

E.C. No. 417

**ESTIMATES COMMITTEE
(1964-65)**

SEVENTY-SIXTH REPORT

**MINISTRY OF FOOD AND AGRICULTURE
(Department of Agriculture)**

INDIAN AGRICULTURAL RESEARCH INSTITUTE



**LOK SABHA SECRETARIAT
NEW DELHI**

April, 1965

Vaisakha, 1887 (Saka)

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C O R R I G E N D A

TO

Seventy-Sixth Report (Third Lok Sabha) of the
Estimates Committee on the Ministry of Food
and Agriculture (Department of Agriculture)--
Indian Agricultural Research Institute.

- Page (v), Introduction, para 3, line 2, for
'19th' read '20th'.
- Page 4, para 9, line 5, for "in..... to
read 'assess their actual achievements
of practical utility. Later,"
- Page 4, para 9, line 12, for 'Institutes' read
'Institute'.
- Page 10, para 18, line 5, for 'Siamazine' read
'Simazine'.
- Page 14, para 23, line 16, for 'research' read
'researches'.
- Page 14, para 23, line 18, after 'increased'
insert 'by'.
- Page 15, para 25, line 17, for 'milets' read
'millets'.
- Page 15, para 25, line 25, for 'State' read
'States'.
- Page 16, line 2, for 'Vaterinary' read
'Veterinary'.
- Page 20, para 34, line 8, after 'this' insert
'Division. The'.
- Page 20, line 6 from bottom, for 'exsicati'
read 'exsiccati'.

P.T.O.

- Page 21, line 2, after 'distribution' insert
'of'.
- Page 24, line 5, after 'dung' insert 'of'.
- Page 24, line 11 from bottom, for 'people' read
'rural people'.
- Page 25, para 44, line 6, for 'others' read
'eithers'.
- Page 26, Table, column 2, line 2, for
'22,826.02' read '22,826.20'.
- Page 26, lines 19-18 from bottom, for
'produc been Private' read
'production at the Hoshiarpur factory
has more than doubled, but'.
- ~~Page 26~~, line 6 from bottom, for 'thicyanates'
read 'thiocyanates'.
- Page 28, line 7, for 'are' read 'far'.
- Page 29, line 21, for 'sed-bed' read 'seed-bed'.
- Page 29, line 22, for 'roviding' read 'providing'.
- Page 36, para 60, marginal heading, for
'Katrain Sub-Sarion' read 'Katrain Sub-
Station'.
- Page 39, line from bottom, for 'reservation' read
'preservation'.
- Page 57, para 88, line 5, after 'made' insert
'for'.
- Page 65, line 10, for 'Trameler' read 'Trampler'.
- Page 72, line 10, after 'biology' insert
'and ecology'.
- Page 81, line 2 from bottom, for 'expedt'
read 'expert'.

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(1964-65)

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*Elected w. e. f. 18th September, 1964, *vice* Shri Lalit Sen ceased to be a member of the Committee on his appointment as a Parliamentary Secretary.

(iv)

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Shri Avtar Singh Rikhy—Deputy Secretary.

Shri B. K. Mukherjee—Under Secretary.

INTRODUCTION

1, the Chairman, Estimates Committee having been authorised by the Committee to submit the Report on their behalf, present this Seventy-Sixth Report on the Ministry of Food and Agriculture (Department of Agriculture)—Indian Agricultural Research Institute, New Delhi.

2. The Committee took evidence of the representatives of the Ministry of Food and Agriculture (Department of Agriculture) on the 1st and 2nd December, 1964. The Committee wish to express their thanks to the special Secretary, Ministry of Food and Agriculture (Department of Agriculture), the Deputy Director, Indian Agricultural Research Institute, and other officers of the Ministry for placing before them the material and information they wanted in connection with the examination of the estimates.

3. The Report was considered and adopted by the Committee on the 19th April, 1965.

4. A statement showing the analysis of the recommendations contained in this Report is also appended to the Report (Appendix IV).

NEW DELHI-I,
April 22, 1965
Vaisakha 2, 1887 (Saka)

ARUN CHANDRA GUHA,

Chairman,
Estimates Committee.

CHAPTER I

INTRODUCTORY

The Indian Agricultural Research Institute (I.A.R.I.), formerly called the Imperial Agricultural Research Institute, was founded by the Government of India at Pusa in Bihar in 1905. The Institute was transferred to the present site in New Delhi in 1936 after its original home had been irreparably damaged in the Bihar earthquake of 1934. It is today recognised as the premier research and teaching institution in India in the field of agriculture.

2. The Institute at Pusa started with five Sections, namely, Agriculture, Economic Botany, Entomology, Mycology and Chemistry. In recent years, and especially during the post-independence era, the Institute has greatly expanded its research facilities. The older Sections have grown into full-fledged Divisions, many new Divisions have been set up and substantial additions have been made to the scientific staff, equipment, library, buildings, and experimental grounds. It may also be mentioned, however, that in the course of the development of the Institute, the expansion of research in some crops has resulted in the springing up of a number of separate research institutions devoted to the study of specific commodities.

The foundations of research in cotton, silk, lac, tobacco, potato, oil seeds, rice, jute and sugar-cane were first laid by this Institute which nursed the research activities in these subjects till each was taken over by a separate research organisation.

CHAPTER II

FUNCTIONS AND ORGANISATION

A. Functions

3. The primary functions of the L.A.R.I. include:
- (i) Conducting of fundamental and applied research in agricultural sciences and related disciplines,
 - (ii) Post-graduate training in the different agricultural sciences leading to M.Sc. and Ph.D. degrees;
 - (iii) Advisory work as also extension work in the Kanjhawala Block in rural Delhi;
 - (iv) Soil surveys in the various parts of the country under the All-India Soil and Land Use Survey Scheme.

Besides its own research and development programme, the Institute undertakes co-operative research projects with institutions, such as, the I.C.A.R., Commodity Committees, Rockefeller Foundation and the United States Department of Agriculture.

B. Administrative Set-up

4. The Institute is in charge of a full-time Director who is assisted by the Dean and Deputy Director of Education in connection with the post-graduate training activities, and by a part-time Deputy Director for Research. One of the senior Heads of Divisions at the Institute is granted a special pay of Rs. 150 p.m. for performing the duties of Deputy Director (Research) in addition to his own duties. On the administration side, there is a Registrar, a Deputy Registrar, an Assistant Registrar (Education), an Accounts Officer and a Stores Officer, with the necessary complement of staff. There is also an Institute Council, consisting of the Dean and Deputy Director of Education, the Heads of the Divisions and the Registrar, which assists the Director in dealing with policy matters. An organisational chart of the Institute is given in Appendix I.

C. Divisions of the Institute

5. The scientific work of the Institute is carried out through the following twelve Divisions, each under the charge of a Head of the Division:—

- (i) Division of Agronomy
- (ii) Division of Botany

- (iii) Division of Entomology
- (iv) Division of Mycology and Plant Pathology
- (v) Division of Soil Science and Agricultural Chemistry
- (vi) Division of Agricultural Engineering
- (vii) Division of Horticulture
- (viii) Division of Agricultural Extension
- (ix) Division of Agricultural Economics
- (x) Division of Microbiology
- (xi) Division of Plant Introduction
- (xii) Division of Agricultural Physics.

Except for the first five Divisions, which correspond to the older Sections founded at Pusa, and the Division of Agricultural Engineering, established in 1945, the other Divisions are quite new. The Division of Horticulture was set up in 1957, while the Divisions of Extension, Economics, Microbiology, Plant Introduction and Agricultural Physics have been established during the Third Five-Year Plan period.

D. All-India Soil and Land Use Survey

6. The All-India Soil and Land Use Survey, which has been functioning as a separate unit at the Institute since 1958, is headed by a Chief Soil Survey Officer.

E. The Sub-Stations

7. The Institute has under its control a total of 17 sub-stations located in the various parts of the country. These sub-stations provide the necessary facility for undertaking and repeating experiments and trials in different regions having marked variations in soil and climatic conditions.

CHAPTER III

ACHIEVEMENTS AND ACHIEVEMENT AUDIT

A. Important Recent Achievements

8. The Committee have been informed that the most notable achievement of the Institute in recent years has been the production of a series of improved disease-resistant wheat varieties—now well-known as the New Pusa or 'N.P.' Wheats. It is stated that the New Pusa varieties are gaining popularity on account of their superior yielding ability and their capacity to resist the rust and smut diseases which so commonly ravage the wheat crop in India. It is claimed that the estimated increased yields from the improved wheat varieties evolved by the Institute, on the assumption that the improved varieties are grown in 20 per cent of the area, would amount in value to about Rs. 15 crores annually. It has also been stated that the Institute has produced a number of improved varieties in barley, linseed, arhar (red gram) as well as in several vegetable crops; and has also played a leading role in the researches undertaken in the country recently, as a result of which a number of high-yielding maize hybrids have been evolved and released for cultivation. Among the other achievements of the Institute, mentioned to the Committee, are the preparation of a soil map of India and the development of methods for producing synthetic pine oil from crude turpentine.

B. Achievement Audit

9. In their Seventh Report (1953-54), the Estimates Committee had recommended that a periodical achievement audit should be undertaken every three years or so in the agricultural research institutes with a view to in their Fifty-Third Report (1956-57), the Committee suggested quinquennial audit of achievements as a three year period might be considered too short to assess achievements in the field of agricultural research. In pursuance of these recommendations, Achievement Audit Committees on the various Divisions of the Indian Agricultural Research Institutes were appointed by the Ministry of Food and Agriculture in 1962.

Considering the valuable recommendations made by the Achievement Audit Committees to improve the qual-

ity and content of research work being undertaken in the various Divisions of the Institute, the Estimates Committee would like to recommend that such performance reviews may be made in the third/fourth year of each Five Year Plan period so that the suggestions regarding future line of development can be duly incorporated in the next plan period.

CHAPTER IV

RESEARCH ACTIVITIES

A. Division of Agronomy

10. The work of the Agronomy Division at the I.A.R.I. is carried out under six sections: (i) Soil Fertility, (ii) Field Crops, including Grassland Improvement, (iii) Vegetable and Commercial crops, (iv) Farm and Dairy (v) Irrigation and (vi) Weed control. The Division is also entrusted with the work on the All-India fertilizer trials sponsored by the I.C.A.R.

11. The total area of land available for the Institute Farm is 650 acres out of which 85 acres is under *Kutch* farms and irrigational channels. The area actually under cultivation is 565 acres, of which 450 acres are irrigated and 115 acres unirrigated. The unirrigated area is utilized for experiments under rainfed conditions. The Committee understand that 10 to 15 acres of the irrigated land suffers from temporary water-logging during the rainy season.

12. In view of its increased activities the Institute requires an additional 200 acres of land for experimental purposes. A provision of Rs. 5 lakhs was made for this purpose in the original Third Five Year Plan of the I.A.R.I. The Delhi Administration, who were approached in the matter, have agreed to make the required land available contiguous to the existing farm at the rate of Rs. 5 per sq. yd. The total cost on this basis would work out to about Rs. 48 lakhs. The Committee have been informed during evidence that a part of the Institute's need for additional land has already been met. Further, of the 115 acres, yet to be acquired, 45 acres owned by the Delhi Administration are being transferred to the Institute immediately.

The Committee hope that efforts to acquire the additional acreage needed for the Institute Farm will be speeded up. The Committee suggest that necessary measures should be taken at an early date to prevent waterlogging of any portion of the farm land. They would also like the Government to ensure that the existing and the new land for the farm are put to effective use.

13. Farm operations on the experimental plots of the Agronomy Division and the Botany Division have recently been partly mechanised. This has helped in reducing the recurring costs of the farm. However, there is no satisfactory arrangement for servicing and mainten-

ance of the machinery and the Institute farm has to depend for major repairs either on the Agricultural Engineering Division or on workshops in the city.

The Committee recommend that a separate 'servicing cell' may be earmarked in the Institute to attend to the servicing of mechanised equipment in the various Divisions.

14. The Committee on Achievement Audit (1962) on Agronomy had suggested that (a) procedures should be developed for maintenance of records on the Institute farm (as also on the farm of the Karnal Sub-station) involving cost accounting from which realistic conclusions with the practical applications might be drawn, (b) the economics of farm operations including cost of production of crops should be worked out, and (c) the Karnal Sub-station seed multiplication operations should be developed on business lines to demonstrate to progressive farmers how quality seed production could be a profitable business.

It has been represented to the Committee during evidence that cost accounting is possible only in cases where production is undertaken on a commercial scale; and that it is difficult to maintain cost accounts, and to work out the cost of production, in respect of the Institute, farm as the farm is mainly devoted to conducting experiments and there is no production on a sizeable scale. The Committee are also informed that the Karnal farm is being used not only for seed production but for experimental purposes as well. Further, the farm only produces nucleus seed—a highly skilled operation which, according to the Ministry, has necessarily to be done by research workers and cannot be undertaken on a commercial basis.

While the Committee appreciate the difficulties in apportioning the costs in the case of developing research, they strongly feel that there is scope for introducing cost accounting in the case of those experiments the objective of which is to recommend new practices for extension purposes. They consider that before any new agricultural practice is recommended for being passed on to the cultivator, the cost of production should always be estimated with a view to ascertain whether the recommended practice would be economical.

In regard to the Karnal Sub-Station, the Committee are of the view that its two principal activities, viz. seed production and experimental work, should be clearly demarcated and separate accounts should be maintained for that part of the sub-station farm which is used for seed

production. The Committee suggest that attempts may be made to organise the seed multiplication operations of the sub-station on commercial lines.

Investigations in Progress

(i) Model Agronomic Trials

15. Coordination work of the I.C.A.R. scheme on Model Agronomic Experiments was taken up in the Division in the year 1955-56. The Achievement Audit Committee had pointed out in their Report of March, 1962, that the necessary follow up action in the form of laying out of demonstrational trials of useful recommendations on a large scale in the country had not been initiated till then and that there had been delay in drawing conclusions from the Model Agronomic Trials. The Committee had stressed the necessity of working out the economics of the recommended practices emerging from these trials. They had also strongly emphasized that the organizational set up of the Coordinated Scheme should be such that at the State level the recommendations were quickly transmitted into farm practice.

It has been stated during evidence by the representative of the Ministry that the data relating to the Model Agronomic Trials has since been processed. The broad results are that (i) there is almost a universal response to nitrogen all over India, (ii) sixty per cent of the trials have shown that there is quite an appreciable response to phosphorous, and (iii) the general impression that Indian soils are rich in potash is not correct. It is, however, stated that though these trials would help in establishing a correlation between soil testing and actual crop response, the number of experiments conducted so far is not large enough to permit recommendations being made to the cultivator about the fertilizers required for "every type of soil in every village".

The Committee endorse the Audit Achievement Committee's views as to the need to work out the economics of the useful recommendations arising from the Agronomic trials and the proper transmission of such recommendations to the cultivators. They would, however, like to suggest that the Agronomy Committee of the Indian Council of Agricultural Research may review the working of the whole scheme, now in operation for about a decade, and give suitable directions in order that results of practical value to farmers may be obtained from these experiments as expeditiously as possible.

(ii) Experiment with 200% intensity of cropping

16. In pursuance of the recommendations of the Audit Achievement Committee (1962) a trial was started in

Kharif 1963 at 200% intensity of cropping for the maximisation of production of different crops grown in suitable rotations according to a package programme of improved agronomic practices. Besides, maximisation of production of individual crops is also attempted by various workers separately in the respective Sections of the Agronomy Division. The maximum yields obtained from the various crops included in these trials are given below:—

Name of the Crop	Maximum yields obtained on the farms (in quintals)	Yields obtained during 1963 in maximisation trials (in quintals)	Remarks
Maize + Cowpea (fodder)	435.0	435.0	..
Jowar (Fodder)	516	516	..
Oats (fodder)	850	446	After maize and cowpeas
Napier + berseem	2648.0	3567	Berseem taken as mixed stand in Napier
Berseem (Fodder)	1362	764	
Senji (fodder)	280	199.0	After cotton
Maize (grain)	45	26	
Wheat grain.	55	48	After maize
Oats grain	50	..	
Linseed	23	17	
Peas	14	15	} Severely affected by frost during winter of 1963
Potato	300	149	
Seed Cotton	17	8.90	Damaged by excessive rain during monsoon of 1963.

The Committee consider that the maximisation of production trials conducted by the Agronomy Division demonstrate great potentialities of stepping up farm yields through a proper combination of as many improved production practices as possible. They hope that the results obtained so far from these trials will be evaluated by the Agronomy Committee of the I.C.A.R. and the improved practices given wide publicity for the benefit of farmers.

(iii) Experiments in Spray Fertilization

17. A scheme to investigate the possibility of meeting the nutrient needs of crops through spray fertilization was initiated in the year 1957. The results of experiments conducted under the scheme some years ago indicated that application of nutrients through spray fertilization might lead to more effective use of nutrients by the crop and, consequently, result in economy in fertilizer use. More recently, it has been found that it is feasible to combine spray fertilization with fungicides and insecticides—a process by which crops can be simultaneously ensured effective nutrient supply as well as protection against pests and diseases.

