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 1941

NAGPUR
GOVERNMENT PRINTING, C. P. & BERAR
1941

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GOVERNMENT OF THE
CENTRAL PROVINCES AND BERAR
AGRICULTURE DEPARTMENT

Nagpur, the 28th August 1941.

READ—

Report on the working of the Department of Agriculture for the year ending the 31st March 1941.

RESOLUTION

The Agriculture Department has completed another successful year. The agricultural conditions prevailing during the year were peculiar. On the whole they were more favourable to the cotton tract than to the wheat and rice tracts. In fact in the Chhattisgarh Division and in the Jubbulpore and Mandla districts of the Jubbulpore Division it was necessary to organise some measures of relief.

2. In the field of agricultural education Nagpur University has gone a step further in encouraging post-graduate study by instituting a Ph.D. degree in Agriculture. The popularity of the College of Agriculture in the province continues to grow and the results achieved are highly satisfactory.

3. In the field of research and experimental work also steady progress has been maintained. It has been established that grape-fruit can be grown successfully in the plateau districts. One of the most important research schemes in the province at this time is the rice research scheme located at Labhandi farm in the Raipur district. The department has evolved 14 improved varieties of paddy to suit the varying requirements of different tracts and people. Hybrids bred for the elimination of wild rice (karga) are almost fixed and, at the lowest computation, it is expected that they would be able to save loss aggregating about Rs. 21 lakhs in the three districts of the old Chhattisgarh Division. Research continues into methods of fighting rust which is the great enemy of the wheat crop. Two new rust resistant varieties, Nos. 3712 and 3729, are being tried out and the Mycological Department is making experiments to discover methods for fighting the infestation. A new wheat research scheme which the Imperial Council of Agricultural Research is helping to finance came into force soon after the close of the year.

4. The research into cotton has now been divided into separate branches for the Central Provinces and Berar. Government is pleased to note that there has been increase in the popularity of verum cotton, the area under which has risen from 16,000 acres in 1937-38 to nearly 2.71 lakhs acres in the year under report. It is also satisfactory that verum 434 commanded

a premium of Rs. 42-13-0 over Broach and Rs. 76 over Oomra, and that the decline in prices of cotton caused by the war was much less steep for verum than that for Oomra. Another instance of the value of agricultural research to the rural economy of the province is furnished by the fact that it is estimated that the extra income to agriculturists from verum 434 alone amounted to about Rs. 15.5 lakhs.

5. The department carried on its usual administrative and propaganda activities to bring home the results of research to the agriculturists. In this connection it is interesting to note that a scheme for a new method of propaganda and for promoting an interest in mixed farming has been evolved with the aid of the Imperial Council of Agricultural Research and the Indian Central Cotton Committee and will soon be put into operation. 5.33 lakhs maunds of pure seed were distributed during the year and the estimated area under improved seed increased from 20.88 lakhs acres to 22.90 lakhs acres. This seed is in addition to over 35 lakhs of sugarcanes and nearly one and a quarter lakhs of fruit seedlings distributed for planting during the year. Implements to the value of over Rs. 1½ lakhs were sold. A decline of about Rs. 30,000 is attributable to an increase in the price of the implements and unsatisfactory crops in some tracts.

6. The Agriculture Department did its part in the measures for fighting the conditions created by the failure of crops in the Chhattisgarh Division. All the assistance possible was rendered to the officers of the Revenue Department in estimating the outturn of crops and making enquiries into the requirements of the people. Seed worth Rs. 90,000 was purchased in the Drug district alone with the aid of the officers of the Agriculture Department and similar action, though on a smaller scale, was taken in some other districts.

7. A scheme has also been evolved for planting ornamental trees on roadsides and in compounds in the Nagpur town, for which purpose a special fund has been organized to which Government and the people are expected to contribute.

8. The thanks of the Provincial Government are due to the Imperial Council of Agricultural Research and the Indian Central Cotton Committee for their continued support. Government also records its appreciation of the continued devotion to duty and industry of the Director of Agriculture, Mr. J. C. McDougall, and his 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, C. P. & Berar,

K. B. L. SETH,

Secy. to Govt., C. P. & Berar, Agr. Dept.

REPORT ON THE WORKING OF THE DEPARTMENT OF AGRICULTURE, FOR THE YEAR ENDING THE 31ST MARCH 1941

PART I.—ADMINISTRATION

I held charge of the department throughout the year.

Mr. R. H. Hill, Deputy Director of Agriculture, Economics and Marketing, was on leave from 1st April to 30th June during which period Mr. J. S. Gurjar was placed in charge of the Section.

Mr. J. F. Dastur, Mycologist, was on leave from 15th April to 29th June. During his absence Rao Bahadur D. V. Bal held charge of the Mycological Section in addition to his own duties as Agricultural Chemist.

Mr. S. G. Mutkekar, Deputy Director of Agriculture, Western Circle, Amraoti, proceeded on leave preparatory to retirement from 16th February. Rao Bahadur G. K. Kelkar was placed temporarily in charge of the Western Circle in addition to his own duties as Deputy Director of Agriculture, Southern Circle.

Mr. P. D. Nair was attached to the office of the Director of Agriculture until he proceeded on leave for four months from the 6th March.

Mr. S. S. Pande, officiating Economic Botanist for Cotton, was on leave from 9th July to 6th September. During his absence Mr. S. C. Roy was placed in charge of the current duties of the post of the Economic Botanist for Cotton in addition to his own duties of Cotton Breeding Research Officer.

Mr. B. Subba Rao was appointed to officiate in the Provincial Agricultural Service, Class II, from 30th September and posted as Extra-Assistant Director of Agriculture, Hoshangabad.

Mr. A. H. Barde officiated in the Provincial Agricultural Service, Class II, from 14th December to 20th January as Extra-Assistant Director of Agriculture, Akola.

Mr. M. S. Barker, Extra-Assistant Director, retired with effect from the 8th August.

2. Expenditure on the department during the year amounted to Rs. 10,12,919 [Rs. 9,92,519]. This included a sum of Rs. 69,826 contributed by the Indian Central Cotton Committee and the Imperial Council of Agricultural Research for the various research schemes detailed below :—

(a) *Contribution from the Indian Central Cotton Committee*

	Rs.
(i) Cotton Extension and Marketing Scheme ..	22,824
(ii) Central Provinces and Berar Cotton Breeding Schemes.	12,424
(iii) Heliothis Obsoleta investigation ..	789
Total ..	36,037

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

		Rs.
(i) Agricultural Marketing Scheme	..	14,522
(ii) Oilseeds Research Scheme	..	10,140
(iii) Rice Research Scheme	..	5,899
(iv) Sann hemp Research Scheme	..	1,632
(v) Citrus Research Scheme	..	1,596
Total	..	33,789

In addition, a contribution of Rs. 6,161 on account of the Pan Research Scheme is due from the Imperial Council of Agricultural Research, bringing the total contribution of the Imperial Council and the Cotton Committee for the year to Rs. 75,987.

Receipts during the year amounted to Rs. 2,52,872 [Rs. 2,42,301]. The net expenditure on all branches of the department's activities thus amounted to Rs. 7,60,047. Deducting the contributions of Rs. 75,987 mentioned above, the net cost of the department to the province will be Rs. 6,84,060 in 1940-41. The net cost in the previous three years was as follows :—

	Rs.
1939-40	... 6,72,219
1938-39	... 6,72,234
1937-38	... 6,79,976

PART II.—AGRICULTURAL EDUCATION

3. The Victoria Technical Institute building, which had to be vacated by the College of Agriculture early in the preceding session as being unsafe for occupation, was re-occupied in August. Thanks are due to the Public Works Department for the promptitude with which the extensive repairs were executed. The north wing of the first floor, previously occupied by the office of the Director of Agriculture, has been made over to the college to provide for an additional chemical laboratory and other teaching and research requirements. Shortage of accommodation was being felt acutely and the extra accommodation now secured will go a considerable way towards remedying the position. Arrangements for fitting up the new premises are in hand.

Three men were admitted to the degree of M. Sc. (Agr.) of Nagpur University during the year on presentation of a thesis. The University has gone a step further in encouraging post-graduate study by instituting a Ph. D. degree in Agriculture.

Applications for admission to the College of Agriculture numbered 78 [72] ; 54 [42] candidates were selected for interview and 48 [39] were finally admitted. The total strength of the

college at the end of the year was 166 [169]. This is exclusive of six students who appeared privately for the University examinations.

Out of 43 students who appeared for the first year promotion examination, 38 qualified for entry into the second year class. Thirty-nine students appeared for the University Intermediate examination. This number included three candidates who appeared privately and six who joined for a revisionary course after Diwali. Four men passed in the first division, 14 in the second division, nine passed without securing a division and three were granted compartmental passes. Thirty-two students out of a total of 36 in the third year class were promoted to the final year class. Forty-nine students, including three private candidates and 10 who joined for a revisionary course after Diwali, sat for the final B. Sc. (Agr.) examination. The percentage of passes was unusually high; one man passed in the first division, 25 in the second and nine in the third, while six secured bare passes.

