E.C. No. 421.

ESTIMATES COMMITTEE (1964-65)

EIGHTIETH REPORT

(THIRD LOK SABHA)

MINISTRY OF FOOD AND AGRICULTURE

(DEPARTMENT OF AGRICULTURE)

INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE, JHANSI

AND

SOIL CONSERVATION RESEARCH, DEMONSTRATION AND TRAINING CENTRES

LOK SABHA SECRETARIAT
NEW DELHI
April, 1965/Chaitra, 1887 (Saka).
Price: *Re.* 1.00

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CONTENTS

75 (Aii) LS—1.

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(1964-65)

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INTRODUCTION

I, the Chairman, Estimates Committee having been authorised by the Committee to submit the Report on their behalf, present this Eightieth Report on the Ministry of Food and Agriculture (Department of Agriculture)—Indian Grassland and Fodder Research Institute, Jhansi and Soil Conservation Research, Demonstration and Training Centres.

2. The Committee took evidence of the representatives of the Ministry of Food and Agriculture (Department of Agriculture) on the 2nd and 24th December, 1964. The Committee wish to express their thanks to the Special Secretary, Ministry of Food and Agriculture (Department of Agriculture), Special Officer, Indian Grassland and Fodder Research Institute, Jhansi and other officers of the Ministry and the Institute for placing before them the material and information they wanted in connection with the examination of the Indian Grassland and Fodder Research Institute, Jhansi and Soil Conservation Research, Demonstration and Training Centres.

3. The part of the Report relating to Indian Grassland and Fodder Research Institute, Jhansi was considered and adopted by the Committee on the 16th February, 1965 and the part relating to the Soil Conservation Research, Demonstration and Training Centres was considered and adopted by the Committee on the 1st April, 1965.

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

NEW DELHI;
April 11, 1965.
Chaitra 21, 1887 (*Saka*).

ARUN CHANDRA GUHA,
Chairman,
Estimates Committee.

INDIAN GRASSLAND AND FODDER RESEARCH INSTITUTE, JHANSI

CHAPTER I—INTRODUCTORY

A. Historical Background

The agricultural prosperity of India is closely linked with the development of its livestock resources. Grazing and fodder resources are not only of interest for animal husbandry but their development and utilisation hold the key to many problems in the related fields of land use and agricultural production. Grazing and fodder resources contribute towards the better feeding of livestock, help in the maintenance of soil fertility, conservation of soil and water resources by providing protective plant cover and assist generally in the correct management of forests. Hitherto the work of livestock improvement in India was directed towards breeding of healthy animals while feeding, which plays an equally important part in their upkeep, was neglected with the result, that the gaps between supply and demand of feeds and fodders have been progressively widening. This has resulted in malnutrition and low productivity of livestock, denudation of vegetation and erosion due to uncontrolled grazing and lowering of the fertility.

2. In the recent years, with the ever increasing emphasis on food production, considerable portions of natural resources have been diverted for raising food crops accentuating the already critical situation of animal nutrition in the country. The current emphasis on increased production of dairy products has highlighted national deficiencies in good quality fodder. Dairy animals cannot be productive on Indian natural grasslands alone, and have to depend on the availability of cultivated fodder crops, particularly the high-prctein legumes.

3. Although sporadic researches have been going on in the country on the subject of grasses and grasslands, it is practically after the attainment of independence that organised researches were taken up. The work carried out in the Agrostology Section of the Indian Agricultural Research Institute, the number of fodder research schemes started in the States at the initiation and with financial help of the Indian Council of Agricultural Research, the ecological survey of grasslands carried out under Indian Council of

Agricultural Research, the monumental treatise on 'Grassland and fodder resources in India' by Dr. R. O. Whyte, published by the Indian Council of Agricultural Research, the formation of the Soil Conservation Board with the consequent emphasis on the role of grasses in soil conservation and the increased need for the livestock products to supplement the human nutrition, all these have contributed to the awakening of interest in the subject of grassland and fodder development from the points of view of forage, soil fertility and soil conservation.