While noting the encouraging results that have come out of some of the experiments in spray fertilization, the Committee regret to observe that although the scheme has been in operation for over seven years the data available so far, in the case of some important crops, are insufficient for drawing any firm conclusions. For instance, only one year's data is available in regard to wheat and potato. The Committee suggest that the tempo of work on the scheme should be accelerated and proper data should be maintained on a regular basis in respect of all the crops.

The Committee also note that spray fertilisation under rainfed conditions has so far been undertaken only in respect of barley. In view of the encouraging results of the experiments on barley, the Committee suggest that the desirability of undertaking spray fertilization of other crops under rainfed conditions may be considered by the Institute.

(iv) Weed Control

18. The Committee note that the effectiveness of the chemical 2-4-D in the control of weeds in cereal crops like wheat has been demonstrated convincingly during the last ten years even on farmers' fields. The selective weedicide Siamazine has been found to be promising for crops like maize and sugarcane, while another chemical M.C.P.B. has been found useful for control of weeds in linseed. The economics of chemical weed control compares favourably with hand weeding. For instance, it has been found that the yield increase in maize from the application of weedicides, costing Rs. 19 per acre, is at par with three hand weedings. Chemical weeding has the additional advantage of being more lasting in effect.

The Committee consider that application of weedicides would help materially in stepping up agricultural production side by side with conserving soil fertility.

To popularise the use of weedicides, they would suggest the holding of effective demonstrations in cooperation with State Departments of Agriculture. Government should also take necessary measures to ensure that such weedicides as have been proved to be efficacious and free from toxicological hazards are manufactured increasingly within the country and made available to farmers at reasonable rates.

19. The Sahiwal herd at the Indian Agricultural Research Institute was founded in 1904. In 1951-52, the major portion of the herd was transferred from the Indian Agricultural Research Institute to the Karnal Cattle-cum-Dairy Farm, which has since grown into the National Dairy Research Institute, and only 43 animals were left at Delhi. The present herd of 180 animals with 71 adult cows has been built up from the small number retained in Delhi.

In a note submitted to the Committee by the Ministry it has been represented that although animal husbandry is not one of the main functions of the I.A.R.I. there is need for maintaining some cattle at the Institute in connection with the studies on mixed farming as well as the evaluation of feeds and fodders evolved by the plant scientists at the Institute. During evidence the Committee have also been informed that the Indian Agricultural Research Institute is not doing any fundamental research in animal husbandry and that in the sphere of animal science the Institute's work is largely restricted to a few studies in animal nutrition.

Since the primary responsibility of research on cattle breeding and cattle nutrition is that of the National Dairy Research Institute, the Committee would suggest that cattle surplus to the research requirements of the Indian Agricultural Research Institute may be transferred to the National Dairy Research Institute, Karnal. The Committee would also wish to emphasize the desirability of close coordination between the Indian Agricultural Research Institute and the National Dairy Research Institute to avoid infructuous overlapping in research programmes of the two Institutes.

B. Division of Botany

20. The Division of Botany is responsible for conducting researches with the ultimate object of breeding improved varieties of crop plants, by building and utilising for this purpose scientific knowledge in basic sciences, like genetics, cytogenetics and plant physiology. The plant breeding work of the Division has resulted in the development of many improved varieties of crop plants which

have been found useful from the farmer's point of view. It has been stated that research using radioisotopes has been in progress in the Division since 1955 and that as a result of this work several mutations of economic value have been isolated in wheat, barley, cotton, tobacco, tomato, potato and toria, the most notable achievement being the evolution of a new wheat variety, named NP 836, which has a high yield and a high degree of resistance to rust and also well developed awns. In order to intensify this work a 200 curie cobalt-60 field radiation unit, popularly known as 'Gamma Garden', was set up in 1960. The Committee have been informed that this facility has been used by all research workers in the country and has enabled the initiation of an extensive programme in the field of mutation breeding. Experimentation is done free for all the States and about 500 to 600 requests from the various States and abroad are received during a year.

Besides its own research programme, the Botany Division is at present, closely associated with the Co-ordinated Wheat Rust Control Scheme and the co-ordinated projects for hybrid maize and millets.

(i) *Coordinated Wheat Rust Control Scheme*

21. In 1935, researches were taken up at the Simla Sub-station of the Institute, for the first time in the country, for breeding disease-resistant varieties of wheat. In 1949, the Indian Council of Agricultural Research decided to take up this work on a country-wide basis under the co-ordinated Wheat Rust Control Scheme. Under this scheme, research centres were located in the States of Punjab, Rajasthan, Uttar Pradesh, West Bengal, Madhya Pradesh, Bombay (now Maharashtra) and Andhra Pradesh. At the Indian Agricultural Research Institute the scope of the work under this scheme was enlarged and was carried out at New Delhi and at sub-stations located, besides Simla, at Bhowali (Uttar Pradesh Hills), Pusa (Bihar), Indore (Madhya Pradesh), and Wellington (Nilgiri Hills). The Botany Division concentrated on the breeding work and the Division of Mycology and Plant Pathology cooperated by testing the breeding material for resistance to diseases. During the Second Five Year Plan period, the scheme was taken over by the Government of India, and it now forms a part of the permanent research activity of the Institute.

The Committee are gratified to note that the N.P. 800 series of wheat, developed by the Institute, not only possess a high degree of resistance to rusts but are also immune to loose smut. However, in order that the Wheat improvement programme, currently under way in the Institute, may make a greater impact on wheat production in the country, the Committee suggest that efforts should

be made to breed new varieties of wheat that can stand upto much higher levels of fertilizer application than the existing varieties, and are at the same time resistant to diseases and insect pests, besides possessing the superior quality characteristics of the Indian wheats.

Considering that nearly 70 per cent of the area under wheat in the country is under 'barani' (unirrigated) cultivation, investigations for breeding wheat varieties resistant or tolerant to draught should be intensified.

The Committee also suggest that Indian Agricultural Research Institute may investigate the possibilities of the commercial exploitation of hybrid vigour in wheat—a recent advance in wheat breeding which has helped in raising the average yield of wheat from 3,000 kgs. to over 6,000 kgs. per hectare in many good lands in California and Mexico.

(ii) Coordinated All-India Projects for Hybrid Maize and Millets

22. In 1957, the Indian Council of Agricultural Research put into operation a research project, in cooperation with the I.A.R.I., the Rockefeller Foundation and the principal maize-growing States, for the development of maize hybrids suited to Indian conditions. For this purpose, the country was divided into four agro-climatic zones and in each zone a main centre and some sub-centres were set up. One of the four main breeding centres is situated in the Botany Division of the Indian Agricultural Research Institute. This Centre has also been entrusted with the responsibility for coordinating the work carried on at the different centres.

As a result of this coordinated work, 6 hybrids have been recommended and released for general cultivation. These hybrids are resistant to diseases and pests prevalent in the country and also produce more fodder of superior quality. Besides, being highly responsive to fertilizer application and to other improved methods of crop culture, the hybrid varieties are capable of giving much higher average yields than the ordinary (open pollinated) varieties commonly grown by the farmers. For instance hybrid maize has been able to respond to 80 lbs. to 100 lbs. doses of nitrogen per acre and to give a grain yield of 73 maunds per acre, the average per acre yield of maize in India being only 8 to 10 mds. Research work is still in progress for developing new and still better maize hybrids.

The Committee appreciate the progress made in the development of hybrid maize and hope that research on this will be intensified for further progress and results.

23. Another coordinated scheme, the Accelerated Hybrid Sorghum Breeding Project, was initiated by the I.C.A.R. in 1960. This is a regionally-coordinated programme conducted in collaboration with the Rockefeller Foundation, at the centres in Surat, Dharwar, Dhadesugar (Mysore) and Coimbatore. As in maize, the main centre, which coordinates the entire work, is located at the I.A.R.I.

The Committee have been informed that although more than a 1000 hybrids of sorghum have been tested, only one high yielding variety has so far been released for general cultivation as a hot weather irrigation crop in Madras State and in some areas of Andhra Pradesh, Mysore and Gujarat States.

The Committee feel that the progress so far achieved in the evolution of high yielding varieties of sorghum is not quite satisfactory. Inasmuch as research have conclusively demonstrated that grain yields in many crops can be very substantially increased using seeds of hybrid varieties, the Committee would like to recommend that research work for evolving new and better hybrids in sorghum should be intensified.

24. A scheme to study the protein and gluten contents of Indian wheats and also to assess their milling, baking and chapatee-making qualities was initiated in the Botany Division under the Second Five Year Plan, and for this purpose provision for a small nucleus staff was made. The U.S. Technical Cooperation Mission (Now U.S.A.I.D.) made available for this work modern equipment and apparatus and the Rockefeller Foundation assisted in the construction of the Cereal Research Laboratory. When the Study Group of the Committee visited the Institute towards the close of September 1964, it was stated that the equipment and apparatus made available by the U.S.A.I.D. were not being used for want of electric power. However, the Committee have been informed during evidence that the requisite power has since been made available by the Delhi Corporation and the equipment and apparatus are now in use. It has also been stated that the Institute is getting an expert from the United States to help it in the matter of the nutritional and technological assessment of the various varieties of wheat.

The Committee are unhappy to note that costly equipment of the Cereal Research Laboratory should have remained idle for about two years for want of electric power. This underlines the need for effective coordination between various Departments of the Government. Now that the requisite power has been made available, the Committee hope that researches on nutritional quality of cereals will be intensified.

25. It is recognised on all hands that the available supply of improved varieties of seeds falls far short of the country's requirements. For instance, out of a total acreage of about 10 million acres under maize, only approximately 82,000 acres are estimated to have been planted with the high yielding hybrid varieties in Kharif, 1963.

The Committee have been informed that so far as the I.A.R.I. is concerned it has not been possible for the Institute, due to the limited land at its disposal, to multiply large quantities of seeds. However, the Botany Division and the Agronomy Division of the Institute, and their substations at Pusa and Karnal, cooperate to produce small quantities of foundation seeds of the improved varieties bred at the Institute, and these seeds are supplied to State Governments and to a few selected progressive farmers for further multiplication and distribution. In the case of hybrid maize and millets, pure nucleus seeds, which are necessary for producing the seeds of the hybrids, are supplied to the National Seeds Corporation.

The Institute is also working in this direction in the Kanjhawala Block where it is carrying on extension work since 1950. A number of villages in the Block have been saturated with the improved varieties of wheat and other crops evolved by the Institute. The Institute has also assisted the farmers in selling their seeds to other State.

The Committee have been informed that the Ministry of Food and Agriculture have recently constituted a Committee under the Chairmanship of Shri B. Sivaraman to draw up a plan to streamline and intensify the seed multiplication programmes in the country.

The Committee are in agreement with the views expressed by the Panel of Agricultural Scientists that "the time and money spent in plant breeding research will be a waste, if there is no efficient machinery for multiplying the seeds of new varieties." The Committee would, therefore, urge the Government to launch, without any avoidable delay, a country-wide crash programme for the multiplication of seeds of improved varieties as well as for the proper distribution of such seeds among the farmers. The Committee would also suggest in this connection that the seed production programmes of the agricultural research institutes in general and the Indian Agricultural Research Institute in particular may be thoroughly examined with a view to augment the production of improved nucleus seeds.

26. Research in fodder grasses, conducted in Botany Division, have resulted in the development of two outstanding varieties, namely "Pusa Giant Napier" grass for irrigated fodder and "Pusa Giant Anjan" grass for dryland pasture. The Committee understand that some research

on grasses and legumes is also being carried out in the National Dairy Research Institute and the Indian Veterinary Research Institute. Moreover, in view of the importance of developing fodder varieties a separate Grassland Research Institute has been set up at Jhansi under the Third Plan. The Committee have been informed during evidence that even with the establishment of the Grassland Research Institute, a certain amount of work on fodder grasses will have to continue at the Indian Agricultural Research Institute because some students may like to take up problems which are connected with these grasses.

The Committee would, in this connection like to reiterate the recommendation made by them in their Eightieth Report (Third Lok Sabha) on the Indian Grassland and Fodder Research Institute, namely, that there should be close and intimate coordination between the various Institutes engaged in research on fodder grasses so that the more promising projects may be picked up for further intensified research and duplication and overlapping may be avoided.

C. Division of Entomology

Functions and Set-up.

27. The activities of the Entomology Division aim at conducting both fundamental and applied investigations for the economic control of insects and other animals pests of crops. The work of the Division is carried out under five sections, namely (1) Systematic Entomology, (2) Insect Ecology and Toxicology, (4) Insect Physiology and (5) Insect Genetics, the last named Section having been added during the Third Plan period.

Work on Systematic Entomology

28. Work on Systematic Entomology has been carried out in the Entomology Division ever since the Institute was founded. A separate section for the purpose was created in 1948, with a Systematic Entomologist in-charge. The main responsibility of this Section is to maintain and develop what is known as the "National Pusa Insect Collection" which had been built up, largely during the three decades preceding 1946, by survey and collection from all over India and by mutual exchange with many neighbouring countries and Europe. This Collection forms the basis for the correct identification of insect pests and their parasites and predators and is thus of very great value not only to the different States of India, from where a large number of insects are received every year for identification, but also to other countries especially those in Asia and Africa.

29. Commenting on the work carried out in the Systematic Entomology Section, the Achievement Audit Subcommittee (1962) had observed:

"the progress has been extremely unsatisfactory both from the quality and output of work as

well as from the direction of work which seems to have very little relevance to its agricultural utility. The bulk of the work carried out has been of a compilatory nature and of the book work type and very little original contribution based on critical examination of actual specimens has been done."

The Sub-Committee also examined the National Pusa Insect Collection and noticed that "the state of maintenance and curating of the specimens was highly unsatisfactory." Further, as regards the actual output of work, such as the description of new species, etc. it pointed out that there had been 'no marked increase from 1936—45 onward". The Sub-Committee made a number of suggestions indicating the lines of work which the Section might adopt and also recommended that the staff of the Section should be strengthened by the addition of one Curator, two Assistant Systematic Entomologists, four Research Assistants and two Insect Setters.

30. The Committee have been informed during evidence by the representative of the Ministry that the research programme of the Entomology Section has been "completely reoriented in the light of the recommendations of the Achievement Audit Sub-Committee." It has been stated that the unsatisfactory state of maintenance and curating of the National Pusa Insect Collections was due to lack of staff. So far as the appointment of the additional staff, recommended by that Sub-Committee, is concerned, the Committee have been informed that—

"posts have been created six months ago and appointments will be made by the U.P.S.C. gradually".

The Committee are unhappy to note that the maintenance of an important asset like the National Pusa Insect Collection should have been allowed to suffer from want of proper care and attention and that, although the need for augmenting the staff of the Systematic Entomology Section was pointed out by the Achievement Audit Sub-Committee as far back as September 1962, the additional staff required to conduct the work on Systematic Entomology on the right lines is yet to be appointed. The Committee strongly recommend that recruitment of the required additional staff should be expedited and every effort should be made to bring the curating (including preservation, labelling arrangement, identification, etc.) of the National Pusa Collection up-to-date so as to ensure its safety and scientific utility. They would also like to urge that the utmost care should be taken in carrying out identifications of insects. The Section of Systematic

Entomology should also devise ways and means of providing a quick and accurate identification service to all agricultural agencies in the country.

31. Work on biological control, that is, the control of insects through the agency of their natural enemies—the parasites and the predators—was started in the Insect Parasitology Section of the Division in 1948. The Achievement Audit Sub-Committee (1962) had observed with regard to this work,—

“Although the work of biological control has been going on here for the last 15 years...nothing tangible has been achieved by way of biological control mainly because of a completely wrong emphasis on indigenous parasites”.

The Ministry have stated in a written note supplied to the Committee that the observation of the Audit Achievement Sub-Committee, quoted above, “does not actually represent lapses but failure of experimental efforts”. This has been explained at considerable length, as follows:

- (i) “There are two major approaches of biological control. The first approach is to make all kinds of possible efforts to make the indigenous agents of biological control behave better and exercise greater check on the pest than what they have been already doing. The second approach to biological control is to survey the whole world for possible agents of biological control which do not happen to be present in the country and to make arrangements to introduce those exotic parasites and predators and establish them in the country.”
- (ii) “Rich countries like America started experimentation on the second aspect by sending out explorers to different parts of the world and in that way they have introduced several hundred parasites into U.S.A. and about 5 to 6 per cent of them have proved successful. On the other hand, countries like India with poor resources had naturally to follow the former course, i.e. of trying to make the indigenous parasites and predators behave better”.
- (iii) “As a result of the work done during the last two decades or so it has become clear that the work on the former item leads to a large number of very interesting fundamental conclusions but it is on the whole very difficult for man to compete favourably with nature and make the indigenous parasites behave better than what they have been doing. In view of such experience there has been during recent

years an effort all over the world to switch on to the next major approach of biological control, namely, the introduction and establishment of exotic parasites.

- (iv) The Parasitology Section of the Division of Entomology has also been experiencing the same difficulty and has been meeting the same fate as indicated above."

The Committee have also been informed that the Entomology Division has recently submitted to the Government a proposal suggesting that the Section of Parasitology should be reorientated so as to introduce exotic parasites through the facilities provided by the Commonwealth Institute of Biological Control, Bangalore and to subject these parasites and predators to fair trials in the different regions of the country.