The second year students visited Betul farm in January. The third year class visited Chhindwara, Powarkheda and Adhartal farms and the Jubbulpore Military Dairy during February. The final year students toured in Chhattisgarh in November, visiting Drug and Bilaspur farms, the Tandula irrigation headworks, and Baghmarra village in Balod tahsil.

The short course in practical dairying which is held in alternate years ran from October till March. The attendance was poor; 11 men joined the course but only five completed it.

With effect from 1940-41 session, the basic College fee charged to *bona fide* residents of the province has been raised from Rs. 90 to Rs. 102, thus bringing it to the same figure as in the Government Arts Colleges. Four students admitted from States and other provinces the fee has been raised from Rs. 600 to Rs. 1,000.

The strength of the College contingent of the University Training Corps was 22 [18]. Eleven new men were enrolled and two discharged. One member has obtained a temporary commission in the Indian Army.

The College Council met twice during the year. The social gathering held in December was addressed by Mr. W. R. Puranik, B.A., LL.B., Advocate-General. The College Magazine continues to furnish useful information, and successive issues appeared regularly. Mr. B. Subba Rao relinquished the editorship of the magazine and the wardenship of the hostel to Messrs. N. M. Joglekar and S. K. Misra, respectively, on his promotion to gazetted rank in the field service, and Mr. K. S. S. Iyer became Assistant Hostel Warden. The health of the students was very satisfactory throughout. Necessary precautions were taken to ward off cholera infection.

The College was honoured by a visit from His Excellency the Governor on the 8th January when His Excellency saw the classes at work and inspected the hostel, farm and research sections.

4. Twenty-six new boys were admitted to the Anglo-Hindi Agricultural Middle School, Powarkheda, but 11 left during the session. The number on the roll on the 31st March was 66 [68]. The majority, as usual, belong to Hoshangabad district and of the remainder 11 are from neighbouring States. Twenty-five are sons of malguzars and the other 41 are sons either of cultivators or of people who possess land. Nine out of the 12 boys who appeared for the final examination passed. Good progress was made in carpentry and smithy work which are recent additions to the curriculum. Physical training and games are prominent features of the school life. The classes were taken to neighbouring villages to study crops and village conditions, and the senior class visited Itarsi market. Produce of the value of Rs. 375-11-0 was obtained from the area of seven acres worked by the boys. Tuition and hostel fees amounted to Rs. 2,228 [Rs. 2,328]. The charges in the cash mess were Rs. 4-2-0 per boy per month. For boys who bring their own rations the cost of extra items like vegetables and fuel was 10 to 12 annas per month.

The school was honoured by the visits of His Excellency the Governor and Lady Twynam and of the Financial Adviser to the Governor.

5. Entries to the junior class in the Anglo-Hindi Agricultural Middle School, Betul Bazar, were 24 [31]. The school continues to be affected appreciably by competition from the middle section attached to the Betul High School in which agriculture is taught. The total number on the roll on the 31st March was, however, the same as in the previous year, *viz.*, 83, although 13 boys left during the session. The proportion of (*a*) Brahmins, (*b*) Kurmis and Kunbis and (*c*) other castes is almost exactly equal. Among the latter are three from the scheduled castes. Seventeen boys appeared for the final examination and 16 passed. As at Powarkheda, the boys were keenly interested in carpentry and smithy work. A farm area of 2.80 acres was allotted to the school for practical work. Produce of the value of Rs. 143 was obtained from this area. The classes were taken to the Veterinary Hospital and to Betul Bazar market. Recreation activities included games, drill and scouting. Seven boys were in residence in the hostel. They provided their own rations. The cost of living did not exceed Rs. 4 per head per month. Receipts from tuition and hostel fees were Rs. 1,577-8-0 [Rs. 1,688-12-0].

6. Agriculture continued to be taught as an optional subject at Basim and Betul High Schools and in the middle schools at Multai and Talegaon Dashesar. Agricultural instruction was also imparted in 25 other middle schools in the province.

PART III.—RESEARCH AND EXPERIMENTAL WORK

A.—Experimental Work in the Circles

7. **Northern Circle.**—The main part of the experimental work was carried out at Adhartal, Kheri and Powarkheda farms. An interesting and important result of the wheat varietal trials at

Adhartal was that the variety I. P. 52 was practically unaffected by the severe general rust epidemic and gave the very satisfactory yield of 777 lb. per acre. I. P. 101 came next with 654 lb. The Second Economic Botanist's selections Nos. 345, 346, 3712 and 3729 have also shown a higher resistance to rust than the standard varieties. Their yield under normal conditions will be observed. Gram type V gave the highest yield both at Adhartal and Powarkheda.

Manurial experiments in *haveli* wheat confirm the conclusions reported last year that the application of niciphos drilled in with the seed at the rate of 15 lb. nitrogen per acre is profitable in ordinary circumstances. All the varieties included in the experiment, except I. P. 52, were damaged by rust and therefore the manure did not prove economic in their case. But in the case of I. P. 52 which escaped damage the results of previous years were fully confirmed. Very good results were also obtained from a dressing of ammonium sulphate at the rate of 30 lb. nitrogen per acre on irrigated wheat on light soil at Adhartal. A complex factorial 3^3 experiment under dry conditions involving three varieties and three levels of both nitrogen and phosphate, *viz.*, O, 10 and 20 lb. per acre, showed that the highest profit was obtained in each variety by the application of 10 lb. of nitrogen and an equivalent quantity of phosphate.

Other experiments dealing with seed rates, sowing methods, spacing and cultivation practices are in progress. There are indications, which require further confirmation, that the distance between rows can be lessened with advantage in the case of wheat and that cross harrowing with a peg tooth harrow will prove a cheap and simple means of increasing the outturn. The new types of sugarcane, *viz.*, CO290, 300 and 313, have again given much higher yields than the standard variety CO 237. Experiments on a fodder crop mixture (teora and sun-flower) and on a tur-groundnut mixture are in progress.

8. **Southern Circle.**—Experiments in this circle are concerned mainly with sugarcane, rabi crops and garden crops. The main centres are Tharsa and Chhindwara farms. The rabi experiments at Chhindwara were vitiated by a hailstorm which destroyed the crops at the point of harvest. In the sugarcane varietal trials at both these farms CO290 stood first and was followed by CO213. CO290 did best also at Seoni farm but the top yields at Waraseoni and Betul farms were got from CO312. Several new varieties from Coimbatore are under observation. In the wheat varietal series at Tharsa E. B. No. 74 gave the highest yield under irrigation; AO68 did best under dry conditions both at Tharsa and at Betul.

The recently established grape fruit orchard at Chhindwara gave an income of Rs. 372 from 25 trees. It is now certain that this fruit has a good future in the plateau districts. Figs too are likely to do well on the plateau. The grape orchard at Tharsa has been extended to three acres and its progress indicates that grapes will do very well in Nagpur district. Ten varieties from Quetta are under trial. A large private orchard in Pardi village near Nagpur gave a very heavy crop last season.

9. **Eastern Circle.**—A number of rice hybrids and selections evolved at the Rice Research Station, Raipur, are finding their way into general cultivation. A general description of these varieties will be found at pages 11 to 12 of this report.

In the wheat varietal trials A115 continues to be prominent, with the new E. B. 267 a close competitor. Gram No. 62 continues to do well.

Among the sugarcane varieties CO312 continued to give the highest yield. With a view to the better organization of cane-crushing operations on any given holding, fortnightly analyses of the sucrose content of different varieties were carried out from December to April. This investigation showed that CO313 ripens first, that CO210 and CO312 are mid-season ripeners and that CO237 ripens last. These four varieties, planted in the proper proportions, will permit of crushing being carried out continuously for 4½ months with the minimum risk of loss from deterioration. Dry planting of cane in *kachar* soil is now reported to have become a regular practice. Experiments are in progress to determine whether the Kolhapur system of planting the cane in September is suitable for this province. The working of the open pan sugar factory at Lormi has again shown that the cultivator can make a substantial profit (Rs. 49 per acre this year) by turning his cane into sugar and molassine gur rather than by manufacturing gur alone.

10. **Western Circle.**—There is no experimental farm in this circle except the Akola Farm which is under the Economic Botanist for Cotton. The Deputy Director co-operated with the Economic Botanist in extensive cotton varietal trials on cultivators' fields and also did a certain amount of experimental work on cotton and other crops on the seed and demonstration farms.

B.—Experimental Work in the Research Sections

11. **Cotton Botanist's Section.**—Under the new arrangement which came into operation last year, work on cotton has now been specifically divided into two definite schemes according to regional requirements—the Central Provinces Breeding Scheme based on Nagpur and the Berar Breeding Scheme based on Akola. The objectives of the two schemes have been detailed in last year's report.

