubberies, pot plants and delicate trees were kept going by hand watering from wells. A scheme for amplification and improvement of arboricultural work in the civil station area is being worked out with the collaboration of the Silviculturist of the Forest Department.

At Pachmarhi, weather conditions were fairly normal for garden operations, although frost in February caused damage to tomatoes and brinjals. The display of flowers was remarkably good in both seasons and was much appreciated by visitors. Financially the garden has suffered heavily in the past two years through the discontinuance of the September-October stay of Government officers, and competition from vegetables imported from Chhindwara and elsewhere. The total receipts amounted to Rs. 5,580-6-6 (Rs. 6,132-5-9) against an expenditure of Rs. 7,154-11-0 (Rs. 7,252-11-9).

Ten district gardens were under the direct management of this department. These gardens have improved considerably since they were taken over by this department and are becoming increasingly popular as public resorts. Recently the area under fruit has been increased. They are now important centres for demonstrating methods of fruit culture and for propagating and supplying fruit seedlings. Every effort is made to run the gardens on profitable lines but it is difficult to accomplish this aim as in every case an ornamental portion has to be maintained for the use of the public. Besides, some of the gardens are also not very suitably situated for profitable cultivation as the soil is unsuitable and water-supply insufficient.

28. **Acknowledgments.**—Grateful acknowledgment is made of the generous financial assistance which the Imperial Council of Agricultural Research and the Indian Central Cotton Committee continued to give for the promotion of research and development work, details of which are given in paragraph 2 of this report.

STATEMENT A

Number of private seed farms and unions

Name of circle	Wheat	Rice	Cotton	Juar	Ground-nut	Sugarcane	Other crops	Total for 1939-40	Total for 1938-39
1	2	3	4	5	6	7	8	9	10
Northern circle ..	4,975	1,713	1,967	827	794	621	4,008	14,905	12,410
Southern circle ..	746	707	195	166	214	405	209	2,642	3,630
Eastern circle ..	714	3,187	..	..	441	575	613	5,530	5,066
Western circle ..	364	..	4,600	1,270	2,305	..	845	9,384	10,614
Total ..	6,799	5,607	6,762	2,263	3,754	1,601	5,675	32,461	31,720
Total for previous year ..	6,392	5,551	6,173	2,013	5,630	1,399	4,562	..	31,720

STATEMENT A—*concld.*

Seed distributed in maunds and canes.

Name of circle	Wheat	Rice	Cotton	Juar	Groundnut	Whole canes	Other crops	Total of 1939-40 (Excluding whole canes)	Total for 1938-39
1	2	3	4	5	6	7	8	9	10
Northern circle ..	199,519	16,121	16,673	5,556	7,705	446,375	18,470	264,044	262,172
Southern circle ..	48,735	37,679	2,035	2,199	7,932	1,760,155	1,660	100,240	101,568
Eastern circle ..	11,280	106,876	..	..	1,334	2,745,218	1,494	120,984	109,030
Western circle ..	2,831	..	24,575	2,065	30,946	..	815	61,232	59,982
College Farm, Nagpur ..	158	..	24	33	26	..	64	305	529
Total ..	262,523	160,676	43,307	9,853	47,943	4,951,748	22,503	546,805	..
Total for previous year ..	259,001	154,409	38,687	8,027	55,717	3,151,163	17,440	..	533,281

STATEMENT B

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

Name of circle	Wheat	Rice	Cotton	Juar	Groundnut	Other crops
1	2	3	4	5	6	7
Northern circle ..	371,130	59,250	26,574	41,002	7,712	90,525
Southern circle ..	184,770	157,570	59,645	33,420	14,705	..
Eastern circle ..	27,281	607,603	..	..	11,962	2,663
Western circle ..	7,865	..	128,793	151,878	124,612	8,842
Total ..	591,046	824,423	215,012	226,300	158,991	102,060
Total for previous year ..	606,319	781,040	300,380*	196,398	184,236	83,869

*Includes 126,252 acres of roseum.

STATEMENT B—*concld.*

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

Name of circle	Sugarcane	Total for 1939-40	Total for previous year	Approximate value of the increased outturn resulting from the use of improved seeds	
				1939-40	1938-39
1	8	9	10	11	12
				Rs. (Lakhs)	Rs. (Lakhs)
Northern circle ..	3,262	599,455	587,280	1256	11.74
Southern circle ..	12,818	462,928	515,085	22.53	23.48
Eastern circle ..	5,875	655,384	591,490	1.90	16.75
Western circle ..	..	495,872	476,289	12.13	10.33
Total ..	21,955	2,213,639	..	49.12	..
Total for previous year ..	17,902	..	2,170,044	..	62.30

STATEMENT C

Number of implements and parts of implements sold.

Name of circle	Ploughs	Cane mills	Fodder cutters	Akola hoes	Other implements	Spare parts	Total
1	2	3	4	5	6	7	8
Northern circle ..	488	35	..	..	1,040	3,563	5,126
Southern circle ..	170	134	1	..	166	1,033	1,504
Eastern circle ..	31	95	..	15	340	208	689
Western circle ..	722	..	1	26	121	18,291	19,161
College Farm, Nagpur ..	..	..	..	..	..	22	22
Total ..	1,411	264	2	41	1,667	23,117	26,502
Total for previous year ..	1,174	135	9	69	1,915	17,371	20,673

STATEMENT C—*concld.*

Number of implements and parts of implements sold.

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	48,409 0 0	38,418 0 0	109	181	290	132
Southern circle	47,166 15 3	44,819 6 6	34	174	208	247
Eastern circle	22,825 1 5	19,252 10 0	120	214	334	348
Western circle	62,835 0 0	39,131 0 0	68	839	907	1,048
College Farm, Nagpur	22 13 8	78 12 1	..	..	..	..
Total ..	1,81,258 14 4	..	331	1,408	1,739	..
Total for previous year ..	..	1,41,699 12 7	239	1,536	..	1,775

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 ..	46	2,390	144
Southern circle ..	23	1,879	88
Eastern circle ..	11	4,343	61
Western circle ..	33	3,053	287
Total ..	113	11,665	580
Total for previous year ..	97	11,054	434

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