The Committee consider that the Institute should have long ago undertaken a systematic effort to investigate the possibilities of controlling through the agency of exotic parasites insect pests, which according to rough estimates are known to destroy between 10 to 20 per cent of the country's total agricultural produce. They hope that Government would expedite decision on the Entomology Division's proposal seeking the necessary reorientation in the activities of the Parasitology Section. The Committee need hardly state that where laboratory experiments on a parasite show promising results it should be tried out in the field to establish whether it could be successfully used for biological control.

32. The Committee note that work on Insect Ecology and Toxicology has yielded the following interesting results in recent years:

Work on Insect Ecology and Toxicology.

(i) Simple and cheap modifications of mud structures, incorporating a layer of polythene, have been successful in keeping the stored grains free from insect infestation. The new storage structures have been successfully demonstrated in the Delhi villages.

(ii) Spraying a 1 per cent suspension of 'neem' seed in water keeps crops free from locust attack for 3 weeks. It is also fairly effective against larvae of Bihar hairy caterpillar. Also the 'neem' seed preparation mixed 1 to 2% with gram and 'mung' seeds protects both the seeds from bruchid infestation at least for two months; encouraging results were also obtained with wheat seeds.

(iii) Studies on the effect of formulation on the toxicity of insecticidal emulsions to locust adults yielded certain results of fundamental importance, one of which is

that against ordinary expectations the increase in the quantity of a solvent beyond a particular proportion in the emulsion can result in the decrease in toxicity.

The Committee consider it necessary that the economic utility of these and other results emanating from researches in the Entomology Division should be fully tested, and that such of the new findings and practices as are found to be of practical value in controlling the pests should be promptly made known to the farmers.

**Need for
Studies on
Bird Pests.**

33. It has been stated during evidence that no systematic work on bird pests has been done at Indian Agricultural Research Institute.

The Committee feel that the Entomology Division could at least make a beginning in this direction by initiating studies on (a) the biology and ecology of birds and (b) methods of control of bird pests. The Division may also undertake studies on the use of birds for biological control of pests.

D. Division of Mycology and Plant Pathology

**Functions
and Set-up**

34. The Division conducts researches on plant diseases caused by fungi, bacteria and viruses with the object of evolving suitable measures for their control. It also collaborates with the Division of Botany in the work of breeding diseases—resistant varieties of wheat and other crops. A Mycological Herbarium, known as *Herbarium Cryptogamae Indiae Orientalis*, comprising about 21,000 specimens, is housed in this Division comprises four Sections: (1) Systematic Mycology, (2) Plant Pathology, (3) Plant Bacteriology and (4) Plant Viruses.

**Systematic
Mycology.**

35. The main work of the Section of Systematic Mycology is maintenance of the Herbarium, preparation of exsiccati sets of Indian fungi—exsiccati are dry specimens of pathogenic, i.e. disease-producing, material—and identification of plant disease fungi as and when received. It has been stated during evidence that two complete exsiccati sets, prepared by the Section of Systematic Mycology, have already been issued to two regional centres in the country and other two sets are being sent to other regional centres shortly.

Considering that the Indian exsiccati sets can be a useful aid to mycological studies and investigations, the Committee would like the I.A.R.I. to endeavour to supply these sets to such agricultural research and training institutions in the country as may be interested in acquiring them and are in a position to make good use of them.

36. The Committee have been informed during evidence that for a more thorough study of the distribution races of wheat rusts than has been possible till now owing to the limitations of the existing set-up, it would be necessary to collect and analyse thousands of specimens "because new races of rust are coming up by mutation every year." To conduct investigations on such a large scale a number of additional sub-stations would have to be established in different parts of the country for the collection and examination of specimens. In this connection, it has also been stated that the Indian Agricultural Research Institute have formulated a proposal for initiating an integrated and expanded Wheat Improvement Programme. The programme which is presently being examined by the Government will involve considerable augmentation of staff and equipment. However, the representative of the Ministry has expressed the hope that it would be possible to sanction it in the Fourth Plan.

Researches in
Wheat Rusts.

The Committee would like to suggest that pending a decision on the proposal of the Institute for an expanded Wheat Improvement Programme, every effort should be made to intensify investigations on the problem of wheat rust at the existing wheat research sub-stations of the Institute

37. It has been stated during evidence that only routine testing of fungicides is being done in the Indian Agricultural Research Institute in a preliminary way; the evolving and developing of new materials is the concern of the National Chemical Laboratory which, however, "is not taking much interest in this".

Works on
Fungicides.

The Committee fail to understand why with all its facilities for research the Indian Agricultural Research Institute should have confined itself to merely routine testing of fungicides. In any case, the Institute after some preliminary research should have actively pursued the matter with the National Chemical Laboratory. As the availability of efficient fungicides at cheap rates can obviously make a significant contribution to the success of the country's food production programmes, the Committee would like the Government to take appropriate steps for the development and manufacture of fungicides.

E. Division of Soil Science and Agricultural Chemistry

38. The principal objective of this Division is to study the soils of India in relation to their crop producing capacity and to carry out investigations on soil conditions and manurial practices which would help in increasing the yields and the quality of agricultural produce obtained from

Functions
and Set-up.

the land. The Division has four Sections: (1) Agricultural Chemistry, (2) Soil Survey and Soil Physics, (3) Physical Chemistry, and (4) Plant Chemistry. It also conducts radio-tracer studies on fertilizer uptake by plants from various types of soils and co-ordinates the all-India project on soil testing. Prior to the setting up of the All-India Soil, and Land Use Survey* at the Institute, a considerable amount of soil survey work of India was also done in this Division.

**Permanent
Manurial
Experiments.**

39. It has been stated that the results of the permanent manurial experiments conducted at Pusa (Bihar) have shown that there is no basis for the belief that continuous application of chemical fertilizers leads to a deterioration in the quality of wheat crop, mainly its protein and mineral content. Further, it was stated during evidence that "balanced inorganic fertilizers can maintain the crop yields on long term basis like farm yard manure or prosphated green manure."

The Committee consider that the results emanating from the manurial experiments conducted by the Division of Soil Science and Agricultural Chemistry should be collated and widely publicised among farmers so as to enlighten them on the balanced use of fertilizers and remove any misconception about the effect of chemical fertilizers on the nutritional value of food crops or the fertility of the soil.

**Research on
Pesticides.**

40. The Plant Chemistry section of the Division has been conducting researches on developing synthetic pesticides and extraction of insecticides from natural resources. It has been stated that the neem seed emulsion has been found a useful repellent for locusts and pests and that it has the additional advantage of being free from toxic hazards. Further, as manure also neem cake seems to nitrify better. The Committee have also been informed that although the progress made in India, in increasing the know-how about pest-control compares quite favourably with the United States, Britain, Japan, etc., the application of this know-how on large scale in the country is mainly a question of organisation, economics etc. and in this respect India has to make much progress.

It has been stated during evidence by the representative of the Ministry that the main bottleneck in spreading the use of pesticides in the country is the lack of pesticides as well as equipment for spraying them. Hand-spraying equipment is made in India, but what is required is power sprayers, engines for which are not made in the country. As regards the neem seed spray, the Committee have been informed that although the economics of protecting crops by this method have not been worked out, it is gene-

rally said that the method is of practical use only for high-value orchard crops.

The Committee note with distress that inspite of the high level attained in regard to the know-how about pest control, there has been scant progress in regard to the application of the know-how on a large scale in the country. Even the supply of spraying equipments falls far short of the requirements of the farmers. The Committee need hardly stress the necessity of making cheap pesticides available to the farmer. They would like the Government to devise ways and means in consultation with the Hindustan Insecticides Ltd. for production of pesticides and spraying equipment on a scale adequate to meet the country's requirements.

The Committee also suggest that the Indian Agricultural Research Institute should undertake detailed investigations and trials to assess the economic utility of the neem seed spray in regard to different crops. The investigations should be followed up by adequate publicity in regard to the method of producing and using the spray and its economics.

41. It is well-known that enormous quantities of cattle dung produced in the country, which could otherwise be used as manure to step up agricultural production, are burnt as fuel in the absence of alternative cheap sources of fuel. The Indian Agricultural Research Institute took up this practical problem of the farmer for investigation in 1939. It tried to work out some system by which these two conflicting aspects—of burning dung for fuel purposes and using it for manuring of crops—could be reconciled. The experiments resulted in the design of what is known as the cowdung or Gobar Gas Plant. The usefulness of this plant has been described as follows in notes supplied to the Committee:

The Cow-dung Plant.

"The cowdung gas plant . . . provides a worthwhile solution of the traditional problem of the farmer having to burn dung for fuel purposes. The gas plant enables combustible gas to be produced by fermentation of dung and the residue can still be used as manure; actually, the quality of the manure thus obtained is superior to farm yard manure. The gas can be used for cooking and lighting as also for producing power for operations like chaff-cutting, lifting of water from small to medium depths, etc. . . . The cowdung gas plants have been successfully operated by farmers and research and educational institutions and there is great need and scope for their further popularisation in the country.

The cost of installation of the village model of the gas plant comes to about Rs. 450. No other expenditure on its day to day maintenance is required. The daily production of about 100 c.ft. of gas is obtained by regular addition of dung about 5 animals. This is sufficient to meet the cooking requirements of a family."

42. When the Study Group of the Estimates Committee visited the Institute in September, 1964, it was stated that the cowdung gas plants had been working successfully for over 10 years. There were 200 plants working in the whole country, Gujarat had 100 of them and the Kanjhawala Block of Delhi had 6. The Study Group were also informed that the adoption of this gas plant offered a vast scope to farmers all over the country. However, during the course of official evidence the Committee have been informed that certain difficulties have been experienced in popularising these plants. In the first place the number of those who are trained in handling and installing the plant is very small. Secondly, since even the ordinary size plant for a house costs at least Rs. 300 and might cost as much as Rs. 600 if made in a commercial workshop, not many cultivators could afford to go in for one.

The Committee are unhappy to note that although the country has been hearing of the cowdung gas plant for nearly two decades, the plant is still essentially in the demonstration stage. They consider it particularly unfortunate that lack of trained personnel should come in the way of installing this device in places where it is in demand.

In view of the difficulties mentioned during evidence, the Committee strongly recommend that future investigations in regard to the cowdung gas plant project at the Indian Agricultural Research Institute should concentrate on bringing down the cost of the plant. The Committee suggest that Government should also make a phased programme for getting trained personnel in adequate numbers and should encourage commercial manufacture of the plant at an economic price. The Committee also suggest that Blocks and Panchayats may be persuaded to put up demonstration plants in their regions so that the people may get some idea of the utility of the plant.

**Soil Testing
Laboratories.**

43. The Indian Agricultural Research Institute under Indo-U.S. Operational Agreement No. 4 (Determination of Soil Fertility and Fertilizer Use) established 24 Soil Testing Laboratories, each with a capacity to handle about 10—12 thousand samples per year. These laboratories were run by the Centre for the first 3 years and thereafter handed over to the States. The coordination of work of these laboratories is however, done by the Indian Agricultural Research Institute. Under the Intensive Agricul-

tural District Programme, the Ford Foundation in co-operation with the Indian Agricultural Research Institute, and the Ministry of Food and Agriculture, are establishing nine new laboratories. The co-ordination of the laboratories will also be done by the Indian Agricultural Research Institute. Besides these, the State Governments have established also a few laboratories of their own.

The total number of Soil Testing Centres functioning at present in the country is 30. The number of soil samples analysed so far by the laboratories is 7.5 lakhs. The Soil fertility maps depicting deficient and sufficient areas have been prepared on samples analysed upto December, 1963.

At the Indian Agricultural Research Institute, a Special Officer has been appointed to help the Head of the Division of Soil Science and Agricultural Chemistry in the co-ordination of the work of all the laboratories in the country. Soil test data are compiled through reports received on a standard proforma from each centre every month. Every month processed data for all the laboratories are circulated to the various laboratories, administrations etc. Year-wise soil test summaries and maps are also prepared. To check on the procedures or methods of analysis in the various laboratories periodically, a number of check samples are sent out to the laboratories and the laboratories are asked to report the results to the Headquarters. The Indian Agricultural Research Institute also provides the various laboratories help in the maintenance and repairs of equipment. Further, the Soil Testing laboratory located at the Institute does soil analysis work for the Delhi area.

The Committee have been informed that Government intend to set up a National Soil Service with the help of the U.N. Special Fund within the next two years. The Committee suggest that Government may examine whether, the responsibility for the co-ordination of the work of the Soil Testing Laboratories should, in due course, be entrusted to the new Organisation proposed to be set up.

44. It has been stated that, as a result of researches carried out in the Division of Soil Science and Agricultural Chemistry, the Institute has been able to obtain three patents which have proved suitable for commercial exploitation. One of these concerns improvements in or relating to the preparation of terpene ethers and alcohols, now popularly known as synthetic pine oil. The product has essentially been developed as a base and synergist for pesticidal formulations but, being almost similar in composition to natural pine oil which was entirely imported, it has been found to be a good substitute for the natural product in numerous other industries. The other two patents are inter-related and cover preparation of thiocyanates

Processes
Patented for
Commercial
Exploitation.

which "besides being effective against aphids, notorious pests of agriculture, are characterised by their knock-down properties". They also synergise or activate other insecticides and are, therefore, incorporated in most of the household sprays.

The Committee have been informed that the patent in respect of synthetic pine oil was licenced for commercial development in 1959 to M/S Prabhat General Agencies, Bombay and a 300-ton capacity factory went into commercial production at Hoshiarpur (Punjab) in the year 1961. The monetary gains that accrued to the Government on account of this patent are given below:

<i>Royalty</i>	Rs.
1960-61	8,470.50
1961-62	22,826.02
1962-63 (April-Sept.)	12,222.76
TOTAL (UPTO SEPT. 1962)	43,519.46
 <i>Premia</i>	 10,000.00
Total amount received upto Sept., 1962	53,519.46

It has been stated that since September, 1962, production was granted to M/s Bhagwan Finance Corporation Private royalty with respect to subsequent production is yet to be received by the National Research Development Corporation (N.R.D.C.).

Another licence for producing synthetic pine oil has been granted to M/s Bhagwan Finance Corporation Private Ltd., Calcutta, in 1962. The factory is under construction at Rajpura (Punjab) and production is likely to start during 1965. With full production it is expected that there will be a saving of Rs. 40—45 lakhs per annum in foreign exchange.

Licences for two patents covering the preparation of thicyanates have also been issued for commercial development to M/S Bhagwan Finance Corporation by the National Research Development Corporation in 1963. The firm has paid a premium of Rs. 5,000 to the Corporation.

The Committee suggest that processes patented by the Indian Agricultural Research Institute should be given

adequate publicity and be made available for commercial exploitation preferably to more than one party, so that the prices of the finished products are kept at reasonable levels through the operation of healthy competition.

45. The Committee have been informed during evidence that the Differential Thermal Analysis Unit, costing Rs. 29,000 and obtained for the Division of Soil Science and Agricultural Chemistry in 1958, has not been set up so far for want of a certain part that was not supplied initially and which could not be imported for a long time due to non-availability of foreign exchange. Subsequently, the spare part was imported but it was damaged in a fire which broke out in October, 1964 in the godown of the Company to which it was entrusted for repair. The equipment continues to remain idle. So far as the damage from the fire is concerned, the Committee have been told that the Institute will not have to bear the loss as the damaged part has to be replaced by the concerned company. The Institute has only to provide foreign exchange to the tune of Rs. 3,800 to the Company for importing the spare part again.

The Committee have also been informed that the equipment or Electrophoresis, obtained at a cost of Rs. 10,000 has remained idle for one and a half years for want of qualified staff who could make use of it. It has been stated that the job required M.Sc's in soil chemistry and "they are rather few in India". However, the staff is now in position.

The Committee regret that all the parts required for Differential Thermal Analysis Unit were not imported initially in 1958 and that there was considerable delay in making available foreign exchange to the tune of Rs. 3800 for importing the requisite part. The Committee consider that had timely action been taken to obtain the requisite part, it should have been possible to commission the Differential Thermal Analysis Unit long ago. The Committee hope that every effort will be made to put the equipment to use as early as possible, and that necessary action will be taken to ensure that such instances of non-utilisation of research equipment do not recur.

F. Division of Agricultural Engineering

46. The Agricultural Engineering Division was established in November, 1945 with the following objectives in view:—

- (1) To collect and conduct trials on the indigenous implements, to modify or redesign them to improve their efficiency.

- (2) To import horse or bullock drawn implements from abroad, to try them and make necessary modifications to suit our cultural practices and draught power of animals.
- (3) To conduct field tests on tractors and power implements with a view to determine their suitability under Indian conditions in so far as their performance, cost of operations and other advantages and disadvantages are concerned.
- (4) To conduct research and design new and labour saving and cheap implements for the Indian farmers to suit various types of soil, climate, draught power and other regional conditions.
- (5) To advise the public and State and Central Governments on different technical problems of mechanised cultivation that arise from time to time.
- (6) To impart post-graduate training in Agricultural Engineering.

Achievements.