At Nagpur, new selections from cultivators' fields were made and work on the progenies of the previous year's selections was continued. Ten single plant progenies isolated last year which exhibited good staple length and high ginning percentage were grown in progeny rows, and the field characters and performance of every plant in the series were studied in detail. The data so obtained were subjected to statistical analysis, and this analysis will form the basis of next year's selection work. Good material in respect of staple length, yield and ginning percentage is reported to be available for further tests. A collection of indigenous, exotic and wild cottons obtained from different parts of India was grown. With the exception of two cultivated varieties from Lyallpur, none of them appeared to be suited to Nagpur conditions. At Akola, a large number of selections previously made from cultivators' cotton, V.434 and other verum types, and Buri strains were under detailed observation. 361

single cultures have been retained for further study. Fourty-two single plant progenies with a lint length of three-fourths of an inch and over and a ginning percentage of 35 to 38 have been isolated. These are considered to be superior to V.434 and will be under preliminary yield trials next year. Some 700 fresh selections were made during the year.

Forty-eight yield trials of V.434, H.415, H.420, Jarilla and local Jari were carried out at different places throughout the cotton tract. In the Berar tract where 31 of the trials were made, differences in yield were statistically insignificant in 19 cases. In the remaining 12 cases, the differences were significant and in most of them local Jari gave the highest yield; V.434 and the two H. strains showed no marked difference between themselves, while Jarilla came last. In the 17 trials conducted in Nagpur, Wardha and Nimar districts the majority of the yields were in favour of local Jari, with V.434 second and Jarilla third. The justification for growing V.434 in preference to local Jari, known to the trade as Oomra, lies in the much higher quality and commercial value of the former, particulars of which are given at pages 15 and 16 of this report.

Crops, other than cotton, for which this section is responsible are juar, groundnut and bajra. The yields of the new juar strains E.B.1, E.B.3 and 123-A are reported to justify their inclusion in the list of types approved for distribution. Groundnut AK 12-24 continues to be more prolific in bearing and to stand adverse conditions better than other varieties. A new set of experiments approved by the departmental Experiments Committee was laid down at Akola. These relate mainly to rotational, varietal, manurial and cultural investigations on the staple crops. Single-plant and bulk selections of juar, groundnut and bajra are also under trial.

The Akola Farm, which is under the management of the Cotton Botanist, had a very successful year, in spite of unfavourable conditions at the beginning of the season. Eleven acres under cotton were flooded and had to be resown later with groundnut, but the remaining 91 acres of cotton gave an average yield of 670 lb. per acre, which is more than double the standard outturn of Akola district. Verum 434 which occupied the major part of the area yielded 685 lb. per acre, and Buri 107 gave 611 lb. The average outturn of groundnut on 80 acres was just over 1,300 lb. Juar in 44 acres yielded 1,300 lb. per acre, or 24 per cent above the average of the past 31 years. 250 cart-loads of compost manure were manufactured from crop residues and weeds. Pure seed amounting to 1,112 maunds was distributed from the farm.

12. **Second Economic Botanist's Section**—Research work continued on the usual lines.

Wheat.—Strains No. 76 (selection from Persian wheat), No. 267 (selection from the Punjab wheat 16A), and No. 281 (A115 × Clarendon), bred for rust resistance, were under trial on a field scale on various experimental farms. Nos. 76 and 267 did well in the Eastern Circle. At Kheri Farm also, No. 76 competed successfully with AO90 which is the stock variety of the tract. The severe rust epidemic gave a thorough test to the

recently evolved crosses, Nos. 3,712 and 3,729 (A115 × Pusa 4) which showed much greater resistance to rust than all other varieties under trial. Work on other inter-specific crosses continued on last year's lines.

The new wheat research scheme which the Imperial Council of Agricultural Research is helping to finance came into operation from the 2nd June 1941. The work hitherto done on breeding for yield and rust resistance should form a useful basis for the new scheme.

Pulses.—Tur No. 38 is maintaining its reputation of being strongly resistant to wilt. A new mutant in tur E.B.3, evolved with the help of chloral hydrate, is reported to produce seeds and pods almost 1½ times larger than the original stock.

A newly evolved strain of gram E.B. No. 36 (No. 28 × Cawnpore) has given the highest yield at Tharsa Farm. Work on *urid*, *mung* and soy bean continued on the lines of the previous year. Lack of staff has, however, made it impossible to devote to pulses, in general, the attention which their importance as the chief source of protein in the diet of the cultivator and his livestock and the part they play in maintaining soil fertility demand. A scheme for more intensive research on these crops was approved by the Advisory Board of the Imperial Council of Agricultural Research in April 1941.

Fodder grasses.—Work on the improvement of pastures was continued in Ambajheri and Telinkheri catchment areas in collaboration with the Forest Department. Data regarding herbage collected in the previous year were submitted to the Central Silviculturist, Dehra Dun, for analysis, with a view to determining the best size of the sampling unit, the number of such sampling units per plot and the number of plots required per treatment to obtain significant results. The investigations were continued on the lines recommended by the Central Silviculturist, and data regarding density, height and green weight of the various fodder and non-fodder species were recorded.

Other crops.—Selection work on various varieties of small millets was continued. Proposals for intensive work on these crops were put up to the Imperial Council of Agricultural Research, but consideration of the scheme has been postponed till a later meeting of the Advisory Board. Strains of *kharif* castor obtained from Hyderabad were tested against the departmental selections Nos. 16 and 31, but No. 31 proved best. Work on chillies continued.

A study was made of the life history of the weed *Xanthium strumarium*, and methods of eradicating it were investigated. These methods will be tried on a large scale next season. Experiments with live fencing at Richhai and Powarkheda have not given satisfactory results.

13. Chemical Section—*General analytical and advisory work.*—369 samples of soils, manures, fodders and feeding stuffs were analysed and reported upon. Analysis of samples of *mahua* flowers sent by a local distilling firm showed that the distilling capacity of the flowers varied according to locality. Seventy-five samples of wheat were analysed with a view to determine the

effect of certain fertilizers on the quality of the grain. The results showed that grain from unmanured land had a higher protein content and, except in one variety, a higher phosphoric acid content than grain from manured land, but that the lime content was higher in grain from manured land.

Special investigations.—Work on sugarcane was continued at various farms on the same general lines as last year. It was found that cane on all the farms reached its maximum sucrose content by about the first week in February and maintained this maximum till about the end of March, after which deterioration set in. These results are of definite economic value, showing that cane-crushing should be pushed on as rapidly as possible in February and March. Useful investigations were also carried out at the Lormi sugar factory with the object of ascertaining, and minimising, if possible, the sucrose losses which take place during the manufacturing process. Out of the total sucrose content of 13 per cent in the cane, 4.5 per cent and 3.5 per cent was recovered in the form of sugar and molassine *gur*, respectively Sucrose to the extent of 2 per cent was lost in the *begasse*, and inversion during the process of boiling the juice to *rab* and during the preparation of *gur* from molasses accounted for losses of 1.7 per cent and 1.2 per cent, respectively. To minimise some of these losses, the Agricultural Chemist suggests that the juice should not be allowed to accumulate but should be boiled as quickly after crushing as possible, and that in the manufacture of molassine *gur* the molasses should be boiled in the shortest possible time.

Further study of the periodic fluctuations in the carotenoid content of butter again showed that feeding with green clover raises the carotene content.

Other activities.—On behalf of the Marketing Section, ghee-grading was undertaken on an experimental basis. Fourteen samples were received, seven of which were rejected as being below standard. The remaining seven, representing 40 maunds, were graded.

Natural drinking straws, made from wheat straw, were manufactured on a small scale. These will be sent to local restaurants for opinion.

A malguzar was supplied with pure cultures of nodule bacteria from gram and *masur* sufficient to inoculate over 20 maunds of seed.

The research work of two post-graduate students was directed and supervised by the Agricultural Chemist. One student was awarded the M.Sc. (Agr.) degree of Nagpur University.

14. Mycological Section—*Cotton.*—The experiment of dusting cotton seed with certain fungicides for the control of seedling blight confirmed the results obtained in previous year, *i.e.*, that treated seed produces a healthier plant and a higher outturn than untreated seed. In the manurial experiment for the control of wilt, the highest percentage of infection occurred in the unmanured plots, and the lowest in the plots manured with kainit, but the final yield of *kapas* from both sets of plots was practically the same. The only significant increase in yield was in plots to which superphosphates had been applied.

Juar.—Experiments in methods for the control of grain smut confirmed the results of previous years, thus confirming the necessity of dusting the seed with fungicides—copper carbonate or sulphur.

Wheat.—The possibility of a severe rust infestation was foreseen as early as December when an experiment in prophylactic measures was laid down on Chhindwara farm. A field measuring 1.6 acres was divided into 16 equal plots. Alternate plots were left untreated; four plots were dusted with cirrus powder once in the third week of December, and again on the 5th and 17th January. The other plots were similarly treated with sulphur powder, except that the second dressing had to be omitted as no sulphur powder could be obtained on the 5th January. The results were very striking. The leaves and stems in all the untreated plots were more or less completely covered with pustules of *puccinia graminis* whereas in the treated plots the pustules were extremely few. Unfortunately, the weights of grain produced on each plot could not be recorded as the whole crop was destroyed by hail before it was ready for harvest.