B. Setting up of the Grassland and Fodder Research Institute

Time lag in setting up the Institute.

4. In order to organise and channalise through a central research organisation work in the wider field of grasses and fodders, the Government of India prepared a scheme in June, 1961 for setting up a Grassland and Fodder Research Institute at a cost of Rs. 45 lakhs during the Third Plan period. The Planning Commission approved the proposal in July, 1961 and the concurrence of the Ministry of Finance was taken in November, 1961. The Institute was started at Jhansi with effect from 1st November, 1962. Asked about the reasons for delay, the Ministry of Food and Agriculture have explained that "the time-lag between the decision of the Planning Commission (16th July, 1961) and the appointment of the special Officer (1st November, 1962) was due to the visit of officers of the Ministry to different States for the location of the Institute's site."

The Committee are surprised to note that Government have thought of setting up the Institute in such an important matter as grasses and fodders only in Third Plan particularly when fodder scarcity is almost a regular feature. They think that considering the importance of the subject Government should have taken steps to fill the gap during the preceding ten years. The Committee are distressed to find that despite adequate financial provision being made in the Third Plan there has been dilatoriness in setting up the Institute. The Committee hope that Government would lose no further time in developing the full potentialities of the Institute and achieving the objectives underlying its establishment.

C. Criteria for location of the Institute

5. Bharari Farm, Jhansi made available for the Institute by the Uttar Pradesh Government comprises 1,421 acres.

The Committee are informed that Jhansi was selected as it satisfied the following criteria:

(a) Location in one of the major cattle tracts;

(b) Land which has a certain proportion of the areas under irrigated and dryland cultivation, and under natural grassland;

(c) Soils of contrasting types;

(d) Adequate residential, educational, medical and other social amenities; and

(e) Good rail and other communications.

The area of the present farm is considered adequate by Government for undertaking research schemes centrally.

D. Objectives of the Institute

6. The objectives of the Institute are as follows:

(i) To carry out research both of fundamental and applied nature, on grasses, grasslands and fodder crops as related to animal nutrition, soil fertility and crop production, and soil and water conservation;

(ii) To collect, co-ordinate and collate research work on this subject in the country by centralizing direction operation and superintendence;

(iii) To find out solutions of the various confronting problems which can be given practical application under the existing social and economic conditions; and

(iv) To disseminate knowledge of the subject through organised training courses.

E. Organisational Set-up

7. The organisational set-up proposed in the original scheme consisted of an Administrative Division and following four Technical Divisions at the headquarters of the main Institute and 5 sub-stations to be located in the different ecological zones of the country: Original Scheme.

(i) Division of Grassland Management;

(ii) Division of Fodder Agronomy;

(iii) Division of Plant Improvement; and

(iv) Division of Plant/Animal relationship.

Subsequently, a Division of Weed Ecology and Control to be located at a suitable place, was added.

8. In view of the national emergency calling for greatly increased production of high quality fodders to meet the demands of dairy development for civil and military requirements, the original scheme was revised laying more emphasis on the establishment of the sub-stations.

Revised Scheme.

9. The proposed organisational set up under the revised scheme is as follows:

(i) *Main Institute.*—The main Institute consisting of the Administrative Division and four Technical Divisions referred to in para 7 above are to be located at Jhansi. The Division of Weed Ecology and Control is proposed to be located at Lucknow where land is being acquired. Each of these Divisions will be in charge of a Head of Division with necessary supporting technical staff for carrying out research and other technical activities of the various sections of the Division. The Director would be in overall charge of the Institute.

(ii) *Regional Centres.*—It is also proposed to establish six regional stations to represent the following regions:—

(1) North East Paddy Region;
(2) Central Deccan Region;
(3) Southern Region;
(4) Western Intensive Dairy Region;
(5) North-West Intensive Dairy Region; and
(6) Himalayan Region.