47. The Committee are informed that the main achievements of the Division, since its inception in 1945, are as follows:—

Manure Sieving Machine.—In order to screen out undesirable materials, such as bricks, glass pieces, tin cans, stones etc., from the compost manure heaped in town refuse dump so that it can be utilised on the fields properly, proto-type manually operated rotary screen has been designed and fabricated in this Division.

Jute Seed Drill.—A single-row jute drill was designed and sent to the Jute Agricultural Research Institute, Barrackpur, for field trials. After some modifications the drill was found to be quite successful. On the basis of this design a four row drill was fabricated later and was found satisfactory during trials in the Institute. The machine is worked by a pair of bullocks.

All Grain Drill.—With a view to evolve a simple, multi-purpose bullock drawn seed drill, studies with drills of different designs were carried out and a four-row multi-purpose seed drill has been fabricated and tested with wheat and maize seeds. The performance of the same was satisfactory.

Groundnut Planter.—A two-row Groundnut Planter has been developed. The machine has been extensively tried in the Agronomy Division farm and has been found to be quite satisfactory.

Hand Hoe.—A hand hoe of special design has been developed. The implement is very light, strong, cheap and simple in construction. It is also very convenient to operate from a standing position. The implement has been very successful in the field trials.

Tractor Testing.—In the early stages of origin of the section more than a score (medium size) agricultural tractors—TD-14 D-4, Oliver; Farmall. Ferguson, Zetoor, Allis, David Brown, Deutz, (of Horse Power between 20 and 35) and Low H.P. tractors have been tested in this Division under cultivator's conditions in the fields for field performance, turnover, economics and other general adaptability to local conditions.

Bullock-drawn Scraper.—A bullock-drawn scraper has been fabricated. This is a well constructed wooden plank provided with a steel cutting edge and a control handle to alter the angle of the cutting.

Fleat.—A wooden fleat to bring the sed-bed to a good level for providing proper irrigation has also been designed.

Tile Drainage.—Tile Drainage studies have been carried out. Tile drainage system has been laid down by this Division in the Division of Botany of the Estate to remove water logging over an area of about 15 acres.

Water-Measuring Device.—For supplying of required quantity of irrigation water, a simple water measuring device has been fabricated and tried in the field with success.

In addition to the above, the Division has carried out a large-number of tests of implements from Indian Manufacturers from other States and also other countries."

48. In their Report of April, 1964, the Achievement and Audit Committee on the Division of Agricultural Engineering had observed:

"The Division has tried with the very limited facilities available to it to achieve the objectives laid down but due to inadequate equipment and changes of technical staff and other circumstances it has not been possible to start the full-fledged post-graduate classes in Agricultural Engineering. Apart from the handicaps imposed by inadequacy of facilities and limited staff much of the time of the Division has to be spent on the repairing and maintenance work

of the machines and equipment of other Divisions and running the common facilities of the Institute. So much so, research and other legitimate activities of the Division are to a certain extent handicapped."

Commenting further on the difficulties faced by the Division in regard to accommodation, electric power, facilities for field trials and tests, etc., the Achievement and Audit Committee observed that "on the whole it would not be incorrect even now to say that the Agricultural Engineering Division is still in the process of being set up and incomplete in many respects."

Keeping in view the objectives underlying the setting up of the Division of Agricultural Engineering, the Committee cannot but regard the achievements of the Division during nearly two decades of its existence, as meagre. The Committee regret that the work of the Division should have been allowed to suffer for all these years due to various handicaps in regard to accommodation equipment, etc. To ensure better results in future they would urge the need of speedy action to remove the difficulties faced by the Division or by any other Division.

The Committee have already suggested in para 13 the earmarking of a separate Servicing Cell to look after the servicing of mechanised equipment in various Divisions of the Institute so that maintenance work does not distract from the main work of research in the Agricultural Engineering Division.

**Need to
develop
Research
Facilities.**

49. The Achievement and Audit Committee had suggested the immediate expansion of the Agricultural Engineering Division into a full-fledged Central Institute of Agricultural Engineering. According to the Achievement Audit Committee such a Central Institute would be "a normal precursor of the ultimate goal for the establishment of a National Agricultural Engineering Institute analogous to those types of Agricultural Engineering Institutions functioning in advanced countries like Japan, Sweden, England, Germany and others."

The Committee have been informed during evidence that the above recommendation of the Achievement Audit Committee has not been accepted by the Government. Explaining the Government's position, the representative of the Ministry observed. "We think such an institute should be located only in a full-fledged engineering college. Perhaps Kharagpur would be the most appropriate place." However, asked when Government expected Kharagpur to be developed as a National Institute of Agricultural Engineering, the representative of the Ministry replied,

"Actually, you want a National Institute of Agricultural Engineering only when there is original research on power operated implements. We are at present far behind to go in for research in these things."

In view of the fact that Indian agriculture is still being conducted with crude and out-dated implements and in view of the remarkable success achieved by many countries, notably Japan and Germany, in increasing agricultural production through the use of improved agricultural machinery and implements, the Committee consider that there is imperative need to intensify research in agricultural engineering in India so that it may be possible to develop cheap and efficient implements suited to the needs of Indian farmers. The Committee also feel that with the introduction of agricultural engineering in a number of agricultural Universities, the time has come when the training facilities in agricultural engineering, especially at the Post graduate level, should be coordinated and planned on an all India basis. They would, accordingly, like the Government to formulate and implement, as early as possible, a comprehensive and integrated all-India programme for research and higher studies in agricultural engineering.

The Committee have suggested in Chapter VI that it would be desirable to introduce a major course in Agricultural Engineering at the Post-Graduate School of the Institute. As a corollary to this, they would recommend that the research facilities in the Agricultural Engineering Division should be suitably strengthened so as to enable the Division to cater to the needs of Post-Graduate instructions in Agricultural Engineering.

50. The Committee understand that besides the Indian Agricultural Research Institute each of the other agricultural research Institutes has a small section of Agricultural Engineering whose primary duty is servicing and maintenance of the agricultural machinery and equipments of the Institute and also to test suitability of engineering machinery and equipment peculiar to a particular commodity.

To avoid duplication of work and to ensure the best use of available talent and resources in the country, the Committee would like to recommend that, as amongst the various agricultural research Institutes in the country, fundamental research work in regard to designs and improvements of agricultural implements may be concentrated in the Agricultural Engineering Division of the Indian Agricultural Research Institute. The Committee suggest that engineering sections of other agricultural research institutes should look mainly to the maintenance and repairs of their own implements and machineries.

Production, Demonstration Trial and Popularisation of Improved Agricultural Implements.

51. Testing of Agricultural implements, tractors and power units is one of the main functions of the Agricultural Engineering Division. The Committee understand that under a scheme for the production, trial and popularisation of improved agricultural implements, sanctioned by the Indian Council of Agricultural Research, the Division distributed seventeen selected imported and indigenous implements and machines to the States for intensive field trials. The names of these implements and the Division's observations thereon are given in Appendix II. The Committee have been informed that implements found useful as a result of these tests have been taken up for manufacture by a number of firms.

The Committee consider that the field trials should be intensified and should cover a wider range of implements particularly those imported from advanced countries like Germany and Japan which have made noteworthy advances in recent years in designing and manufacturing of agricultural machinery.

52. The Committee are informed that the Indian Council of Agricultural Research has instituted awards for research workers, who design useful agricultural implements and machines and also for manufacturers of improved agricultural machinery. The value of these awards ranges from Rs. 500 to Rs. 2000.

The Committee feel doubtful whether the existing scheme of Indian Council of Agricultural Research for awards can provide sufficient incentive for designing and manufacturing improved agricultural implements. They are of the view that an upward revision of the value of these awards is necessary for attracting the best engineering skill in agriculture. The awards should also be given wider publicity. The Committee would also like the Government to consider early a recent proposal made by the Panel of Agricultural Scientists for the award of two prizes by the Government of Rs. 50,000 each to the designer of (1) an improved seed drill for small grains and (2) a thresher useful for wheat or paddy.

53. Asked about the manufacture of implements developed by the Institute, the representative of the Ministry stated during evidence that "Large-scale manufacture is not done. Only blue-prints and prototypes are prepared and are given to private manufacturers or governmental workshops. For mass manufacture there is no agency in the Centre but some States like U.P. have manufacturing units." It has been added that though there is no price control, some States like Punjab try to control the quality and price of the improved implements. The Committee have also been given to understand that improved designs developed by the Indian Agricultural Research Institute

are being freely made available to the manufacturers in the hope that it would encourage them to undertake increasingly manufacture of improved implements.

So far as popularisation of the improved implements is concerned, the Committee understand that the Indian Council of Agricultural Research has sanctioned a scheme for the intensive field testing of selected improved implements on the farms attached to the Research, Testing and Training Centres in Improved Agricultural Implements as well as on farmers' fields adjoining the Centres and workshop wings of Extension Training Centres. The Committee are also informed that a subsidy of 25 per cent on the total cost of improved agricultural implements distributed is also being given by the Centre to the State Governments.

The Committee need hardly emphasise that Indian agriculture cannot make any appreciable progress unless improved agricultural implements, of standard quality, are available to the farmers at reasonable prices. The Committee suggest that Government should formulate a definite programme to manufacture cheap but improved agricultural implements suitable for Indian agriculture and then to introduce them through the Community Development Blocks and Panchayats. The programme should also provide for the establishment at the State Government level of suitable machinery to enforce price and quality control in respect of improved agricultural implements.

Further, in order to popularise improved agricultural implements among the farmers, the Committee would suggest that in addition to holding demonstration trials of such implements the Indian Agricultural Research Institute should make arrangements in collaboration with State Departments of Agriculture for the display and demonstration of new implements developed by the Agricultural Engineering Division at fairs and exhibitions held in different parts of the country, which are largely attended by farmers.

The Committee also consider it desirable that the Agricultural Implements and Machinery Museum at the Institute, which has already become a storehouse of valuable material for agricultural engineering designs and developments, should be developed into a national information centre for agriculturists and industrialists.

54. A scheme for research on water lifting devices and allied matters was sanctioned by the Government of India for a period of three years with effect from July 1, 1961. The Scheme was entirely financed by the Ford Foundation who had agreed to finance it till January 15, 1965. The Committee have been informed during evidence that the

**Research on
Water Lift-
ing Devices.**

work on the Scheme had been held up during the emergency at the instance of the Finance Ministry who thought that "they could persuade the Ford Foundation to utilise the foreign exchange for something more urgently required". However, "they (the Finance Ministry) could not do anything of that kind", and work on the Scheme was resumed in November, 1963. It has also been stated that the Ford Foundation have agreed to finance the Scheme "for a year more, that is till 1966".

The Committee attach great importance to research on water lifting devices inasmuch as it can, if conducted on the right lines, provide effective solutions to one of the most pressing problems of Indian Agriculture, viz. the lack of adequate irrigational facilities. Now that the Ford Foundation Scheme on the subject is again in operation, the Committee urge that the Agricultural Engineering Division should intensify its research and testing activities in this important field so that it may, within a reasonable time, be able to devise or identify cheap and efficient water lifts suited for adoption under farmers' conditions.

Idle Machinery.

55. It has been stated during evidence that various machines and machine-tools, valued in all at about Rs. 83,000, had remained idle with the Division for periods ranging from one to two years because it had not been possible to get the requisite electric power connections.

While noting that all the machines and machine-tools in the Division have been in commission since, May, 1964, the Committee cannot but feel unhappy over the fact that, for a considerable period, the Division was handicapped for want of adequate electricity in making full use of its machines. As the work of this Division entails the use of various power-operated machines, the Committee hope that in future care will be taken to ensure that the Division is provided with adequate supply of electricity to meet its requirements in full.

G. Division of Horticulture

Functions and Set up.

56. The Division of Horticulture is one of the recent additions of the Indian Agricultural Research Institute. Studies in Horticulture were initiated at the Institute in 1954 when a Section of Horticulture was established in the Division of Botany. In 1958, this Section was made into a full-fledged Division which now has four sections, namely (i) Pomology (fruits), (ii) Olericulture (Vegetables), (iii) Floriculture, and (iv) Fruit and Vegetable Preservation. Attached to the Division is a 30 acre experimental orchard. The Division also operates a vegetable

sub-station at Katrain (Kuly Valley). Under the Third Five Year Plan another sub-station of the Division has been set up at Karnal for production of nucleus seeds of certain vegetables.

57. In 1962, the Achievement Audit Sub-Committee had observed in their Report that (a) the staff provided to the Division was 'much below the requirements for the functions allotted to the different staff members', (b) since its very inception the Division had "worked under very difficult conditions" as it had no building and laboratories of its own and (c) for the efficient implementation of its research projects, the Division required "much more land facilities than are available at present". The Sub-Committee had suggested a 'Master Plan' envisaging considerable accretions to the staff, equipment and land facilities of the Division.

Difficulties
in regard to
Staff, Land
and Equip-
ment.

The Committee note that after over six years, the Horticulture Division has now been housed in its own building which is being further extended as scheduled under the Third Plan. However, the Division's requirement of additional land is yet to be met. The Committee in para 12 have already suggested that efforts should be speeded up to acquire another 200 acres needed for the Institute's farm. They hope that the Horticulture Division's needs will be substantially met from the additional acreage to be acquired by the Institute.

58. It has been stated in the course of official evidence that a National Horticultural Institute "is coming up under the Fourth Plan". The Institute will have regionally located sub-stations which will produce varieties of fruits and vegetables that are suitable for different agro-climatic conditions.

The Committee are of the view that Government should carefully consider whether the functions proposed to be allotted to the National Horticultural Institute could not as well be performed by the Division of Horticulture which has now been in existence for over seven years. In general, the Committee would like to suggest that every attempt should be made to avoid proliferation of research institutes having overlapping or similar functions as in their opinion this leads to duplication of research effort which may not be commensurate with the outlay involved.

Research on the Production and Preservation of Fruits and Vegetables

59. It has been stated that the Horticulture Division has been able to build up extensive varietal collections in many fruits, especially in grapes, citrus, mango, guava,

papaya, peach, plum and strawberry. The selection of the grape varieties, like 'Pusa Seedless', 'Bharat Early' and 'Gros Colman', has, it has been claimed, made successful grape cultivation possible in northern India. In mango, an improved method of grafting known as 'Veneer grafting' developed by the Division is said to have made plant propagation in mango, 'very successful'. As regards vegetables, the Division has found that the use of growth-regulating chemicals, such as 2, 4-D and maleic hydrazide, increases yields in tomato, cowpea (*lobia*) and cucumber. It has also been stated that improved techniques have been developed for de-hydration of peas, canning of tomato and preservation of juices of citrus fruits, guava and mango.

Considering that a plentiful supply of vegetables and fruits can go a long way in improving the nutritional value of the average Indian diet, the Committee would like to suggest that the Horticulture Division may make more intensive efforts to develop high yielding varieties of fruits and vegetables.

Katrai Sub-Station.

60. The Katrain Sub-Station was initially started, in May, 1949, under the direct administrative control of the Ministry of Food and Agriculture. In April, 1955, it was transferred to the Indian Agricultural Research Institute. It has been stated that as a result of the work done at this Sub-Station a number of improved varieties of vegetables have been released for distribution to the growers. The Sub-station has also been conducting research on certain varieties of flowers. The Committee have been informed during evidence that the laboratory facilities and the residential accommodation provided to the staff at the Katrain Vegetable Breeding Sub-Station are not adequate. This difficulty, it has been explained, has persisted because it has not been possible so far to acquire the additional land needed for putting up the laboratory and residential buildings. The representative of the Ministry has stated in this connection, "we are entirely at the mercy of State Governments where acquisition of land is concerned. We cannot acquire land ourselves in the States".

While recognising the difficulties in acquisition of land, particularly good agricultural land, the Committee suggest that in case of any delay, the matter may be taken up with the concerned State Government at a higher level stressing the importance and urgency of purpose for which the land is to be acquired. In view of the national importance of the research work of this sub-station, the Committee feel that Government should have made every effort to acquire the additional land required for the sub-station.

The Committee feel that as the Katrain Sub-Station is the only important centre for research for the improvement of vegetables, like cauliflower, cabbage, etc., every effort should be made to ensure that the nucleus seeds produced at this sub-station are sufficient for meeting the country's requirements. The Committee also suggest that proper arrangements may be made for the distribution of the nucleus seeds, produced by the Sub-station, to progressive farmers and other agencies who may like to multiply them.

H. Divisions of Agricultural Extension and Agricultural Economics

61. The Divisions of Agricultural Extension and Agricultural Economics have been created quite recently as separate units during the Third Plan period. Earlier, they formed part of the Division of Agronomy. Functions and Set-Up.

62. The research work of the Division of Agricultural Extension is carried out in six Sections: (i) Extension Methodology and Youth Development, (ii) Rural Sociology (iii) Educational Psychology (iv) Home Economics, (v) Audio-visual aids, and (vi) Extension Teaching. Besides research activities the Division is spearheading the Institute's extension advisory work in the Kanjhawala Block of the Delhi State with the cooperation of the other Divisions of the Institute.