Pan.—Work on the Pan Research Scheme which the Imperial Council of Agricultural Research is helping to finance commenced during the year at Ramtek. Two sets of experiments were laid down; one is to determine whether chemical fertilizers could be substituted for oilcake, the manure generally used in pan gardens, and whether the substitution would help to control the incidence of foot-rot disease; in the second, control of the disease by the use of a fungicide is being investigated. The preliminary results indicate that there is no correlation between the incidence of the disease and the kind of manure or fertilizer applied although chemical fertilizers appear to have produced a better growth than oil-cakes, but no disease was in evidence in the plots treated with Bordeaux mixture fungicide.

Citrus.—Further study of the pink disease, *Corticum salmonicolor,* has shown that the dormant mycelium is found not only in the cankers formed by the disease but also in the bark at the points where the branches fork. Therefore, in addition to removing the parts visibly affected before the rains commence and coating the surfaces so exposed with Bordeaux paste or creosote oil, it is necessary also to apply the fungicide at the forking points.

Groundnut.—Pot experiments have shown that plants grown in soil which was under groundnut in the previous year exhibit *tikka* disease a month earlier than do plants grown in soil which was not under groundnut for two successive years, and that the yield in the former case is less than in the latter. It is therefore essential that groundnut should not follow groundnut in the same field.

15. Entomological Section—*Citrus pests.*—Observations were continued on the life history of the beetle borer (*Stromatium barbatum* Fb.) an important pest on oranges. The possibility of controlling the *Indarbela* pest by the use of petrol alone, and thus providing an even cheaper remedy than the petrol-chloroform mixture recommended last year, was investigated with very encouraging results. A serious general infestation of citrus

orchards by the lemon caterpillar (*Papilio demoleus* Linn.) occurred in July. Methods of control were demonstrated in the heavily infested areas. Spraying of trees in bearing with lead arsenate was recommended; in other cases the remedy was vigorous shaking of the branches, followed by collection and destruction of the caterpillars.

Egg masses of the sugarcane-fly (*Pyrilla* Sp.) were collected from some Government farms with a view to identifying parasites and predators on them which might be used eventually for the control of the pest. Parasitism to the extent of 50 per cent was found in the October—December period. The parasites and predators were identified by the Sugarcane Entomologist, New Delhi.

The life-history of the linseed gall-fly (*Dasyneura lini* Barnes.) was studied along with the nature and extent of the damage caused by the fly. Eggs are deposited on the young flower buds which are subsequently destroyed by the larvae, and thus no fruit is formed. The average percentage of attack was 52, and in some cases as high as 90. A caterpillar pest (*Laphygma exigua* Fb.) which appeared on linseed, *lac* and *masur* in December was found to be controllable by spraying with lead arsenate. Resistance to the sann-hemp top-shoot borer (*Laspeyresia pseudonectis* Meyr.) of various strains of sann under trial in the research scheme on that crop was investigated. Three strains were found to have a much lower percentage of attack than others.

In connection with an investigation by the Imperial Council of Agricultural Research into the factors governing the setting of seed in *berseem*, and in particular of the part played by insects in pollination, a collection was made of insects found on the crop on five farms and these were sent to the Imperial Entomologist, New Delhi.

Final reports on two research schemes were compiled by the Entomologist during the year. One was on the *Heliothis obsoleta* pest in relation to cotton, financed by the Indian Central Cotton Committee. This report was approved by the Committee and recommended for publication as a departmental bulletin. The other report dealt with the investigation of the *Gangai* pest of rice financed by the Imperial Council of Agricultural Research. It was approved by the Advisory Board with the recommendation that important sections should be published departmentally.

A scheme for a fresh investigation of *Heliothis obsoleta* in relation to the extensive damage the pest causes to gram was approved by the Advisory Board of the Imperial Council of Agricultural Research in April 1941. The Entomologist will also participate shortly in an all-India investigation into problems connected with the storage of juar grain on lines suggested by the Imperial Council.

Encouraging progress continues to be made in developing an interest in bee-keeping, and arrangements have been made for expanding this work in the coming year.

16. Rice Research Scheme.—This scheme has now been in operation for eight years. Excellent results have been obtained by selections from among existing varieties, and several hybrids

of economic value have been bred. The research station has produced nine selections and five hybrids, all of which will be of definite economic value to one or more of the rice tracts of the province. The fourteen new types include early, medium and late maturing rices.

Early types are represented by selections R. 3—Sultugurmatia and R. 10—Chhatri. The first is under distribution in all three of the main rice tracts—Chhattisgarh division, the Wainganga valley and the northern districts; the second is for cultivators who specialise in fine scented varieties.

The new medium maturing types are the selections R. 6—Budhiabako, R. 11—Banspatri, R. 12—Kubrimohar, hybrid No. 19—(Budhiabako × Parewa) and hybrid No. 116—(Bhondu × Parewa). R 6 is being distributed in all the three tracts; R. 11 and R. 12 are for those who want fine scented varieties; hybrid No. 19 is a type of fair quality, popular in Chhattisgarh; hybrid No. 116 is a coarse variety but it is the highest yielding variety in the province and is liked by people who prefer bulk to quality.

Late maturing types are represented by selections R. 7—Ajan, R. 8—Benisar, R. 13—Badshahbhog and R. 15—Chinoor. The first two are suitable for Chhattisgarh and the Wainganga valley, the third and the fourth for people who like fine, scented, late varieties. On the average of five years' results at Raipur, R. 7—Ajan has exceeded the former standard late variety—Gurmatia by 24 per cent in yield.

The three foregoing sub-paragraphs give particulars of eleven of the fourteen new types. The remaining three are hybrids which have been evolved to deal with a problem specific to Chhattisgarh—the elimination of wild rice (*karga*). The incidence of this weed in *biasi* fields was studied in detail in 21 villages in Raipur, Drug and Bilaspur districts. In two villages it was as low as 3 per cent but in other villages it varied from 4 to 55 per cent. Even with the lowest incidence of 3 per cent, it is calculated that wild rice would be responsible for an annual loss of 21 lakhs of rupees in those three districts. In last year's report it was stated that the solution of the *karga* problem would be facilitated if good yielding hybrids, possessing purple leaves and stems which would make them easily distinguishable from *karga* in the seedling stage, could be evolved. This object, it is believed, has now been achieved. Three fixed hybrids (one early, one medium and one late) were tested during the year at 26 different centres in Chhattisgarh. The yields are reported to have been very satisfactory, and arrangements are being made to distribute small quantities of the seed in as many villages as possible in the coming season. An attempt to get still higher yielding purple hybrids is being made by back-crossing them with the higher yielding green parents.

17. Sann Hemp Scheme.—The cultural and chemical work done under the supervision of the Agricultural Chemist included a study of the effect of—

(*a*) seed rate,

(*b*) time of sowing and

(*c*) time of harvesting on the yield of sann-hemp stalks and fibre.

Certain factors relating to the retting process were also studied. The season being exceptionally wet, the whole experimental area suffered badly from water-logging and the last sown plots gave practically no crop. Only 128 out of a total of 192 plots have been taken into account.

The results have shown—

(1) that a seed rate of 100 lb. per acre produced the highest yield of stalk;

(2) that the earliest sowing gave higher yields both of stalk and fibre than the second sowing;

(3) that the germination capacity of the seed is highest when the crop was harvested at the dead-ripe stage;

(4) that fibre obtained from the second and third harvest was superior in colour, lustre and strength to that obtained from the first and fourth harvest; and

(5) that the optimum duration of the retting period is 8 to 9 days in the cold weather and 4 to 5 days in the hot season.

On the botanical side which is supervised by the Second Economic Botanist, 31 sann-hemp cultures under mass selection and 61 plant selections were grown along with 10 new samples received from Pusa. Out of those 22 promising strains have been isolated. Yield trials of five commercial varieties, *viz.*, Belgaum, Jubbulpore, Chhindwara, Cawnpore 12 and Pusa, were continued. No statistically significant difference was observed but the mean yields of fibre tend to show that the first three are better than the Cawnpore and Pusa varieties. Controlled pollination by introducing bees free from adherent pollen grains into large muslin cages gave a higher percentage of seed-setting than the various other methods so far tried.

18. **Oilseeds Research Scheme.**—Work continued on the four crops with which this scheme is concerned, namely, linseed, sesame, safflower and niger—

Linseed.—Preliminary yield trials of 97 true-breeding cultures were carried out, and 10 of these cultures have been finally selected for further tests in the important linseed tracts. Most of the latter are reported to possess desirable features like high yield, early maturity and resistance to disease. One variety obtained from Hyderabad appears to be particularly promising both in yield and oil content. Selection work on the four existing departmental types continued. Very significant differences were observed in the outturn from irrigated and unirrigated plots, the former giving an average of 50 per cent more yield than the latter.

Experiments on the dry extraction of fibre from linseed straw and on the improvement of hand machines designed for this purpose were continued. Canvas cloth and other fabrics in which different proportions of cottonized linseed fibre and pure cotton were used, were produced on an experimental basis with the kind

co-operation of the Empress and Model Mills. The Imperial Council of Agricultural Research has agreed to help to finance a scheme for further work on the commercial utilization of linseed fibre.

Sesame (*Til*).—Twenty-nine white-seeded *kharif* varieties which are higher yielders and better disease resisters than the ordinary varieties have been isolated. Among the coloured-seeded isolations, five proved superior to the local mixtures. Good selections have also been made in *rabi* and *purvi maghai* types. Final yield trials will be conducted in various parts of the province next season. Work continued on imported varieties, including one with a particularly high oil content from Cyprus.

Safflower.—Preliminary yield trials of 33 strains were carried out with promising results. Among extra-provincial varieties a Cawnpore type, T. 39, continues to show promise. Being a tolerably spineless variety it does not present the customary difficulties in harvesting and threshing; but its yield is below that of the spined varieties and further selection with a view to increased yield is necessary.

Niger.—Five previous selections were multiplied at Dindori to provide seed for yield trials in the important niger-growing tracts. Forty-seven new single plant selections, representing a wide range of variations, were made from cultivators' fields.

PART IV.—ECONOMICS AND MARKETING

19. **Surveys.**—Market survey reports on—

(1) wool and hair,

(2) gram,

(3) jute, and

(4) rape and mustard.

were submitted to the Agricultural Marketing Adviser to the Government of India. Reports on mangoes and sheep and goats are being drafted, and surveys of juar and pulses are in progress.

Development Work.—During the year special efforts were made to develop an interest in the grading of agricultural produce prior to sale, according to the Agmark standards prescribed by the Government of India. Grading was done at 31 centres. The produce handled at these stations included nearly 11,000 baskets of oranges, 3,150 maunds of rice and 58,000 eggs. A beginning was also made with other commodities, including *gur* and *ghee*. Two Wardha merchants who were granted authority in January to grade *ghee* were not able to do so as their *ghee* did not come up to the specified standards. It was asserted that this was due to the preponderance of cotton seed in the rations of dairy animals and to a lack of green fodder. *Ghee* samples collected from the Wardha area are being analysed to verify the truth of this assertion. Forty-six samples were also collected from Saugor district and forwarded to the Central Ghee Control Laboratory, Cawnpore, for analysis. *Ghee* of satisfactory quality will not, however, be generally available in the market until the sale of adulterated *ghee* has been effectively discouraged by a stricter enforcement by local authorities of the Food Adulteration Act.

It was suggested to certain municipal committees that the best way of enforcing control would be that those bodies which possessed chemical laboratories should engage their own chemist for analytical work. It was also suggested that the chemist should be allowed to analyse samples submitted by merchants authorized to grade. The Jubbulpore municipal committee appointed a chemist in January and Nagpur municipality has recently agreed to take similar action.

Thirteen samples of linseed oil were sent to the Harcourt Butler Technological Institute, Cawnpore, for analysis with a view to drawing up grade specifications. Of those 5 were found to be adulterated, some with as much as 60 per cent of groundnut oil, although there was no difference in the selling rates of the samples. Thirty samples of *gulabi* gram were analysed with the same object in view and draft specifications for this gram, as well as for two types of rice and some important wheats were circulated to the trade for opinion. Close contact was maintained with the Revenue authorities in the matter of proposals for the establishment of regulated grain markets in the north of the province.

Mr. Hill was appointed a member of the Provincial Price Control Board. Weekly or fortnightly price data were obtained from 84 markets. Prices current in the nine most important provincial markets were submitted each week to the provincial Price Control Officer.

20. Extension and marketing of Verum 434 and Buri 107 cottons.—Very substantial progress has been made in the extension of the area under Verum 434 in the two tahsils of Nimar district and the five taluqs in Berar in which the Indian Central Cotton Committee is helping to finance the extension work. In 1937-38 the area under this variety in the seven taluqs was 16,000 acres; in 1938-39, 1939-40 and 1940-41 the areas were 25,000, 86,000 and over 218,500 acres respectively. A further 53,000 acres were under Verum 434 in other parts of the province, bringing the total to a little more than 2.71 [1.38] lakhs of acres in 1940-41. 30,080 maunds of seed obtained from cotton ginned in the departmental pool in 1939-40 was distributed in the selected taluqs and a further 6,264 maunds was given out in other areas, making the total distribution of V.434 seed 36,344 maunds. Over 61,000 maunds of seed were ginned in 1940-41 pool and this will provide ample seed for the next year's expansion programme. The total number of verum bales of all strains sold through the departmental pool in 1940-41 was 7,065½ [8,246] of which 6,721 [7,744] were of V.434 strain. Of the latter total, the special areas contributed 5,201 [4,936] bales. The reason for the fall in the pool transaction as compared with last year was the keen competition for verum cotton ruling in the open market where prices equivalent to the pool rates were offered. Very good prices were obtained for the pool stocks. The general average was Rs. 231-11-6 [Rs. 298-7-0] per khandi f. o. r. Bombay basis. The average rates for Broach and Oomra during the corresponding period of sale were Rs. 188-14-6 [Rs. 275-7-0] and Rs. 155-11-6 [Rs. 246-8-0]. Verum thus fetched a premium of Rs. 42-13-0 [Rs. 23] on Broach and Rs. 76 [Rs. 51-15-0] on Oomra. The premium in the open market

remained high throughout the season and it may safely be assumed that sellers of pure verum kapas got as good prices for their cotton as the people who sold through the pool. It will be observed that the decline in price this year as compared with last year's prices, is much steeper in the case of Oomra than in the case of Verum. Verum average prices fell from Rs. 298-7-0 to Rs. 231-11-6 but Oomra rates fell from Rs. 246-8-0 to Rs. 155-11-6. From figures collected through the district staff and from the mills it is estimated that the total quantity of verum produced in the province was 68,500 bales but it is believed that the actual production was considerably higher than this. It is further estimated that the extra income derived from Verum 434 in 1940-41 was about 15.5 lakhs of rupees.

4,809 maunds of Buri 107 seed was made available for distribution in 1940. The previous year's area of 10,000 acres under this variety in Burhanpur tahsil was raised to 33,800 acres in the year under report. The yield was very satisfactory and the premium for the cotton in the local market was so high that the cultivators could not be induced to sell through the departmental pool. It was, therefore, necessary to make other arrangements for the 1941 seed supply. Certain local merchants agreed to gin separately Buri 107 kapas purchased by them in the open market which was passed by the agricultural staff as being of the necessary standard of purity, and to sell to the department the seed obtained from this kapas at a slight premium over the market rate. To enable the Burhanpur seed depôt to buy up a sufficient quantity the permanent advance was raised from Rs. 6,000 to Rs. 18,000. 7,400 maunds of seed was stocked but the selection arrangements did not work altogether satisfactorily as some proportion of small-seeded jari cotton was afterwards detected. The stock was, therefore, seived to eliminate the small seed and all seed passing through the sieves was sold for feeding. Although the seed retained for distribution is not of the same very high order of purity as Verum 434 seed collected through the departmental pool, and is believed still to contain about 2 per cent jari mixture, it is of very much higher quality than any that would have been available to the cultivators from any other source. There is sufficient of it to cover the same area in 1941 as was grown in 1940. Taccavi on a liberal scale has been provided for cultivators who buy seed from the depôt.

PART V.—DEMONSTRATION AND PROPAGANDA

21. **Economic features of the year.**—The monsoon commenced early and followed an abnormal course throughout. Conditions in the post-monsoon period also were abnormal. *Kharif* sowings were delayed to begin with and a good deal of resowing was necessary in areas of heavy precipitation but operations were finished in the second fortnight of July. Heavy rain continued till the middle of August and gave no opportunities for intercultivation. Up to this stage the prospects for cotton were poor but conditions in the rice tract were favourable. In fact many cultivators were seriously considering the advisability of bakharing up low-lying cotton fields and substituting rabi crops. Then came a sudden change which completely reversed the prospects for cotton and rice. A break set in the second half of August and very little rain fell in the

rice tract from then until the 12th October. The break was less complete in the cotton tract where conditions after the middle of August remained exceptionally favourable for cotton throughout the rest of the season. Two districts (Buldana and Nimar) gave a 15-annas crop and the general average for the province was about 13-annas—the heaviest crop for many years. Rain in November was responsible for a certain amount of black-leaf in the *kapas* but this slight effect on quality was more than balanced by the lengthening of the growing period and the consequent increase in outturn. Juar gave a fairly satisfactory outturn of grain but a scarcity of *kadbi* was in evidence towards the end of the hot weather. In the rice tract, the prolonged break brought unirrigated paddy to the verge of collapse but this general failure was averted by a week of showers of varying intensity which set in from the 12th of October. This rain was of little material benefit to early varieties in unprotected light soils but it improved considerably the medium and late varieties. The anna outturn of the crop in general was 8 annas. *Kodo* and *kutki* also suffered severely in certain areas.

Rabi sowings were slightly delayed by the October rain, and in some cases wheat sown before the rain arrived had to be resown. Germination of all crops sown after the rain was excellent and there were prospects of a bumper rabi harvest up till towards the end of February. Then came cloudy weather followed by abnormally heavy rain which induced a heavy attack of rust on wheat and of pod-bores on gram, and damaged linseed. Considerable local damage was also done by hail, in a large number of villages in Chhindwara in particular, and also in some villages in Patan and Jubbulpore tahsils. The general annawari outturns of wheat, and linseed were 9.5 and 10.4, respectively.