63. The primary functions of the Division of Agricultural Economics include (a) the conducting of research in agricultural economics with a view to offering solutions of economic problems at the farm level and guiding agricultural economics research, and (b) Post graduate teaching of agricultural economics at the M. Sc. and Ph. D. levels. The research studies conducted by the Division are divided into six major fields of Agricultural Economics, namely, (i) Farm Management, (ii) Agricultural Finance (iii) Agricultural Cooperation (iv) Agricultural Marketing (v) Land Economics, and (vi) Production Economics. The Division is also assisting in the economic evaluation of the extension work of the Institute in the Kanjhawala Block.

64. The Committee have been informed that the Agricultural Economics Division has conducted a survey of the economics of 60 farm-holdings in the Kanjhawala Block in Delhi. The studies conducted so far, it has been stated, have thrown light on the nature of resource-use and resource-earnings on farms of different sizes; provided knowledge about the input-output co-efficients "which are the *sine qua non* for a correct farm planning approach for achieving rapid gains in resource productivity"; provided information on costs of production of important crops in the area and led to a better understanding of the complex Research Projects in the Agricultural Economics division.

nature of the relationships involved between the various factors of production (e.g. land, labour, capital, skill in farming, product, etc.).

65. A study of vegetable marketing costs and practices at Phool-ki-Mandi, Daryaganj, Delhi, conducted during the winter season of 1962-63, has revealed that between 25 to 33 per cent of the consumer's price was shared by whole salers and retailers and the farmer got on the average about 60 per cent. The Study underlines the need for improving marketing efficiency and increasing the producer's share in the consumer's rupee.

66. At present, fourteen research projects covering the various specialised fields, such as, Farm Management, Production Economics, Rural Credit etc. are underway. The object of these investigations, it has been stated, is "to probe deeper into the cause-effect ramifications of farm economic phenomena in order to contribute to greater production and production efficiency on cultivators' holdings."

The Committee suggest that the conclusions drawn from the various studies conducted by the Agricultural Economics Division may be duly utilized for developing teaching material on the different aspects of the subject as also for actual extension work in the Kanjhawala Block.

CHAPTER V

EXTENSION ACTIVITIES

A. Extension Work in the Kanjhawala Block

67. In 1950, the Indian Agricultural Research Institute, launched a pilot Scheme of Intensive Cultivation in 19 villages in Delhi State. The object of this scheme was to raise the agricultural production of the area by carrying to the farmers the latest findings of research for adoption and bringing back their problems to the researchers for solution. The programme of work included "Result Demonstrations" of improved varieties of crops; form, method and time of applying manures and fertilizers to crops and vegetables; use of improved cultural practices; and control of pests and diseases. The Plan of action was first to lay emphasis on demonstration of improved varieties and remunerative practices and to bring about a close contact between the research workers and the farmers. Follow-up action was then taken to bring about the "saturation" of the area with improved varieties and the adoption of better agricultural practices which had found general acceptance among the farmers.

It has been stated that for the execution of the programme mentioned above, working parties from the Institute were organized for tackling items of work related to their subjects; students of the Institute stayed with the farmers and impressed on them the benefits of new agricultural methods.

In 1961, the Institute was entrusted with a larger and more intensive extension programme embracing the whole of Kanjhawala Block with its 56 villages. The Committee have been informed that under the expanded programme seed farms with progressive farmers have been established in each Village Level Worker circle. These farms not only produce seed of high quality but also function as 'Enterprise Demonstration Farms' for the diffusion of knowledge and adoption of innovations. In addition, demonstrations with improved wheat varieties and management practices, are laid out to motivate farmers for the adoption of improved practices. The farmers are also educated in the application of plant protection measures. Recently, youth clubs have been organised and demonstrations conducted in connection with the reservation of fruits and vegetables and utilization of bajra grains for making biscuits.

B. Evaluation of Extension Work in Kanjhawala

68. In 1962, after a little over ten years of extension work, the Agricultural Economics Division initiated a study on the impact of the Institute's Intensive Cultivation Scheme Programme in Delhi Villages. The salient findings of the study have been stated as follows in a note supplied to the Committee.

"The Scheme farmers were found to be technically superior to their counterparts outside (i.e. in the non-Scheme areas) in the matter of management, resource-use and adoption of better inputs and wider use of productive credit. In the ultimate analysis it was found that with an extra cash expense of Rs. 27, the scheme farmer gets an extra farm income of Rs. 238. In its totality it means a benefit of over five and a half lacs of rupees annually to the 2311 farmers of the nineteen Scheme villages. Since some of the technical benefits have been built into the farms, the profits are likely to enhance as years roll by."

C. Need for strengthening Extension Efforts

69 The Committee have been informed that apart from its practical extension work in the Kanjhawala Block, the Indian Agricultural Research Institute also gives advice on such specific problems as are referred to it by the State Governments. Further, the Institute has constituted a panel of 50 farmers who are addressed from time to time to ascertain their reaction to application of research work to the fields. The farmers are also free to seek advice of the Institute on any problem encountered by them in the field. Results of research are also propagated among the farmers through the sub-stations* of the Institute located in the various States.

While noting the work done by the Indian Agricultural Research Institute in the field of practical extension and propagation of results of research, the Committee would like to urge that Government should, with the co-operation of the State Departments of Agriculture, devise effective machinery to ensure that the results of practical value emerging from the research activities of the Indian Agricultural Research Institute are systematically and speedily transmitted to farmers on a more extensive and country-wide scale.

The Committee would also suggest that, to reduce the time-lag between the conclusion of experiments and making the results available to the cultivators, the Institute

*See Organisation Chart of the I.A.R.I.—Appendix I.

should seek the assistance of the Indian Council of Agricultural Research in arranging quicker publication of research results in the form of attractive pamphlets in popular style and sending them to State Governments, farmers' organisations and other concerned agencies.

Further, instructional films depicting improved methods and advances in agriculture and the advantages flowing from them should be prepared and widely displayed in rural areas. Arrangements should also be made for giving publicity to improved agricultural practices, implements etc. at fairs and exhibitions held in the country side.

The Committee would also like to suggest that the feasibility of starting a rigorous technical training Programme for extension workers at the Indian Agricultural Research Institute may be examined. The training programme may be organised in such a way that the extension workers themselves lay out demonstrations, hold field days, harvest the crops and learn the scientific principles underlying maximised crop production.

CHAPTER VI

THE POST-GRADUATE SCHOOL

A. Historical and Introductory

70. Ever since its establishment during the first decade of this century, the Indian Agricultural Research Institute has been an important all-India centre for post-graduate training in agriculture. In 1923, the training programme at the Institute was placed on a systematic basis and two-year courses, leading to the Diploma of Associateship of the Institute were organised in the major disciplines of agricultural science. The Diploma courses were discontinued in 1958 when, on the recommendation of the first Indo-American Team on Agricultural Research and Education, the present Post-Graduate School was established.

The Institute was also accorded the status of a University under section 3 of the University Grants Commission Act of 1956. Since it attained the status of a University, the Institute conducts courses leading to M.Sc. and Ph.D. Degrees in agriculture and related basic disciplines.

B. Administration

71. The Dean of Post-Graduate Studies, who is also Deputy Director (Education), exercises overall supervision over the post-graduate training programme of the Institute. The Post-Graduate Council of which the Dean is the Chairman and the Director of the Institute a member, is the Institute's highest body in academic matters; the other members of the Council include the professors from the various Divisions, the Field Director of the Rockefeller Foundation, the Agricultural Commissioner with the Government of India, the Statistical Adviser to the Government of India, and two elected representatives of the Post-Graduate Faculty of the Institute. The Rockefeller Foundation has been closely associated with the School ever since its inception and has given it valuable financial and other assistance.

C. Admissions and Scholarships

72. The demand for admission to the M.Sc. and Ph.D. courses of the school is large and the competition keen. The applications for admission, which usually number about six to eight times the available seats, are screened individually by the Post-Graduate Council in full session. The selected candidates are then invited to appear for an

interview before the Post-Graduate Council. The final admissions are made on the basis of the students academic record and performance at the interview.

The number of students on the rolls towards the close of 1963-64 academic year was 383. This number included 17 foreign students, 13 lady students and 14 students belonging to the Scheduled Castes and Scheduled Tribes. The number of students admitted to the School year-wise until the commencement of the 1963 academic year is indicated below:

	<i>Ph.D.</i>	<i>M.Sc.</i>
1958	52	104
1959	78	100
1960	81	89
1961	63	86
1962	78	75
1963	72	51

The students admitted to the school receive financial support during their training period from various sources. Thus, at present, 38 I.A.R.I. fellowships valued at Rs. 100 per month, are available for the M.Sc. students and 12 I.A.R.I. fellowships, valued at Rs. 250 per month, are available for Ph. D. students. Besides, a few fellowships are offered by bodies like the Indian Council of Agricultural Research and the Council of Scientific and Industrial Research.

In view of the heavy demand for admission to the Post-Graduate School and the country's growing need for properly trained agricultural scientists, the Committee suggest that the Indian Agricultural Research Institute may consider the feasibility of increasing the annual intake of students for both M.Sc. and Ph.D. courses.

The Committee also note that while on the one hand there has been a pressing demand for admissions to the Post-Graduate School, on the other hand the number of admissions to M.Sc. course of the School has been going down year by year and has reached the low level of 51 in 1963 as compared to 104 in 1958. The Committee are distressed to note this downward trend and would suggest that detailed reasons for this should be investigated and remedial measures taken to attract competent students to

undertake post-graduate study in the vital subject of Agri culture.

D. Pattern of Instruction

73. The instruction under the Post-Graduate School is patterned largely on the credit-course system prevailing in many American Universities. An important feature of the system is that each M.Sc. and Ph.D. student, in addition to undertaking research work for his thesis, is required to take up course work not only in his major field of specialisation but also in supporting minor fields. The academic year of the school commences in October each year and is divided into three trimesters, each trimester being approximately 13 weeks' duration of which 12 weeks are devoted to teaching and the last week to final examinations. The subject matter in each discipline is divided into a number of discrete courses, so that a given course is begun and completed in a given trimester. Each course is assigned certain "credits". A credit of lectures represents 12 lectures, each of approximately one hour, given at the rate of one lecture per week. Similarly, a credit of laboratory work or field practical represents 12 practicals, each of approximately 2 to 3 hours, given at the rate of one practical per week.

There is a built-in system of examination with each course, as it progresses. Students must successfully complete all the courses and seminars assigned to them. Unlike other Indian Universities no class or division is awarded to candidates successfully passing the M.Sc. examination. The relative performance of students is judged on the basis of the over-all 'grade point average' secured in course work, the maximum attainable grade point average being 3.00 and the minimum required for passing in the case of M.Sc. students, being 1.75. Students who are unable to fulfil the minimum requirements are advised to discontinue their studies at the School. Since the establishment of the School only four M.Sc. students have been required to discontinue their studies on this account.

The Committee are glad to note that the pattern of instruction followed at the Post-Graduate School leaves little room for wastage of educational effort on the part of the students.

In view of this, the Committee would like the Government/University Grants Commission to consider the feasibility of extending the credit course system to other scientific research-cum-teaching institutions and agricultural universities in the country.

E. Courses Offered

74. At present, post-graduate instruction is offered in the following 10 major fields, in addition to supporting courses ('General') in minor fields as shown below:

<i>Field of Specialisation</i>	<i>Number of Courses Offered</i>
1. Agronomy	15
2. Botany	23
3. Horticulture	20
4. Entomology	28
5. Mycology & Plant Pathology	21
6. Microbiology	11
7. Soil Science & Agril. Chemistry	19
8. Agricultural Physics (including Mathematics)	16
9. Agricultural Extension	21
10. Agricultural Economics	18
11. Agricultural Statistics	To be finalised.
12. General	14
	206
	(excluding item 11)

The Committee note that Agricultural Engineering does not form a major course of post-graduate instruction at the School. In view of the fact that Bachelor's Courses in Agricultural Engineering already exist in some institutions in the country, such as the Indian Institute of Technology, Kharagpur, and similar courses are proposed to be introduced in the Agricultural Universities established recently, the Committee feel that Agricultural Engineering should be recognised as a major subject at the Indian Agricultural Research Institute.

The Committee also wish to emphasise the desirability of focusing the attention of the students of the Post-Graduate School upon the actual problems facing the Indian cultivators and encouraging them to take up for their study and investigation problems of greater practical value from the point of view of increasing food production.

F. Short Courses

75. In addition to the regular M.Sc. and Ph.D. courses, the school organises a number of short courses and refresher courses of training for the benefit of members of the research, training and extension staff of the various State

Departments of Agriculture and the Universities in the country. For instance an International Training Course on the use of Radio-isotopes in Agricultural Research was organised in 1960 in co-operation with the UNESCO. In 1964, an International Course on Agricultural Nematology was held with the assistance of the Rockefeller Foundation.

Other regular and occasional short-courses and refresher courses include the following:

- (i) Radio-isotopes in Agriculture (5-months).
- (ii) Soil Survey (6-months).
- (iii) Maize Breeding and Seed Production (6-months).
- (iv) Analytical Methods for the Determination of Oils in small samples of oilseeds (6-weeks).
- (v) Seed Testing (6-weeks).
- (vi) Training Course for Vigyan Mandir Officers.
- (vii) Grassland and Fodder Research.
- (viii) Water requirements of crops.
- (ix) Training of Block Development Officers and Panchayat Officers of the Punjab Government.
- (x) Refresher Courses, during Summer Vacations, for the benefit of Agricultural Research Workers and Teachers—Cytology, Genetics and Plant Breeding (1959), Plant Diseases (1960), Agronomy (1961), and Horticulture (1962).

The Committee feel that there is scope for expansion in the number of short/refresher courses organised at the School. They would like the Institute to make arrangements, for imparting intensive practical training, of short duration, in improved agricultural practices to the actual tillers of the soil.

CHAPTER VII

ALL INDIA SOIL AND LAND USE SURVEY

A. Need for Soil Survey

76. For the growth and prosperity of a country, particularly of a country like India with about 75 per cent of its population depending on agriculture, it is of utmost importance to maintain and increase the productivity of its soil. It will not be possible to increase our present agricultural production, if the soil is permitted to be exhausted by erosion and harmful agricultural practices. To bring about successful agricultural development and increase production much depends on improved utilization of soil by correct land use. It is necessary that the kinds of soils in India must be mapped, defined, recorded and interpreted. The soil and land use surveys are necessary for proper exploitation of soils to the maximum advantage. Agricultural research and soil surveys must be closely integrated if full benefits are to be realised from the land where the research is to be projected. The objective of the soil survey work is therefore primarily (1) to classify and map the different kinds of soils with a view to properly planning the management and agricultural use of the soil resources, and (2) to apply the results of research to the advantage of particular tracts of land or to individual fields.

77. Not much work was done in India in the important subject of soil survey. Only a beginning was made in 1943 when the Division of Soil Science and Agricultural Chemistry in the I.A.R.I. prepared a soil map of India. A revised map was printed in 1954. It shows the distribution of the major soil groups in India and their relation to geographical factors, such as the parent rocks, and climatic factors such as the mean precipitation, mean temperature and moisture deficit. The map serves as a useful basis for the classification of Indian soils and for work relating to the planning of proper land use.

78. To achieve the objective of the soil survey work on All India Soil Survey Scheme was sanctioned in 1956 by the Government of India, under the Second Five Year Plan, for augmenting the soil survey work in progress at the Indian Agricultural Research Institute. The object of this scheme was to carry out Reconnaissance Soil Survey in various parts of the country, to correlate them and to map them. The country was divided into four groups

and four Correlation Centres were established in the undermentioned places on the following basis:

- (1) Delhi Centre . . . To cover the major Alluvial Soil Regions of North India.
- (2) Calcutta Centre . . . To cover the major red and laterite soil regions of East and North East India.
- (3) Bangalore Centre . . . To cover the major red and laterite soil regions of the South.
- (4) Poona Centre . . . To cover the major Black Soils of the Central and Western India.

The Black Soils Centre was shifted from Poona and located at Nagpur in July, 1958, the latter place being selected as being more centrally located in the black soils area. It has continued since then at Nagpur.

79. During the series of meetings of various River Commissions and Flood Control Boards during 1955-56, it was felt that the Central Soil Conservation Board under the Ministry of Food and Agriculture should arrange for undertaking land use survey in the catchments of the main 6 River Valley Projects, viz., Kosi, Damodar, Bhakra, Chambal, Hirakud and Machkund. It was accordingly decided to take up a scheme for establishment of land use survey and planning. Under this scheme, an organisation was set up at Dehra Dun and was entrusted with following main functions:

- (1) to collect and correlate data relating to the slope of land, depth of the type of soil and degree of erosion;
- (2) to prepare maps in respect of soils and land use classification;
- (3) to conduct soil conservation survey by land use planning of the catchments of River Valley Projects and to suggest soil conservation measures in this regard.

B. The All India Soil Survey and Land Use Scheme

80. In 1958 it was decided by the Government of India that the two soil survey organisations one under the Indian Agricultural Research Institute and the other under the new organisation set up at Dehra Dun should be integrated into one and placed under the control of the Central Soil Conservation Board. The integrated scheme was designated as the All India Soil Survey and Land Use Scheme and it became operative from March, 1958 with headquarters at I.A.R.I., New Delhi.