The comparatively low outturn of rice was counterbalanced by the rise in price. At Raipur the average wholesale price of coarse rice in 1939-40 was Rs. 2-12-0 per maund, while in 1940-41 it was Rs. 3-14-0. The valuation of the 8.1 anna 1940-41 crop, as estimated by the Director of Land Records, is Rs. 1,361.1 lakhs as against Rs. 1,305.6 lakhs for the 11.1 anna 1939-40 crop. In the cotton tract the trend has been in the opposite direction. There, the 1940-41 13-anna crop was sold at a price which averages out at only 63 per cent of the price obtained for the 11.4 anna crop of 1939-40. As stated in paragraph 20, the difference between verum prices in the two years was much less. The 10.2 anna wheat crop of 1939-40 has been valued by the Director of Land Records at Rs. 587.8 lakhs, as against Rs. 592.6 lakhs for the 9.5 anna crop of 1940-41.

Measures to ensure a supply of seed for areas in the north and east of the province affected by crop failure were undertaken jointly by the revenue and agricultural staff. Paddy seed of the value of Rs. 90,000 was purchased from a taccavi allotment in Drug district for distribution, and similar purchases were made on a smaller scale in Raipur and Bilaspur districts, and of paddy and wheat in Dindori tahsil of Mandla district. Rs. 1½ lakhs of taccavi has also recently been sanctioned for wheat purchases in Jubbulpore district. Substantial taccavi advances were made to malguzars for the purpose of employing labour on land improvement works. This form of Government aid for the relief of

unemployment appears to be more popular than relief through test works and it also provides some degree of insurance against future scarcities.

22. Before proceeding to a detailed account of demonstration and propaganda work in the various circles, a short description of a new demonstration method shortly to be introduced may be of interest. During the year four projects were approved by the Imperial Council of Agricultural Research. The object of these projects is to demonstrate, within a single village in each of the cotton, rice and wheat tracts and in a village in the aboriginal tract, all improvements in agricultural practice which have proved to be worth adopting in the tract in which the village is situated. The programme in the different villages will have many points in common. These include land improvement, building up of soil fertility, use of improved seed and improved methods of cultivation, introduction of mixed farming and subsidiary industries, fostering of co-operative enterprises and social reform. The projects are proposed to be run for five years and the expenditure on three of them will be shared equally between the Imperial Council of Agricultural Research and the Provincial Government. Half of the expenditure on the cotton tract project will similarly be met by the Provincial Government and the remainder will be met in equal proportions by the Imperial Council of Agricultural Research and the Indian Central Cotton Committee. A further development, the cost of which the Imperial Council of Agricultural Research has also agreed to share equally with the Provincial Government, is a scheme designed to develop the production of milk and milk products for sale in addition to the ordinary crop products. The importance of this type of development was stressed by Sir John Russell and Dr. Wright, who reviewed the working of the Imperial Council of Agricultural Research in 1937, not only as an obvious means of increasing the cultivator's income through the sale of milk products but also of building up the fertility of his holding and thus improving crop yields. Proposals were made for initiating such mixed farming enterprises in the three main crop tracts and details of the work to be done in two of these tracts have been furnished to the Imperial Council of Agricultural Research whose final approval is awaited. This scheme too will run for five years by which time definite data about the benefits to be derived from mixed farming on cultivator's holdings will be available for propaganda purposes. The scheme will be worked on four one-pair holdings in each crop tract, and the income obtained on each of the four mixed-farming holdings will be compared with the returns from two holdings in the vicinity farmed according to the usual practice. The cropping of the mixed-farming holdings will be modified in such a way as to provide sufficient fodder for the milch animals and their followers.

23. Northern Circle.—The quantity of pure seed distributed from all sources amounted to 2.61 [2.64] lakhs of maunds, exclusive of 5.48 [4.46] lakhs of canes and 35,541 [41,000] fruit seedlings. The estimate of area sown with improved seed is 6.76 [5.99] lakhs of acres. Verum 434 and Buri 107, the two standard cotton strains, occupied 56,846 (12,872 departmental

spread only) and 33,800 [16,000] acres, respectively. The total number of Verum 434 bales sold through the departmental pool was 1,882. It was not possible to organise the pooling of Buri 107 cotton because the local pooling committee refused to accept reasonable offers early in the previous season and the stocks had to be disposed of ultimately at lower prices. There was also very strong competition for the cotton in the local market.

The value of improved implements sold was Rs. 30,658 (Rs. 48,409) Sales included 261 iron ploughs, 34 cane mills, 61 winnowers and 16 rahats. The fall in the value of implements sold is mainly due to a falling off in the demand for iron ploughs. Taccavi amounting to Rs. 24,502 [Rs. 24,523] was given for purchase of implements, seeds, manures, and power plant.

The working accounts of Damoh, Dindori, Saugor and Khandwa farms showed profits of Rs. 559 [Rs. 786], Rs. 50 [Rs. 106], Rs. 1,258 [Rs. 1,659] and Rs. 3,932 [Rs. 3,322], respectively. Of the three Government demonstration plots, Amarmao plot in the Saugor district under command of Chandia tank made a profit of Rs. 263 [Rs. 176], Kuan plot in the Jubbulpore district under the command of the Bahoribund tank a profit of Rs. 157 [Rs. 15] while Silari plot in the Hoshangabad district was run at a loss of Rs. 181 [Rs. 91].

The other demonstration centres were 30 [27] private plots and 34 vidya mandirs. All the private demonstration plots except one in Mandla district were run at a profit. Five of the vidya mandir plots in the Hoshangabad district are being closed as they are unlikely to yield the required income even in an average season. On account of the untavourable season and damage by rust only 15 vidya mandirs are expected to give the desired margin of profit.

Other forms of propaganda included 2,946 [2,390] practical demonstrations, 125 [144] cinema and lantern lectures and 44 agricultural shows, co-operative rallies and Farmers' days. Special features were the Farmers' day at Khandwa farm which was attended by His Excellency the Governor, a large scale agricultural exhibition at Garhakota in the Saugor district on the occasion of the cattle fair and rally at Dhar in the Burhanpur tahsil of Nimar district in which the Korkus evinced great interest. Silage making was demonstrated at various centres in co-operation with the Forest Department.

There are 21 agricultural associations in the circle, out of which 7 are registered. Lack of active interest on the part of the members and too much dependence on the agricultural assistants was in evidence in most of the bodies. The associations in Nimar district and at Sohagpur, Jubbulpore, Patan, Sihora, Rehli and Damoh continued to do good work in the sale of improved seeds, implements, fertilizers and in hiring out agricultural implements and machines. The Khandwa, Bir and Harsud associations also helped in providing staff for cotton extension work and in advancing money to meet contingent expenditure on marketing.

Steam tackle ploughing in the Jubbulpore district commenced from the 10th February and 478 [628] acres were ploughed by the end of the ploughing season. Requisitions were fewer than

in the previous year because of the rust epidemic and work was held up by rain in February. The charge was Rs. 9 per acre as formerly.

24. **Southern Circle.**—The demand for improved seed was met from Government farms, plots, seed stores and private agencies like seed farms and seed unions 82,073 [100,240] maunds of improved seed, 13.08 [17.60] lakhs of whole canes and 33,321 [36,750] fruit seedlings were distributed during the year. The estimate of area sown with improved seed is 3.77 [4.12] lakhs of acres. This is the only circle in which a decline in the area under improved crops is in evidence; it is mainly due to the fact that a really suitable cotton for the Nagpur, Wardha and Chanda districts has not yet been evolved. Verum cotton was pooled at five ginning centres and 152 [295] bales were sold at satisfactory prices. The area under oranges is rising rapidly. Fruit nurseries have been established on Government farms and gardens to meet the growing demand.

The demand for fertilizers fell considerably owing to the abnormal rise in price. Only 3,083 [9,063] maunds were distributed. 1,775 [1,301] maunds of oilcakes were also distributed for top dressing sugarcane. Enhanced prices led to a decline in the sale of improved implements. The sales effected amounted to Rs. 35,422 [Rs. 47,167]. 157 lb. of copper carbonate was sold mainly in Chhindwara and Amarwara tahsils as a preventive against smut in juar. Taccavi loans for pure seed, manures, implements and fruit plants sanctioned during the year amounted to Rs. 50,432 [Rs. 78,052].

The four seed and demonstration farms at Seoni, Betul, Waraseoni and Sindewahi continued to serve as useful centres for pure seed production and for the demonstration of agricultural improvements. Several varieties of fruit have been planted at Seoni and Betul farms to find out if they grow well under the climatic conditions of the plateau districts. The Seoni farm had a successful year in spite of serious damage by hail, and showed a profit of Rs. 3,007 [Rs. 4,790] in the farm working account. The Betul and Waraseoni farms showed profits of Rs. 2,060 [Rs. 3,096], and Rs. 2,028 [Rs. 1,549] respectively. The outturn of *gur* on the Sindewahi farm was low as water in the Garmousi tank ran short. The margin of profit therefore came down to Rs. 985 [Rs. 2,211]. Out of 9 [10] Government demonstration plots and 47 [45] private plots run under the supervision of the department, 6 Government plots and 42 private plots paid their way. The 17 vidya mandir farms were maintained but owing to the unfavourable *kharif* season, the rust epidemic on wheat and, in some cases, destruction by hail, only five gave the desired margin of profit.

Practical demonstrations were given at 1,823 [1,879] different centres. Special demonstrations were arranged at the time of the All-India Trades Exhibition held in Nagpur in April when all the research sections co-operated with the district staff, in putting up a comprehensive show of exhibits. "Farmers' Day" demonstrations were held at Betul and Waraseoni farms and attracted good attendances. Similar demonstrations were also

held for the first time at the Government demonstration plots at Khurai, Charankhapa and Khirsadoh in the aboriginal tracts. Lantern lectures evoked great interest.

One new co-operative agricultural association was registered at Multai, bringing the total number to 18. All these associations worked out at a profit. The Chanda association undertook a new enterprise in taking land on lease at Chakpiranji with the double object of making a profit and running it as a demonstration centre. Village uplift work continued in all the seven districts and special demonstrations were arranged for the benefit of the students of the district village uplift class held at Nagpur.

The Orange Growers' Association had to face keen competition from dalals and middlemen. Only 7 wagons were despatched to the selling centres at Delhi, Calcutta and Lucknow. The association also did business in the sale of fruit plants, of which 3,854 [4,058] were sold during the year.

25. **Eastern Circle.**—The quantity of improved seed given out from all sources amounted to 1.29 [1.21] lakhs of maunds. 15.61 [27.45] lakhs of whole canes were also distributed. The area under improved seeds of all crops is estimated at 7.03 [6.55] lakhs of acres.

Progress has been maintained in fruit and vegetable cultivation. 52,858 [58,227] fruit trees of different varieties were distributed out of which 14,903 were supplied free of cost for planting in *baris*. In view of the great difficulty in procuring reliable plants from outside the circle, a nursery has been established at Dharampur in Mungeli tahsil, and small nurseries were raised in 64 private gardens. Vegetable cultivation was extended to 577 [437] centres. Planting of flower gardens was also encouraged and 21 small gardens were laid out for malguzars.

Owing to the increase in area under orchards, sugarcane and garden crops, there was a good demand for agricultural appliances. Implements, equipment and fencing material to the value of Rs. 33,040 [Rs. 22,825] were sold. These sales included 67 cane mills and a complete plant for an open pan sugar factory. High prices caused a reduction in the demand for fertilizers, of which 4,096 [7,084] maunds were sold; but the sale of oilcakes for manure which were relatively cheap, increased to 3,363 [2,044] maunds. Taccavi loans amounting to Rs. 28,745 [Rs. 27,415] were advanced for the purchase of improved seed, manures and implements.

All the three demonstration farms worked at a profit though the unfavourable season and a big drop in prices of gur affected their financial position. The working accounts of Chandkhuri, Bilaspur and Drug farms showed profits of Rs. 784 [Rs. 2,200], Rs. 882 [Rs. 1,291] and Rs. 1,270 [Rs. 894] respectively. The Government demonstration plots at Lormi and Mohtara showed profit of Rs. 447 and Rs. 196 respectively.

The other demonstration centres were 34 private plots and 25 [26] vidya mandirs. All the private plots except one were run at a profit, in spite of the unfavourable season. One vidya mandir plot was closed. Of the 25 vidya mandirs in

operation, 8 failed to meet the cultivation expenses, and the remaining 17 gave very variable profits; only 8 plots gave the required margin of Rs. 200 or over. In several plots paddy, which is the main crop, was a complete failure due to the long drought from August till October.

Other forms of propaganda included 6,219 [4,343] practical demonstrations and 61 [61] lantern lectures. Eight Co-operative rallies were attended by the staff, which gave lectures on agricultural topics. 301 [334] books and bulletins were sold. Ensiling of grass was carried out at 31 centres and silage from 12 centres was distributed free to cultivators with the object of popularising this method of preserving fodder.

The four registered agricultural associations at Mungeli, Bilaspur, Bemetara and Mahasamund rendered useful service in supplying agricultural requisites and hiring out implements. The Co-operative Growers' Associations at Raipur, Drug and Bilaspur made slow but steady progress. The number of members increased from 818 to 882, and 5,159 maunds of paddy was disposed of from the godowns of the associations. Business was on a small scale owing to the partial failure of the paddy crop and reservation of stocks for seed. The premiums obtained ranged from 4 to 20 per cent above the market value of the grain on the date of arrival. Attempts are being made to open subsidiary godowns in the interior to get over carting difficulties.

Seed unions numbering 282 [285] held paddy stocks to the extent of 28,970 [28,000] maunds. Three unions were closed and more attention is being paid to consolidating the existing seed unions than to increasing their number. Twelve seed unions were registered under the Co-operative Credit Societies Act. The profits of the Co-operative Cultivation Society at Raipur were reduced to Rs. 258 [Rs. 1,200] because of the sharp fall in the price of gur. The co-operative dairy societies at Raipur, Bilaspur and Drug worked successfully during the year and supplied 957, 510 and 521 maunds of pure milk respectively, thus improving the milk supply of the respective towns considerably.

A very great amount of work was done during the year on a scheme for the extension of the sugarcane area under the Kharung and Maniari canals. Detailed proposals for the organization and financing of the scheme, based largely on a report submitted by Rao Bahadur Moharikar after he had seen the cane development work in progress in the United Provinces, were framed. Expansion to the extent originally contemplated will not however be possible because of the very large acreage which came under agreement for rice irrigation during the past season. In consequence, the limit of cane under each tank will not exceed 1,000 acres. The present area under both tanks combined is 905 acres. Proposals for a Government cane testing station and for a small colonization scheme, both to be located in the Maniari area, were worked out.

26. **Western Circle.**—Pure seed amounting to 60,732 [61,232] maunds was distributed through departmental agencies. This included 22,633 [30,946] maunds of groundnuts and 31,557 [24,575] maunds of cotton seed. The fall in groundnut seed distribution is due to the fact that cotton was the more profitable

of the two crops in the preceding season. Verum 434 is the best all round variety of stapled cotton so far evolved for Berar and is popular particularly in the *ghat* taluqs, Chikhli, Mehkar, Basim and Pusad, and to a less extent in Ellichpur taluq. Extension efforts have therefore been concentrated in those taluqs. Out of the total area of 2.23 lakhs of acres covered by all Verum strains throughout the circle, V. 434 occupied 2.07 lakhs, out of which 1.62 lakhs were concentrated in the abovenamed taluqs. 5,072 [6,184] bales of Verum were sold through the departmental pool. There is an increasing tendency towards vegetable and fruit growing wherever irrigation facilities exist. 1.17 lakhs of whole canes were distributed for seed purposes and 2,798 fruit trees mostly orange, mosambi and mango were supplied. The total estimated area occupied by improved varieties of all crops was 5.34 [4.22] lakhs of acres.

Implements and spare parts to the value of Rs. 52,669 [Rs. 62,835] were sold during the year. The implement in greatest demand is the iron plough of which 639 [722] were sold. There was also a considerable demand for spare parts. 2,015 lb. of fungicides as a preventive against juar smut were sold. Taccavi loans to the extent of Rs. 11,701 [Rs. 14,941] were issued for the purchase of improved seed, implements and manure.

The circle has five seed and demonstration farms. On the working account, Ellichpur showed a profit of Rs. 2,372 [Rs. 4,649], Borgaon Rs. 858 [Rs. 2,813], Basim Rs. 968 [Rs. 1,632] and Buldana Rs. 4,130 [Rs. 3,483] while Yeotmal farm incurred a loss of Rs. 259. The reduction in receipts on four of the five farms, as compared with last year, is due mainly to the drop in cotton prices. The Government demonstration plots at Pusad, Kelapur, Amraoti, Duni and Zilpi gave net profits of Rs. 102, Rs. 213-8-0, Rs. 1,172-5-0, Rs. 219-4-0 and Rs. 23-2-0 while the plot at Kalamkhar sustained a loss of Rs. 5. Private demonstration plots numbering 25 [29] have shown a reasonable margin of profit. Eleven vidya mandir plots were under cultivation. All except two gave profits sufficient to meet the pay of the gurus and contingent charges.

The departmental staff organised 3,623 [3,053] practical demonstrations, 31 [33] agricultural shows, and 6 [3] ploughing matches. Lantern lectures were given at 258 [287] centres. The departmental cinema lorry toured in the circle and gave 26 shows which were attended by a large number of cultivators.