The All India Soil and Land Use Survey is under the immediate charge of the Chief Soil Survey Officer. Each

of the four Soil Correlation Centres located in Delhi, Nagpur, Calcutta and Bangalore is in charge of a Soil Correlator whose work is supervised and coordinated by the Chief Soil Survey Officer.

C. Scope of Soil Survey

81. The Survey is to be carried out primarily in the areas forming the upper catchments of six major river valley projects, viz. Machkund, Hirakud, Chambal, Bhakra-Nangal, Damodar and Kosi. Soil surveys are also to be conducted in the priority areas in the States where soil conservation or other development works are to be executed.

Besides field survey and mapping, soil correlation, classifications and interpretations have been and are being carried out. An Aerial Photo-Interpretation Unit has been recently added to the Organisation to explore the possibilities of using air photographs in soil survey under Indian conditions.

A total of 185 Soil Survey and Land Use Reports, together with soil and land capability maps have been drawn up and issued to the concerned States for use in planning and execution of soil conservation and land development programmes.

D. Location of Centres on a Regional Basis

82. The Committee discussed with the representatives of the Ministry the question of location of soil correlation centres on a regional basis instead of location on the basis of the quality of soils. The representative of the Ministry stated that 'each centre serves a particular zone, a region, which largely consists of a particular soil'. The Committee would like to invite the attention of the Government to the following recommendation made by Dr. Charles E. Kellogg in his report on 'Soil Conservation and Soil Survey in India' (1958):

"It is recommended that the four areas for soil correlation be revised from the present basis and be established as four groups of States so that each soil correlator works with all the soils in his assigned region. The suggestion of soil correlation by broad soil regions is absolutely certain to involve unnecessary overlapping travel and administrative confusion. To take one example, Alluvial soils are found throughout India".

The Committee are in agreement with the above views of Dr. Kellogg and feel that the location of the soil correlation centres on the basis of the quality of soil alone is not quite sound, inasmuch as each and every region contains different qualities of soil which a soil correlator should take note of. The Committee think that it would

have been better if the Centres were set up on a regional basis. The Committee suggest that in the light of the above the position may be reviewed.

E. Plan Targets

83. The Committee have been informed that during the Second Five Year Plan period (1956 to 1961) 139.56 lakh acres were covered by Detailed and by Reconnaissance surveys as against a Plan target of 125 lakh acres. Of the total surveyed area referred to above, 24.19 lakh acres fell in the catchments of Sutlej (Bhakra-Nangal), Chambal, Mahanadi (Hirakud) and Machkund. In other areas in the States of Maharashtra, Mysore, Madhya Pradesh, Andhra Pradesh, Madras, Kerala, Rajasthan, Punjab, Uttar Pradesh, Delhi, Orissa, West Bengal, Andamans, Tripura and NEFA, an area of 115.37 lakh acres was surveyed and mapped.

During the first three years of the current plan period (III Plan period), 74.49 lakh acres have been covered by Detailed and Reconnaissance surveys as against a Plan target of 125 lakh acres for five years. Of the total surveyed area referred to above 31.77 lakh acres fall in the catchments of Sutlej (Bhakra-Nangal), Chambal, Mahanadi (Hirakud) Machkund, Tungabhadra and Kundah and 42.72 lakh acres in other areas in the States of Mysore, Madras, Andhra Pradesh, Kerala, Tripura, Orissa, Maharashtra, Rajasthan, Uttar Pradesh, Punjab and Delhi. Further work is in progress.

F. Staff Position and conditions of Service

84. During the course of evidence the representative of the Ministry stated that the slight shortfall in the targets during the first years of the Third Plan is due to the delays in getting suitable personnel to fill up vacancies caused by the resignation of some soil survey assistants. The Study Group of the Estimates Committee which visited the office of the Soil Correlator, Nagpur on 31st October, 1964 observed that the following posts remained vacant in the Nagpur Centre during the years from 1961-62 to 1963-64:

	1961-62	1962-63	1963-64
Soil Survey Assistant	3	3	5
Research Assistant	1	1	1
Field Assistant	3	3	3
Draftsman	1	..
Surveyors	2	3	5
Tracers	1	1	1
Head Assistant	1
Jeep Driver	1	1	1
Chainman	1	1	1
Khalasi	1	1	1
Laboratory Keeper

The Study Group were informed that in the case of Soil Survey and Research Assistants, the posts were reserved for Scheduled Castes and Scheduled Tribes, but no candidate was available. The post of Jeep Driver had been kept in abeyance as the jeep expected had not yet arrived. The rest of the posts were vacant for short durations and they were filled up periodically. The posts of Chainman and Surveyors were kept in abeyance on economy measures.

The Study Group were further informed that field survey parties had to remain for days outside the headquarters and they had to work under trying conditions in isolated areas where the lines of communications were either difficult or hazardous.

During evidence it has been stated by the representative of the Ministry of Food and Agriculture that competent hands leave the organisation as soon as they secure more comfortable jobs.

The necessity of improving the service conditions of staff of the Soil Survey Organisation was stressed by Dr. Kellogg who in his report recommended that "the salaries of soil scientists and soil conservationists be examined with a view to any needed advancements to make them *fully* comparable to those of the other top scientists and administrators in the public service. Otherwise it will not be possible to attract the necessary highly competent young men in the field and the essential work will not be done."

Dr. Grunewald, Soils Advisor, U.S.A.I.D. Mission to India in his report on "Soil Survey in India" (March, 1962) reiterated Dr. Kellogg's views when he recommended that "Competent technicians must be given incentive and opportunity to remain and advance in their chosen technical field".

The Committee note that the Central Soil Conservation Board at their Seventh Meeting held on the 4th March, 1963 also considered the question of improvement of service conditions of Soil Survey staff. Extracts from the minutes of the meeting are reproduced below:—

"The Chairman (Central Soil Conservation Board) desired that a note should be prepared and discussed with the Planning Commission immediately as to how soil survey work should be accelerated and the conditions of service of the survey staff be improved. Efforts should also be made to fill up all the vacant non-gazetted

posts. The targets for survey should be laid down by the 'Technical Sub-Committee.'

During the course of evidence the representative of the Ministry stated that the question of giving increased rate of daily allowance to field staff is under consideration.

The Committee regret to note that in spite of the recommendations of experts scant attention has so far been paid by Government to the improvement of the Service conditions of the technical staff and especially of the field staff in the Soil Survey organisation. The Committee recommend that Government should take urgent measures to improve the pay scales, allowances and service conditions of the staff in this organisation so as to bring them at par with those working in the Geological Survey of India and other Organisations doing field work.

The Committee also recommend that in case suitable Scheduled Castes and Scheduled Tribes candidates are not available to fill up the posts reserved for them, the posts of Soil Survey and Research Assistants should be filled up by other candidates.

G. Overlapping of Authority

85. The Chief Soil Survey Officer of the All India Soil and Land Use Survey is under the administrative control of the Director of the Indian Agricultural Research Institute. The budget estimates of All India Soil and Land Use Survey are included in the overall budget estimates of the Institute. In so far as technical side of work is concerned, the organisation is under the Soil Conservation Adviser in the Ministry of Food and Agriculture.

During the course of evidence the representative of the Ministry has stated that "although the Chief Soil Survey Officer has got his headquarters in I.A.R.I. and he is using the soil testing laboratory which is there, actually he is under the control of the Soil Conservation Adviser." In a written note furnished to the Committee it has been stated:—

"For convenience sake, Director, Indian Agricultural Research Institute, was made as Head of the Department for the administrative control of this organisation. The integrated All India Soil and Land Use Organisation being a part of the Central Soil Conservation Board, the question of coordinating the work under the two does not arise. In fact, the technical control of the organisation has now been placed directly under the Soil Conservation Adviser". "Obviously there is no question of putting the two

organisations under one administrative authority because the All-India Soil Survey Organisation is a part of the Board and is under the Control of the Board itself".

The Committee in this connection would like to draw the attention of Government to the following observations made by Dr. Grunewald in his report on "Soil Survey in India";

"The All India Soil and Land Use Survey Organisation cannot operate under two directors. It should be related closely to the soil conservation programme and its operation and administration should be under the Director (Adviser) of Soil Conservation. It is an action programme.

There are two alternatives keeping in mind the above recommendation as the final objective. One is that the field soil survey operation including classification, correlation, interpretation and cartographic services, be part of the Soil Conservation Organisation, with soil analysis and soil research work continuing under IARI as part of the research programme.

The second is that soil surveys be a division of an independent technical organization of soil science, with close coordination with the soil conservation programme".

The Committee feel that the present arrangement under which the Chief Soil Survey Officer is under the administrative supervision of one authority and under the technical control of another authority is neither sound nor expedient. The Committee would like to urge that the question of bringing the All India Soil and Land Use Survey under the technical and administrative control of one expert authority should be considered by Government at an early date.

H. Jeeps at the Soil Correlation Centres

86. Each of the Soil Correlation Centres has six jeeps and trailers for use of the soil survey parties in the field. Of the 24 jeeps in the four centres, 18 jeeps with trailers were purchased in 1955-56 and six jeeps with trailers were transferred in the year 1956-57 to the All India Soil and Land Use Survey Scheme from the T.C.M. Scheme of Soil Fertility and Fertilizer use which terminated in 1958. Three pick-ups were purchased in 1958. The distribution of the jeeps with trailers and Pick-ups in the four Soil Correla-

tion Centres and the amount spent on the purchase of vehicles are given in tabular form below, Centre-wise.

Particulars	No. of jeeps with trailers and pick-ups at the different Soil Correlation Centres.				Total
	Delhi	Calcutta	Nag-pur	Banga-lore	
1	2	3	4	5	6
Jeeps & Trailers— Purchased in 1955-56 and 1956-57 .	4	5	4	5	18
Jeeps and Trailers transferred from T.C.M. Scheme of Soil Fertility & Fertilizer use .	2	1	2	1	6
Pick-ups purchased in 1958 .	1	1	1	..	3
TOTAL	7	7	7	6	27
Total amount spent	Rs.	Rs.	Rs.	Rs.	Rs.
	66,307*	83,867*	68,113*	65,061*	2,83,348

*The above figures are exclusive of the cost of jeeps received from the T.C.M. Scheme of Soil Fertility and Fertilizer Use which terminated in 1958.

The Committee have been informed that no foreign exchange was involved in the purchase of the vehicles from out of the sanctioned budget grant of the All India Soil Survey Scheme. The vehicles were purchased in India through the agency of D.G.S. & D., New Delhi.

Recently 20 additional Soil Survey Parties have been sanctioned at the rate of 5 parties in each Centre for taking up soil surveys in other priority catchment areas and 20 Jeeps with trailers have also been sanctioned (one for each party). These vehicles have been proposed to be purchased in two instalments of 10 each.

The Jeeps and the expenditure will be distributed among four Centres as follows:—

	Delhi	Calcutta	Nag- pur	Banga- lore	Total
No. of Jeeps and Trailers allotted to Different Centres	2 each	2 each	3 each	3 each	10
Cost of Jeeps (in rupees)	30,020	30,020	48,513	45,030	1,53,583
Cost of Trailers (in rupees)	3,081	3,172	4,681	4,681	15,615
Total Expenditure to be incurred (in rupees)	33,101	33,192	53,194	49,711	1,69,198
GRAND TOTAL	Rs. 1,69,198·00				

The Committee understand that there is no arrangement under the organisation for regular servicing of the jeeps. Up-till now the Jeeps were being got repaired at the local workshops from the open market or these Jeeps were repaired at the State Government Workshops when out of Headquarters. Recently a post of driver-cum-mechanic has been created for each Centre and the same will be filled up as soon as the additional jeeps are received.

The Committee regret to note that no satisfactory arrangements have been made for the repair and servicing of the Jeeps, purchased or secured for the various Centres. Even the post of driver-cum-mechanic which has been created for each Centre has not been filled up. The Committee would like to stress the need to keep the vehicles in good working condition and would suggest that proper serving and maintenance facilities be provided at each Centre.

I. Soil Interpretation

87. Dr. Kellogg in his report on "Soil Conservation and Soil Survey in India" observed:

"Soil correlation should be directed during the next three or four years to obtaining uniformity of soil descriptions (according to the Soil Survey Manual or other appropriate handbook) so that soils can be compared and later correlated as soils types (and phases of soil types), with a uniform nomenclature throughout India. But

before countrywide soil correlation can be attempted soil descriptions need to be on a uniform basis and many soils described within the areas that are mapped in detail”.

Dr. Grunewald also laid emphasis on soil interpretation.

The Committee have been informed that the work carried out during the past eight years has enabled All India Soil Survey and Land Use organisation to identify, distinguish and describe about 300 soil series, which are distributed as follows in the different States.

1. Andhra Pradesh	30
2. Kerala	28
3. Madhya Pradesh	47
4. Maharashtra	34
5. Madras	28
6. Mysore	56
7. Orissa	29
8. Punjab	20
9. Himachal Pradesh	47
10. West Bengal	3
TOTAL :	291

It has been stated that the original list of soil series identified during field survey was naturally larger, but this list got reduced after correlation and grouping together under the same series, soils with similar characteristics. Most of the above soil series have been brought together in the form of a “*Handbook of Soil Series*” which are in use in the various correlation centres and have been given to some State Departments also”. It has been stated “this Handbook will enable the concerned State officials to identify and describe the soils in a manner which will be uniform in regard to nomenclature. The above is in line with suggestions made by Dr. Kellogg in his Report.”

As regards Interpretation work, it has been stated that “this is being attended to by only one officer and the need having been realised for strengthening this staff, proposals have been made to the Ministry for providing additional staff to attend to the work both at the Regional Centres and Headquarters.”

The Committee are glad to note that the organisation has compiled a Handbook of Soil Series which is in use in the various Correlation Centres and some State Departments also.

The Committee would however like to suggest that the Handbook of Soil Series should be periodically revised and brought up-to-date as and when more data are collected and new soil series are identified and distinguished.

The Handbook should be supplied to all the State Governments, who should undertake translations thereof in the regional languages. Copies of Handbook may also be supplied to Rehabilitation Centres where new migrants are proposed to be settled.

J. Soil Survey Reports

88. The Committee have been informed that soil survey reports are useful to the State Governments in planning soil conservation in forest and cultivated areas. In the Raipur and Pallari Blocks of Madhya Pradesh (Mahanadi Catchment), recommendations have been made cultivation of groundnut in certain locations of moderately deep Lakholi Series Soils, where so far no cropping used to be practised. The report and maps prepared by the Nagpur Centre in respect of the detailed survey of tobacco growing areas in Guntur District are being made use of in planning tobacco plantation, attention being paid to avoid areas with high salinity as indicated in the maps.

During the course of evidence, the Committee have been informed that the reports of the Soil Correlation Centres are sent to the State Governments because it is they who do the actual work of advising the cultivators. In regard to the extent to which the soil survey data have been put to practical use in increasing qualitative and quantitative production of various crops, the representative of the Ministry stated:—

“It is very difficult to say what use has been made of the soil survey. But all the soil conservation work which is done by the State Governments in the river valley project areas, which cover very large areas, with water-sheds etc. is based on the soil survey reports. Of course, they can use these reports also for the purpose of land use in those areas. We can only roughly say to what extent they are used actually. There have been some difficulties about interpretation, because the State Governments were not able to interpret these soil surveys. We have actually organised some courses for interpretation of those soil survey maps.”

The Committee feel that it is not enough if soil survey reports are merely sent to State Governments. What is necessary is close coordination with the State Departments of Agriculture as also intimate contact with progressive farmers who should be assisted through education and interpretation to use the soil maps, legends, descriptions and reports. Until the user can interpret the information contained in the reports, agricultural projects cannot be properly planned.

The Committee also suggest that the Soil Survey Organisation should keep in touch with the various commodity Committees and help them in mapping out areas suitable for production of crops with which they are concerned.

The Committee would also like to impress upon Government the urgent need for a rapid soil survey of areas which are being developed for resettlement of new migrants.

K. National Soil Service

89. The Committee have been informed during evidence that Government intend to set up a National Soil Service with assistance of the U.N. Special Fund during the next two years.

The Committee hope that the proposed National Soil Service would not only ensure better coordination of soil survey work between the Centre and the States but also coordination among Central Organisations doing various kinds of soil surveys and soil testing work.

L. Memorandum of Understanding

90. One of the recommendations made by Dr. Kellogg which was reiterated by Dr. Grunewald related to the drawing up of a "Memorandum of Understanding" in regard to the work of soil surveys between the States and the Centre on the lines existing in the U.S.A. In his report he recommended:—

"that a memorandum of understanding be drawn up to cover the objectives and plans for cooperative soil surveys between the Centre and each State in full consultation with the representatives of all major using agencies of the Government of India and of the States. Where special organisations are operating, such as the D.V.C. three-way memoranda should be developed to include the three agencies making and using the survey."

In a written note supplied to the Committee, it has been stated that:

"there are many administrative difficulties in our country which are in the way of drawing up such memorandum. The same objective is aimed to be achieved through better coordination of soil survey work between the Centre and the State organisations and through agreement for adoption of uniform patterns of soil survey throughout the country. The All India Soil Organisation is constantly making efforts in this direction."

The Committee do not think that the administrative difficulties are such as cannot be overcome by discussion, consultation and persuasion. Now that the Government are thinking in terms of a National Soil Service, the Committee suggest that the question of drawing up of a Memorandum of Understanding may be considered at a conference with the representatives of the States and the River Valley Projects concerned.

CHAPTER VIII

MISCELLANEOUS

A. Position of the Institute *vis-a-vis* the Ministry

91. The Indian Agricultural Research Institute is under the direct administrative control of the Ministry of Food and Agriculture and works in close cooperation with the Indian Council of Agricultural Research which is concerned with promoting, co-ordinating and financing research schemes on agriculture and animal husbandry in India.

It has been stated during evidence that though the Institute functions "only as a department of the Ministry", so far as the status of the University is concerned, "it is almost autonomous" because, except for funds, it manages, all other matters through its Post-Graduate Council.

As regards the financial powers of the Director of the Institute, it has been stated by the representative of the Ministry, "When there is a budget, within that budget, he can incur all the expenditure he likes. If he adds a new Division which is not included in the budget, he has to take the sanction of the Ministry." Further, if a new research project only involves a change in the technical programme, the Director does not have to take the previous sanction of the Ministry "but if it involves appointment of more staff and if it has financial implications, to the extent that it exceeds his powers and it is not provided in the budget, he has to take the permission".

The Committee have also been informed that the powers delegated to the Director of the Institute by the Ministry of Food and Agriculture are more than the powers of the Directors under the Council of Scientific and Industrial Research. For instance, while the Director, Indian Agricultural Research Institute, has full powers to purchase equipment, apparatus and instruments, in the case of the Council of Scientific and Industrial Research the powers of the Directors are limited to Rs. 50,000.

The Agricultural Research Review Team have, in their recent Report (March, 1964), pleaded that reform in the existing expenditure sanction procedures so as to allow Directors of research organizations more discretion in the expenditure of sanctioned funds would have "an immediate and appreciable effect on research efficiency". They have suggested, *inter alia*, that there should be some discretion allowed to Directors to transfer provision from one budget head to another, especially when relatively small items

are concerned. The Team believed that as a premier institution having university status the Indian Agricultural Research Institute "is entitled to more autonomy in the management of its affairs." They suggested that the Director of the Institute "should receive an annual allotment from the Government and be given delegated authority to expend such funds under proper rules and safeguards to protect the public interest."

The Committee are in general agreement with the above mentioned views of the Agricultural Research Review Team.

Having regard to the fact that the Indian Agricultural Research Institute has been conferred the status of a University, the Committee would suggest that Government may undertake a review of the existing procedure for sanctioning expenditure in order to ascertain whether it would be advisable to delegate more financial and administrative powers to the Institute.

B. Co-ordination with other Agricultural Research Institutes and Universities

92. The Committee have been informed that coordination between the research activities of the Indian Agricultural Research Institute and other agricultural research institutes in the country is secured mainly through the Indian Council of Agricultural Research which gets reports from various State Departments and holds meetings of research workers, crop-wise and discipline-wise. The Director of the Indian Agricultural Research Institute and the scientific experts in the various disciplines of the Institute are members of the scientific committees of the Indian Council of Agricultural Research as also of similar committees in the various commodity Institutes, such as the Central Potato Research Institute and the Central Rice Research Institute. They attend meetings and seminars of agricultural scientists from time to time.

Further, having been raised to the status of a University, the Indian Agricultural Research Institute partakes in the activities of the Inter-University Board, of which it became a member in 1963, and other University bodies. The Director of the Institute also attends meetings of the several Committees constituted by the University Grants Commission. Recently, arrangements have been made between the Post-Graduate School of the Institute and the Delhi University on a mutual basis for holding Extension Lectures in which scientists from both the Institutions will participate.

The importance of closer co-ordination between the Indian Agricultural Research Institute and other agricultural research institutes and Agricultural Universities in

the country hardly needs any emphasis. Such co-ordination will not only help in eliminating unnecessary duplication of effort but also promote fruitful exchange of knowledge and experiences. The Committee feel that as the premier institution for agricultural research and education in the country, the Indian Agricultural Research Institute is eminently fitted to play a leading role in this matter. They would like the Institute to make a positive contribution towards developing greater co-ordination in the field of agricultural education and research by arranging, in cooperation with other Institutes and Universities, extension and foundation lectures in which selected scientists and specialists from all over the country may participate.

NEW DELHI;
April 22, 1965.

Vaisakha 2, 1887 (Saka).

ARUN CHANDRA GUHA,
Chairman,
Estimates Committee.

APPENDIX II

(Vide Para 51)

Testing of Agricultural Implements under I.C.A.R. Scheme for Production, Trial and Popularisation of Improved Agricultural Implements.

The names of implements tested and the observations thereon are indicated below:—

I. Indigenous implements:

(1) *Bund former*.—It was found to be useful and efficient for constructing field bunds for irrigation and also in soil conservation.

(2) *Wet land puddler*.—Excepting Himachal Pradesh and Kerala, the other States have found this implement useful for preparing the seed bed for paddy cultivation.

(3) *Green Manure Trampler*.—It was found useful only in a few States.

(4) *Olpad Thresher*.—It was found to be very useful and efficient for threshing wheat in all wheat-growing areas.

(5) *Orissa Plow*.—The performance was satisfactory only in Andhra Pradesh.

(6) *Bullock-Drawn Seed-Drill*.—It was not found useful.

(7) *Guntaka*.—Bombay and Tripura did not find the implement useful.

II. Imported Implements:

(1) *Pedal operated paddy thresher*.—Was recommended only for hilly areas where labour is difficult to obtain and where fields are located at difficult places.

(2) *Weeder*.—Was found to be very useful in all paddy-growing areas.

(3) *Viking Reaper*.—Was not found very useful as its draught was high and was beyond pulling power of a pair of animals.

(4) *Power Thresher*.—Was not found to be economical in comparison with local practices.

(5) *Paddy Sheller (Manually Operated)*.—The performance was found to be generally satisfactory in most of the States.

(6) *Power Rice Huller & Polisher*.—The performance was satisfactory and it was considered suitable for adoption on a co-operative basis.

(7) *Wheat Thresher*.—The performance was unsatisfactory.

(8) *Paddy Weeder (Two Rows)*.—The performance was unsatisfactory in most of the States.

(9) *Grain Screen*.—It was not found to be very useful.

APPENDIX III

Statement showing the Summary of Recommendations/Conclusions of the Estimates Committee contained in the Report.

Sl. No.	Reference to para No. of Report	Summary of Recommendations/Conclusions
1	2	3
1	9	Considering the valuable recommendations made by the Achievement Audit Committees to improve the quality and content of research work being undertaken in the various Divisions of the Institute, the Estimates Committee would like to recommend that such performance reviews may be made in the third/fourth year of each Five Year Plan period so that the suggestions regarding future line of development can be duly incorporated in the next plan period.
2	12	The Committee hope that efforts to acquire the additional acreage needed for the Institute Farm will be speeded up. The Committee suggest that necessary measures should be taken at an early date to prevent waterlogging of any portion of the farm land. They would also like the Government to ensure that the existing and the new land for the farm are put to effective use.
3	13	The Committee recommend that a separate 'servicing cell' may be earmarked in the Institute to attend to the servicing of mechanised equipment in the various Divisions.
4	14	(i) While the Committee appreciate the difficulties in apportioning the costs in the case of developing research, they strongly feel that there is scope for introducing cost accounting in the case of those experiments the objective of which is to recommend new practices for extension purposes. They consider that before any new agricultural practice is recommended for being passed on to the cultivator, the cost of production should always be estimated with a view to ascertain whether the recommended practice would be economical.

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(ii) In regard to the Karnal Sub-station, the Committee are of the view that its two principal activities, viz. seed production and experimental work, should be clearly demarcated and separate accounts should be maintained for that part of the Sub-station farm which is used for seed production. The Committee suggest that attempts may be made to organise the seed multiplication operations of the Sub-station on commercial lines.

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The Committee endorse the Audit Achievement Committee's views as to the need to work out the economics of the useful recommendations arising from the Agronomic trials and the proper transmission of such recommendations to the cultivators. They would, however, like to suggest that the Agronomy Committee of the Indian Council of Agricultural Research may review the working of the whole scheme, now in operation for about a decade, and give suitable directions in order that results of practical value to farmers may be obtained from these experiments as expeditiously as possible.

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The Committee consider that the maximisation of production trials conducted by the Agronomy Division demonstrate great potentialities of stepping up farm yields through a proper combination of as many improved production practices as possible. They hope that the results obtained so far from these trials will be evaluated by the Agronomy Committee of the I.C.A.R. and the improved practices given wide publicity for the benefit of farmers.

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(i) While noting the encouraging results that have come out of some of the experiments in spray fertilization, the Committee regret to observe that although the scheme has been in operation for over seven years the data available so far, in the case of some important crops, are insufficient for drawing any firm conclusions. For instance, only one year's data is available in regard to wheat and potato. The Committee suggest that the tempo of work on the scheme should be accelerated and proper data should be maintained on a regular basis in respect of all the crops.

(ii) The Committee also note that spray fertilization under rainfed conditions has so far been

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undertaken only in respect of barley. In view of the encouraging results of the experiments on barley, the Committee suggest that the desirability of undertaking spray fertilization of other crops under rainfed conditions may be considered by the Institute.

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The Committee consider that application of weedicides would help materially in stepping up agricultural production side by side with conserving soil fertility. To popularise the use of weedicides, they would suggest the holding of effective demonstrations in cooperation with State Departments of Agriculture. Government should also take necessary measures to ensure that such weedicides as have been proved to be efficacious and free from toxicological hazards are manufactured increasingly within the country and made available to farmers at reasonable rates.

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Since the primary responsibility of research on cattle breeding and cattle nutrition is that of the National Dairy Research Institute, the Committee would suggest that cattle surplus to the research requirements of the Indian Agricultural Research Institute may be transferred to the National Dairy Research Institute, Karnal. The Committee would also wish to emphasize the desirability of close coordination between the Indian Agricultural Research Institute and the National Dairy Research Institute to avoid infructuous overlapping in research programmes of the two Institutes.

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(i) The Committee are gratified to note that the N.P. 800 series of wheats, developed by the Institute, not only possess a high degree of resistance to rusts but are also immune to loose smut. However, in order that the Wheat improvement programme, currently under way in the Institute, may make a greater impact on wheat production in the country the Committee suggest that efforts should be made to breed new varieties of wheat that can stand up to much higher levels of fertilizer application than the existing varieties, and are at the same time resistant to diseases and insect pests, besides possessing the superior quality characteristics of the Indian wheats.

(ii) Considering that nearly 70 per cent of the area under wheat in the country is under 'barani'

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		(unirrigated) cultivation, investigations for breeding wheat varieties resistant or tolerant to draught should be intensified.
		(iii) The Committee also suggest that the Indian Agricultural Research Institute may investigate the possibilities of the commercial exploitation of hybrid vigour in wheat—a recent advance in wheat breeding which has helped in raising the average yield of wheat from 3000 kgs. to over 6000 kgs. per hectare in many good lands in California and Mexico.
11	22	The Committee appreciate the progress made in the development of hybrid maize and hope that research on this will be intensified for further progress and results.
12	23	The Committee feel that the progress so far achieved in the evolution of high yielding varieties of sorghum is not quite satisfactory. Inasmuch as researches have conclusively demonstrated that grain yields in many crops can be very substantially increased by using seeds of hybrid varieties, the Committee would like to recommend that research work for evolving new and better hybrids in sorghum should be intensified.
13	24	The Committee are unhappy to note that costly equipment of the Cereal Research Laboratory should have remained idle for about two years for want of electric power. This underlines the need for effective coordination between various Departments of the Government. Now that the requisite power has been made available, the Committee hope that researches on nutritional quality of cereals will be intensified.
14	25	The Committee are in agreement with the views expressed by the Panel of Agricultural Scientists that “the time and money spent in plant breeding research will be a waste, if there is no efficient machinery for multiplying the seeds of new varieties”. The Committee would, therefore, urge the Government to launch without any avoidable delay, a country-wide crash programme for the multiplication of seeds of improved varieties as well as for the proper distribution of such seeds among the farmers. The Committee would also suggest in this connection that the seed production programmes of the agricultural research institutes in general and the Indian Agricultural

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15	26	<p>Research Institute in particular may be thoroughly examined with a view to augment the production of improved nucleus seeds.</p> <p>In regard to the research on fodder grasses, being conducted in the Botany Division of the Indian Agricultural Research Institute, the Committee would like to reiterate the recommendation made by them in their Eightieth Report (Third Lok Sabha) on the Indian Grassland and Fodder Research Institute, namely that there should be close and intimate coordination between the various Institutes engaged in research on fodder grasses so that the more promising projects may be picked up for further intensified research and duplication and overlapping may be avoided.</p>
16	30	<p>The Committee are unhappy to note that the maintenance of an important asset like the National Pusa Insect Collection should have been allowed to suffer from want of proper care and attention and that, although the need for augmenting the staff of the Systematic Entomology Section was pointed out by the Achievement Audit Sub-Committee as far back as September 1962, the additional staff required to conduct the work on Systematic Entomology on the right lines is yet to be appointed. The Committee strongly recommend that recruitment of the required additional staff should be expedited and every effort should be made to bring the curating (including preservation, labelling, arrangement, identification, etc.) of the National Pusa Collection up-to-date so as to ensure its safety and scientific utility. They would also like to urge that the utmost care should be taken in carrying out identifications of insects. The Section of Systematic Entomology should also devise ways and means of providing a quick and accurate identification service to all agricultural agencies in the country.</p>
17	31	<p>The Committee consider that the Institute should have long ago undertaken a systematic effort to investigate the possibilities of controlling through the agency of exotic parasites insect pests, which according to rough estimates are known to destroy between 10 to 20 per cent of the country's total agricultural produce. They hope that Government would expedite decision on the Entomology Division's proposal seeking the necessary reorientation in the activities of</p>

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		<p>the Parasitology Section. The Committee need hardly state that where laboratory experiments on a parasite show promising results it should be tried out in the field to establish whether it could be successfully used for biological control.</p>
18	32	<p>The Committee consider it necessary that the economic utility of the results emanating from researches in the Entomology Division should be fully tested, and that such of the new findings and practices as are found to be of practical value in controlling, the pests should be promptly made known to the farmers.</p>
19	33	<p>In regard to bird pests, the Committee feel that the Entomology Division could at least make a beginning by initiating studies on (a) the biology of birds and (b) methods of control of bird pests. The Division may also undertake studies on the use of birds for biological control of pests.</p>
20	35	<p>Considering that the Indian exsiccata sets can be a useful aid to mycological studies and investigations, the Committee would like the I.A.R.I. to endeavour to supply these sets to such agricultural research and training institutions in the country as may be interested in acquiring them and are in a position to make good use of them.</p>
21	36	<p>The Committee would like to suggest that pending a decision on the proposal of the Institute for an expanded wheat Improvement Programme, every effort should be made to intensify investigations on the problem of wheat rust at the existing wheat research sub-stations of the Institute.</p>
22	37	<p>The Committee fail to understand why with all its facilities for research the Indian Agricultural Research Institute should have confined itself to merely routine testing of fungicides. In any case, the Institute after some preliminary research should have actively pursued the matter with the National Chemical Laboratory. As the availability of efficient fungicides at cheap rates can obviously make a significant contribution to the success of the country's food production programmes, the Committee would like the Government to take appropriate steps for the development and manufacture of fungicides.</p>

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23	39	<p>The Committee consider that the results emanating from the manurial experiments conducted by the Division of Soil Science and Agricultural Chemistry should be collated and widely publicised among farmers so as to enlighten them on the balanced use of fertilizers and remove any misconception about the effect of chemical fertilizers on the nutritional value of food crops or the fertility of the soil.</p>
24	40	<p>(i) The Committee note with distress that in spite of the high level attained in regard to the know-how about pest control, there has been scant progress in regard to the application of the know-how on a large scale in the country. Even the supply of spraying equipments falls far short of the requirements of the farmers. The Committee need hardly stress the necessity of making cheap pesticides available to the farmer. They would like the Government to devise ways and means in consultation with the Hindustan Insecticides Ltd. for production of pesticides and spraying equipment on a scale adequate to meet the country's requirements.</p> <p>(ii) The Committee also suggest that the Indian Agricultural Research Institute should undertake detailed investigations and trials to assess the economic utility of the neem seed spray in regard to different crops. The investigations should be followed up by adequate publicity in regard to the method of producing and using the spray and its economics.</p>
25	42	<p>The Committee are unhappy to note that although the country has been hearing of the cowdung gas plant for nearly two decades, the plant is still essentially in the demonstration stage. They consider it particularly unfortunate that lack of trained personnel should come in the way of installing this device in places where it is in demand.</p> <p>In view of the difficulties mentioned during evidence, the Committee strongly recommend that future investigations in regard to the cowdung gas plant project at the Indian Agricultural Research Institute should concentrate on bringing down the cost of the plant. The Committee suggest that Government should also make a phased programme for getting trained</p>

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		<p>personnel in adequate numbers and should encourage commercial manufacture of the plant at an economic price. The Committee also suggest that Blocks and Panchayats may be persuaded to put up demonstration plants in their regions so that the rural people may get some idea of the utility of the plant.</p>
26	43	<p>The Committee have been informed that Government intend to set up a National Soil Service with the help of the U.N. Special Fund within the next two years. The Committee suggest that Government may examine whether, the responsibility for the co-ordination of the work of the Soil Testing Laboratories should in due course be entrusted to the new Organisation proposed to be set up.</p>
27	44	<p>The Committee suggest that processes patented by the Indian Agricultural Research Institute should be given adequate publicity and be made available for commercial exploitation preferably to more than one party, so that the prices of the finished products are kept at reasonable levels through the operation of healthy competition.</p>
28	45	<p>The Committee regret that all the parts required for Differential Thermal Analysis Unit were not imported initially in 1958 and that there was considerable delay in making available foreign exchange to the tune of Rs. 3,800 for importing the requisite part. The Committee consider that had timely action been taken to obtain the requisite part, it should have been possible to commission the Differential Thermal Analysis Unit long ago. The Committee hope that every effort will be made to put the equipment to use as early as possible, and that necessary action will be taken to ensure that such instances of non-utilisation of research equipment do not recur.</p>
29	48	<p>Keeping in view the objectives underlying the setting up of the Division of Agricultural Engineering, the Committee cannot but regard the achievements of the Division during nearly two decades of its existence as meagre. The Committee regret that the work of the Division should have been allowed to suffer for all these years due to various handicaps in regard to accommodation, equipment, etc. To ensure better results in future they would urge the</p>

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need of speedy action to remove the difficulties faced by the Division or by any other Division.