The 22 agricultural associations and 29 branch associations mentioned in last year's report continued to function. All these bodies run shops of their own for the sale of pure seed, implements and manure, and they also give out implements on hire. Between them they hired out 1,397 ploughs and thereby secured an income of Rs. 9,068 [Rs. 7,908]. The total profit earned by the associations was Rs. 14,857 [Rs. 12,534] representing 22.69 per cent of their total share capital. Chikhli and Jalgaon associations, in addition to the three mentioned in last year's report, have built their own godowns. Some of the associations are very well managed and attempts are being made by the departmental staff to improve the working of other bodies which are not managed so efficiently.

27. **Agricultural Engineering.**—The Assistant Agricultural Engineer visited Narsinghpur, Jubbulpore, Powarkheda, Khandwa, Betul, Lormi and Bilaspur farms in connection with repairs of machinery and investigation of new schemes. He also prepared estimates for a number of power plants, water lifts and other agricultural machinery.

As a result of experiments in converting petrol paraffin engines to run on charcoal gas and subsequent propaganda, the Section installed two gas engine units for agricultural operations. Experiments were also conducted in converting a tractor engine to run as a compressor. An apparatus for carrying out experiments to accelerate the digestion of dry refuse was constructed. Two steel structures were fabricated and erected in the Maharajbagh Zoo and the engineering workshop respectively.

The oil engine and machinery course was completed by eight students of whom five passed the final test.

A mechanical assistant was added to the staff to supervise well-boring work.

PART VI.—HORTICULTURAL GARDENS AND ARBORICULTURE

28. Flowers did well in the Government gardens in Nagpur in both seasons. Sweet peas at the Maharajbagh were particularly good. The variety of sour lime (citrus acida) which fruits throughout the year has run true to type and will now be propagated for sale.

Seven departmental jamadars and two private students were given training in fruit and vegetable cultivation at the Maharajbagh.

The improvements in the lay-out of the Telinkheri garden suggested by His Excellency the Governor were completed. The main entrance gate was also repaired by the Public Works Department.

The Secretariat and other office gardens were well-maintained. Some of the shrubberies have become old and require to be replaced. This will be done gradually.

The total receipts of these gardens, exclusive of free supplies to the extent of Rs. 395-5-0 to departmental institutions amounted to Rs. 7,366-4-9 [Rs. 9,788-5-3] against an expenditure of Rs. 30,135-11-6 [Rs. 37,605]. The previous year's expenditure included Rs. 7,649 for Government House Garden. The drop in receipts, which come mainly from the Maharajbagh, is due to shortage of water and partly also to stoppage of credit sales.

The arboricultural work is now being done under the general supervision and guidance of the Silviculturist of the Forest Department. Money earmarked in the departmental budget for this work have been transferred to a Civil Station Planting Fund, and efforts are being made to augment this fund by inviting subscriptions from residents in the civil station and public institutions in that area. Receipts from sale of trees removed from roadsides and Government bungalows are also credited to the fund. During th year, 276 trees were planted on roadsides, public institution grounds and bungalow compounds; 250 trees were planted

in the Laxminarayan Technological Institute and in the compound of the new Central College for Women at the expense of those institutions; 100 trees of various species were also planted in the Government House compound; 200 trees planted in the new High Court compound two years ago were attended.

Weather conditions at Pachmarhi were not very favourable for garden operations. A hailstorm in February did considerable damage to all the crops, specially to cabbages, strawberries and plums. There was no damage from frost. Owing to war conditions no seed was imported from abroad and the display of flowers was not therefore as good as usual. Plum, peach and grape fruit trees planted three years ago are progressing well and 18 grape-fruit trees imported from Sind have been added. Receipts amounted to Rs. 6,980-3-9 [Rs. 5,580-6-6] against an expenditure of Rs. 6,830-9-9 [Rs. 7,154-11-0], leaving a surplus of Rs. 149-10-0.

With the taking over of the Chanda garden, 11 [10] district gardens were under the direct management of the department. These gardens are becoming increasingly popular as public resorts. The area under fruit trees has been increased and the gardens have now become important centres for propagating and supplying fruit seedlings and ornamental plants. They are also utilised for demonstrating methods of fruit and vegetable culture. Two gardens paid their way and in 7 others expenditure was confined within the limits fixed by Government, *viz.*, Rs. 500 in excess of receipts in district gardens and Rs. 800 in divisional gardens. As regards the remaining two, Betul garden expenditure was Rs. 56 above the limit and Chanda garden was very considerably above it because of the capital expenditure required to set it going in its first year under departmental management. It is difficult to run these gardens at a profit as in every case an ornamental portion has to be maintained for the benefit of the public.

29. Acknowledgments.—The department is greatly indebted to the Indian Central Cotton Committee and the Imperial Council of Agricultural Research for generous financial assistance given for the promotion of research work, marketing investigations and seed distribution schemes, 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 1940-41	Total for 1939-40
1	2	3	4	5	6	7	8	9	10
Northern circle ..	4,209	2,012	2,399	597	444	599	3,325	13,585	14,905
Southern circle ..	682	660	153	169	187	406	199	2,456	2,642
Eastern circle ..	493	1,894	..	..	367	304	755	3,813	5,530
Western circle ..	420	..	4,268	1,163	1,595	31	721	8,198	9,384
Total ..	5,804	4,566	6,820	1,929	2,593	1,340	5,000	28,052	..
Total for previous year ..	6,799	5,607	6,762	2,263	3,754	1,601	5,675	..	32,461

STATEMENT A—*cont.*

Seed distributed in maunds and canes.

Name of circle	Wheat	Rice	Cotton	Juar	Groundnut	Sugarcane	Other crops	Total for 1940-41 (Excluding sugarcane)	Total for 1939-40
1	2	3	4	5	6	7	8	9	10
Northern circle ..	202,469	18,246	16,776	813	5,624	548,690	17,271	261,199	264,044
Southern circle ..	34,394	35,761	2,292	1,134	6,685	1,308,490	1,807	82,073	100,240
Eastern circle ..	17,704	108,635	..	..	1,014	1,561,793	2,021	129,374	120,984
Western circle ..	3,531	..	31,557	1,981	22,633	117,330	1,030	60,732	61,232
College Farm, Nagpur ..	133	..	200	89	36	..	89	547	305
Total ..	258,231	162,642	50,825	4,017	35,992	3,536,303	22,218	533,925	..
Total for previous year ..	262,523	160,676	43,307	9,853	47,943	4,951,748	22,503	..	546,805

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 ..	376,049	63,946	90,127	20,776	8,260	113,753
Southern circle ..	139,802	159,211	8,249	43,245	14 533	..
Eastern circle ..	33,046	647,716	..	..	11,467	4,392
Western circle ..	7,579	..	23,185	169,886	122,091	11,010
Total ..	556,476	870,873	368,418	233,907	156,351	129,155
Total for previous year ..	591,046	824,423	215,012	226,300	158,991	102,060

STATEMENT B—*cont.*

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

Name of circle	Sugarcane	Total for 1940-41	Total for 1939-40	Approximate value of the increased outturn resulting from the use of improved seed for	
				1940-41	1939-40
1	8	9	10	11	12
				Rs. (Lakhs)	Rs. (Lakhs)
Northern circle ..	2,994	675,905	599,455	19.04	12.56
Southern circle ..	11,990	377,030	(*a*) 462,928	20.94	22.53
Eastern circle ..	6,563	703,184	655,384	23.39	19.01
Western circle ..	..	533,751	(*b*) 495,872	20.86	12.13
Total ..	21,547	2,289,870	..	84.23	..
Total for previous year ..	21,955	..	2,213,639	..	66.23

(*a*) Includes 50,857 acres under Roseum
(*b*) Includes 73,882 acres ,, ,,
} Not now considered as improved cotton.

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 number
1	2	3	4	5	6	7	8
Northern circle ..	261	34	..	..	287	3,615	4,197
Southern circle ..	157	82	3	..	104	1,502	1,848
Eastern circle ..	15	67	..	9	293	193	577
Western circle ..	639	10	..	65	27	19,325	20,066
College Farm, Nagpur ..	..	..	..	..	..	19	19
Total ..	1,072	193	3	74	711	24,654	26,707
Total for previous year ..	1,411	264	2	41	1,667	23,117	26,502

STATEMENT C—*cont.*

Number of implements and parts of implements sold.

Name of circle	Total value in rupees for 1940-41	Total value in rupees for 1939-40	Books sold	Bulletins sold	Total for 1940-41	Total for 1939-40
1	9	10	11	12	13	14
	Rs. a. p.	Rs. a. p.				
Northern circle	30,658 0 0	48,409 0 0	66	245	311	290
Southern circle	35,422 0 3	47,166 15 3	42	92	134	208
Eastern circle	33,040 2 6	22,825 1 5	301	..	301	334
Western circle	52,669 7 0	62,835 0 0	96	497	593	907
College Farm, Nagpur	14 7 8	22 13 8	..	..	..	..
Total ..	1,51,894 1 5	..	505	834	1,339	..
Total for previous year ..	..	1,81,258 14 4	331	1,408	..	1,739

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 ..	44	2,946	125
Southern circle ..	30	1,823	19
Eastern circle ..	3	6,219	61
Western circle ..	31	3,623	258
Total ..	108	14,611	463
Total for previous year ..	113	11,665	580

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