The Committee have already suggested in para 13 the earmarking of a separate Servicing Cell to look after the servicing of mechanised equipment in various Divisions of the Institute so that maintenance work does not distract from the main work of research in the Agricultural Engineering Division.

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(i) In view of the fact that Indian agriculture is still being conducted with crude and outdated implements and in view of the remarkable success achieved by many countries, notably Japan and Germany in increasing agricultural production through the use of improved agricultural machinery and implements, the Committee consider that there is imperative need to intensify research in agricultural engineering in India so that it may be possible to develop cheap and efficient implements suited to the needs of Indian farmers. The Committee also feel that with the introduction of agricultural engineering in a number of agricultural Universities, the time has come when the training facilities in agricultural engineering, especially at the Post Graduate level, should be coordinated and planned on an all India basis. They would, accordingly, like the Government to formulate and implement, as early as possible, a comprehensive and integrated all-India programme for research and higher studies in agricultural engineering.

(ii) The Committee have suggested in Chapter VI that it would be desirable to introduce a major course in Agricultural Engineering at the Post-Graduate School of the Institute. As a corollary to this, they would recommend that the research facilities in the Agricultural Engineering Division should be suitably strengthened so as to enable the Division to cater to the needs of Post-Graduate instructions in Agricultural Engineering.

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To avoid duplication of work and to ensure the best use of available talent and resources in the country, the Committee would like to recommend that, as amongst the various agricultural research Institutes in the country, fundamental research work in regard to designs and improvements of agricultural implements may

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		<p>be concentrated in the Agricultural Engineering Division of the Indian Agricultural Research Institute. The Committee suggest that engineering sections of other agricultural research institutes should look mainly to the maintenance and repairs of their own implements, and machineries.</p>
32	51	<p>The Committee consider that the field trials of agricultural implements should be intensified and should cover a wider range of implements particularly those imported from advanced countries like Germany and Japan which have made note-worthy advances in recent years in designing and manufacturing of agricultural machinery.</p>
33	52	<p>The Committee feel doubtful whether the existing scheme of Indian Council of Agricultural Research for awards can provide sufficient incentive for designing and manufacturing improved agricultural implements. They are of the view that an upward revision of the value of these awards is necessary for attracting the best engineering skill in agriculture. The awards should also be given wider publicity. The Committee would also like the Government to consider early a recent proposal made by the Panel of Agricultural Scientists for the award of two prizes by the Government of Rs. 50,000 each to the designer of (1) an improved seed drill for small grains and (2) a thresher useful for wheat or paddy.</p>
34	53	<p>(i) The Committee need hardly emphasise that Indian agriculture cannot make any appreciable progress unless improved agricultural implements, of standard quality, are available to the farmers at reasonable prices. The Committee suggest that Government should formulate a definite programme to manufacture cheap but improved agricultural implements suitable for Indian agriculture and then to introduce them through the Community Development Blocks and Panchayats. The programme should also provide for the establishment at the State Government level of suitable machinery to enforce price and quality control in respect of improved agricultural implements.</p> <p>(ii) In order to popularise improved agricultural implements among the farmers, the Committee would suggest that in addition to hold-</p>

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ing demonstration trials of such implements the Indian Agricultural Research Institute should make arrangements in collaboration with State Departments of Agriculture for the display and demonstration of new implements developed by the Agricultural Engineering Division at fairs and exhibitions held in different parts of the country, which are largely attended by farmers.

(iii) The Committee also consider it desirable that the Agricultural Implements and Machinery Museum at the Institute, which has already become a storehouse of valuable material for agricultural engineering designs and developments, should be developed into a national information centre for agriculturists and industrialists.

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The Committee attach great importance to research on water lifting devices inasmuch as it can, if conducted on the right lines, provide effective solutions to one of the most pressing problems of Indian Agriculture, viz. the lack of adequate irrigational facilities. Now that the Ford Foundation Scheme on the subject is again in operation, the Committee urge that the Agricultural Engineering Division should intensify its research and testing activities in this important field so that it may, within a reasonable time, be able to devise or identify cheap and efficient water lifts suited for adoption under farmers' conditions.

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While noting that all the machines and machine-tools in the Agricultural Engineering Division have been in commission since, May, 1964, the Committee cannot but feel unhappy over the fact that, for a considerable period, the Division was handicapped for want of adequate electricity in making full use of its machines. As the work of this Division entails the use of various power-operated machines, the Committee hope that in future care will be taken to ensure that the Division is provided with adequate supply of electricity to meet its requirements in full.

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The Committee note that after over six years, the Horticulture Division has now been housed in its own building which is being further extended as scheduled under the Third Plan.

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		<p>However, the Division's requirement of additional land is yet to be met. The Committee in para 12 have already suggested that efforts should be speeded up to acquire another 200 acres needed for the Institute's farm. They hope that the Horticulture Division's needs will be substantially met from the additional acreage to be acquired by the Institute.</p>
38	58	<p>The Committee are of the view that Government should carefully consider whether the functions proposed to be allotted to the National Horticultural Institute could not as well be performed by the Division of Horticulture which has now been in existence for over seven years. In general, the Committee would like to suggest that every attempt should be made to avoid proliferation of research institutes having overlapping or similar functions as in their opinion this leads to duplication of research effort which may not be commensurate with the outlay involved.</p>
39	59	<p>Considering that a plentiful supply of vegetables and fruits can go a long way in improving the nutritional value of the average Indian diet, the Committee would like to suggest that the Horticulture Division may make more intensive efforts to develop high yielding varieties of fruits and vegetables.</p>
40	60	<p>(i) While recognising the difficulties in acquisition of land, particularly good agricultural land, the Committee suggest that in case of any delay, the question of acquiring additional land for the Katrain Sub-station of the Institute may be taken up with the concerned State Government at a higher level stressing the importance and urgency of purpose for which the land is to be acquired. In view of the national importance of the research work of this Sub-station, the Committee feel that Government should have made every effort to acquire the additional land required for the Sub-station.</p> <p>(ii) The Committee feel that as the Katrain Sub-station is the only important centre for research for the improvement of vegetables, like cauliflower, cabbage, etc., every effort should be made to ensure that the nucleus seeds produced at this sub-station are sufficient for meeting the country's requirements. The Committee also suggest that proper arrangements may be made for the distribution of the nucleus seeds, pro-</p>

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		duced by the Sub-station, to progressive farmers and other agencies who may like to multiply them.
41	66	The Committee suggest that the conclusions drawn from the various studies conducted by the Agricultural Economics Division may be duly utilised for developing teaching material on the different aspects of the subject as also for actual extension work in the Kanjhawala Block.
42	69	<p>While noting the work done by the Indian Agricultural Research Institute in the field of practical extension and propagation of results of research, the Committee would like to urge that Government should, with the co-operation of the State Departments of Agriculture, devise effective machinery to ensure that the results of practical value emerging from the research activities of the Indian Agricultural Research Institute are systematically and speedily transmitted to farmers on a more extensive and country-wide scale.</p> <p>(ii) The Committee would also suggest that, to reduce the time-lag between the conclusion of experiments and making the results available to the cultivators, the Institute should seek the assistance of the Indian Council of Agricultural Research in arranging quicker publication of research results in the form of attractive pamphlets in popular style and sending them to State Governments, farmers' organisations and other concerned agencies.</p> <p>(iii) Further, instructional films depicting improved methods and advances in agriculture and the advantages flowing from them should be prepared and widely displayed in rural areas. Arrangements should also be made for giving publicity to improved agricultural practices, implements, etc., at fairs and exhibitions held in the country side.</p> <p>(iv) The Committee would also like to suggest that the feasibility of starting a rigorous technical training programme for extension workers at the Indian Agricultural Research Institute may be examined. The training programme may be organised in such a way that the extension workers themselves lay out demonstrations, hold field days, harvest the crops and learn the scientific principles underlying maximised crop production.</p>

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43	72	<p>In view of the heavy demand for admission to the Post-graduate School and the country's growing need for properly trained agricultural scientists, the Committee suggest that the Indian Agricultural Research Institute may consider the feasibility of increasing the annual intake of students for both M.Sc. and Ph.D. courses.</p> <p>The Committee also note that while on the one hand there has been a pressing demand for admissions to the Post-graduate School, on the other hand the number of admissions to M.Sc. course of the School has been going down year by year and has reached the low level of 51 in 1963 as compared to 104 in 1958. The Committee are distressed to note this downward trend and would suggest that detailed reasons for this should be investigated and remedial measures taken to attract competent students to undertake Post-graduate study in the vital subject of Agriculture.</p>
44	73	<p>The Committee are glad to note that the pattern of instruction followed at the Post-graduate School leaves little room for wastage of educational effort on the part of the students.</p> <p>In view of this, the Committee would like the Government/University Grants Commission to consider the feasibility of extending the credit course system to other scientific research-cum-teaching institutions and agricultural universities in the country.</p>
45	74	<p>(i) The Committee note that Agricultural Engineering does not form a major course of post-graduate instruction at the Post-graduate School of the Institute. In view of the fact that Bachelor's Courses in Agricultural Engineering already exist in some institutions in the country, such as the Indian Institute of Technology, Kharagpur, and similar courses are proposed to be introduced in the Agricultural Universities established recently, the Committee feel that Agricultural Engineering should be recognised as a major subject at the Indian Agricultural Research Institute.</p> <p>(ii) The Committee also wish to emphasise the desirability of focussing the attention of the students of the Post-graduate School upon the actual problems facing the Indian cultivators and encouraging them to take up for their study</p>

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		and investigation problems of greater practical value from the point of view of increasing food production.
46	75	The Committee feel that there is scope for expansion in the number of short/refresher courses organised at the School. They would like the Institute to make arrangements, for imparting intensive practical training, of short duration, in improved agricultural practices to the actual tillers of the soil.
47	82	The Committee feel that the location of the soil correlation centres on the basis of the quality of soil alone is not quite sound, inasmuch as each and every region contains different qualities of soil which a soil correlator should take note of. The Committee think that it would have been better if the Centres were set up on a regional basis. The Committee suggest that in the light of the above the position may be reviewed.
48	84	(i) The Committee regret to note that in spite of the recommendations of experts scant attention has so far been paid by Government to the improvement of the Service conditions of the technical staff and especially of the field staff in the Soil Survey organisation. The Committee recommend that Government should take urgent measures to improve the pay scales, allowances and service conditions of the staff in this organisation so as to bring them at par with those working in the Geological Survey of India and other Organisations doing field work. (ii) The Committee also recommend that in case suitable Scheduled Castes and Scheduled Tribes candidates are not available to fill up the posts reserved for them, the posts of Soil Survey and Research Assistants should be filled up by other candidates.
49	85	The Committee feel that the present arrangement under which the Chief Soil Survey Officer is under the administrative supervision of one authority and under the technical control of another authority is neither sound nor expedient. The Committee would like to urge that the question of bringing the All India Soil and Land Use Survey under the technical and administrative control of one expedt authority should be considered by Government at an early date.

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50	86	<p>The Committee regret to note that no satisfactory arrangements have been made for the repair and servicing of the Jeeps, purchased or secured for the various Centres. Even the post of driver-cum-mechanic which has been created for each Centre has not been filled up. The Committee would like to stress the need to keep the vehicles in good working condition and would suggest that proper servicing and maintenance facilities be provided at each Centre.</p>
51	87	<p>The Committee are glad to note that the All India Soil Survey and Land Use Organisation has compiled a Handbook of Soil Series which is in use in the various Correlation Centres and some State Departments also.</p> <p>The Committee would, however, like to suggest that the Handbook of Soil Series should be periodically revised and brought up-to-date as and when more data are collected and new soil series are identified and distinguished. The Handbook should be supplied to all the State Governments who should undertake translations thereof in the regional languages. Copies of the Handbook may also be supplied to Rehabilitation Centres where new migrants are proposed to be settled.</p>
52	88	<p>(i) The Committee feel that it is not enough if soil survey reports are merely sent to State Governments. What is necessary is close co-ordination with the State Departments of Agriculture as also intimate contact with progressive farmers who should be assisted through education and interpretation to use the soil maps, legends, descriptions and reports. Until the user can interpret the information contained in the reports, agricultural projects cannot be properly planned.</p> <p>(ii) The Committee also suggest that the Soil Survey Organisation should keep in touch with the various Commodity Committees and help them in mapping out areas suitable for production of crops with which they are concerned.</p> <p>(iii) The Committee would also like to impress upon Government the urgent need for a rapid soil survey of areas which are being developed for resettlement of new migrants.</p>

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53	89	The Committee hope that the proposed National Soil Service would not only ensure better co-ordination of soil survey work between the Centre and the States but also co-ordination among Central Organisations doing various kinds of soil surveys and soil testing work.
54	90	The Committee do not think that the administrative difficulties in the way of drawing up a 'Memorandum of Understanding' in regard to the work of soil surveys between the States and the Centre are such as cannot be overcome by discussion, consultation and persuasion. Now that the Government are thinking in terms of a National Soil Service, the Committee suggest that the question of drawing of a Memorandum of Understanding may be considered at a conference with the representatives of the States and the River Valley Projects concerned.
55	91	Having regard to the fact that the Indian Agricultural Research Institute has been conferred the status of a University, the Committee would suggest that Government may undertake a review of the existing procedure for sanctioning expenditure in order to ascertain whether it would be advisable to delegate more financial and administrative powers to the Institute.
56	92	The importance of closer co-ordination between the Indian Agricultural Research Institute and other agricultural research institutes and Agricultural Universities in the country hardly needs any emphasis. Such co-ordination will not only help in eliminating unnecessary duplication of effort but also promote fruitful exchange of knowledge and experiences. The Committee feel that as the premier institution for agricultural research and education in the country, the Indian Agricultural Research Institute is eminently fitted to play a leading role in this matter. They would like the Institute to make a positive contribution towards developing greater co-ordination in the field of agricultural education and research by arranging, in co-operation with other Institutes and Universities, extension and foundation lectures in which selected scientists and specialists from all over the country may participate.

APPENDIX IV

(Vide Introduction)

*Analysis of Recommendations/Conclusions
contained in the Report*

I. CLASSIFICATION OF RECOMMENDATIONS

A. Recommendations for improving the organisation and working:

Serial Nos. 1, 2, 3, 4, 5, 6, 7, 15, 16, 20, 26, 29, 31, 40, 43, 47, 48, 49, 50, 51, 52, 53, 54, 55 and 56.

B. Recommendations for effecting economy:

Serial Nos. 9, 13, 28, 36 and 38.

C. Miscellaneous Recommendations:

Serial Nos. 8, 10, 11, 12, 14, 17, 18, 19, 21, 22, 23, 24, 25, 27, 30, 32, 33, 34, 35, 37, 39, 41, 42, 44, 45 and 46.

II. ANALYSIS OF MORE IMPORTANT RECOMMENDATIONS DIRECTED TOWARDS ECONOMY.

S. No.	S. No. as per Summary of Recommendations (Appendix III)	Particulars
1	9	Cattle surplus to the research requirements of the Institute may be transferred to the National Dairy Research Institute, Karnal, to avoid infructuous overlapping in research programmes of the two Institutes.
2	13	Costly equipment of the Cereal Research Laboratory remained idle for two years.
3	28	Differential Thermal Analysis Unit, imported in 1958 lying idle for want of a spare part.
4	3 ⁶	For a considerable period the Division of Agricultural Engineering was handicapped for want of adequate electricity in making full use of its machines.
5	38	Proliferation of research institutes having overlapping or similar functions should be avoided as this leads to duplication of research effort which may not be commensurate with the outlay involved.