Three of the above regions will further have two sub-stations each. The organisational set-up at each regional station will consist of Officer-in-Charge and representative senior staff of the four main disciplines of the Central Institute with necessary supporting field staff.

CHAPTER II—PROGRESS OF WORK

A. Up-to-date Progress

Soil Survey.

10. After the farm was taken over from the State Government, a contour survey was carried out of the cultivated area with the co-operation of the local soil conservation unit of the State and a reconnaissance soil survey of the entire farm area was carried out through the co-operation of the Chief Soil Survey Officer, Indian Agricultural Research Institute, with a view to get complete soil and soil fertility maps as an essential aid to the proper location of experimental projects.

Technical Activities.

11. The technical activities of the Institute have been confined mostly to preliminaries like surveying and mapping of existing vegetation, collection and establishment of as many herbage material as could be obtained from within and outside the country, their general performance studies with a view to selecting out proper materials for planning of future experimental projects and multiplication of the seed of the recommended fodder crops and of promising herbage material as a first step towards the extension and the research activities of the Institute.

12. The details of the work done under different Divisions are given below:

Division of Grassland Management

Project I—Survey and mapping of natural vegetation of the Central Research Farm.

Survey of Natural Vegetation.

This project was taken up with a view to obtaining a stock map of the existing trees, shrubs and grass vegetation to serve as reference map to study any induced or natural changes in the vegetation. Survey of the grassland communities is also being undertaken.

Project II—Study of Seasonal Vegetation.

This study was taken up as an essential follow up of the general vegetation surveys to obtain classified ecological information on all types of plant species both annuals and perennials occurring in the farm area.

Enumeration of winter and summer vegetation on different habitat conditions was completed and a beginning

was made with these species towards the building up of the ecological herbarium of the Division.

Division of Fodder Agronomy

The activities of this Division in the first year of its working essentially consisted in the multiplication of known and promising fodder and forage crops both for distribution of seed/planting material to governmental and private agencies as well as for undertaking experimental programme of the Division. For this purpose a block of 30 acres was developed. Details regarding plant materials multiplied, the total and per hectare yields together with its distribution are given in Appendix I.

In addition two observational plots on wheat-Hubam and wheat-Vetch mixtures were laid down. The objective in the former mixture was to study the growth of Hubam clover after the wheat harvest so as to explore the possibility of taking Hubam clover for fodder and or green manuring when sown in a wheat field. The objective in growing wheat with Vetch (*Vicia setiva*) was to explore the possibility of enriching the nutritive value of wheat straw by the direct addition of Vetch hay.

Division of Plant Improvement

The activities of this Division have been confined to the collection, establishment and general performance studies of as many herbage material as could be obtained from within and outside the country. A plant introduction garden was established with 28 grass collections and 77 legume collections.

The winter collections in the Plant Introduction Garden consisted amongst others of 35 Lucerne varieties obtained through Food and Agriculture Organisation.

Appointment of Staff.

13. The nucleus staff sanctioned for the advance preparation of the establishment of the Institute and the staffing position at the end of 1963-64 is given below along with their dates of appointment.

Name of the Post	No. of Posts	Scale of Pay	Date of Joining
		Rs.	
1. Special Officer .	1	1100—1400	1-11-1962
2. Ecologist . . .	1	700—1250	3-1-1964

Name of the post	No. of Posts	Scale of Pay	Date of Joining
3. Head Clerk . .	1	210—380	16-2-1963
4. Research Assistant .	2	210—425	6-5-1963
		Do.	14-1-1964
5. Steno-typist	1	110—180 +20/- S.P.	25-7-1963
6. L.D.C.	1	110—180	8-1-1963
7. Driver	1	110—130	6-3-1964
	1	Do.	Vacant
8. Chowkidar	1	70—85	21-12-1962
9. Peon	1	Do.	3-4-1963
10. Mali .	2	Do.	1-4-1963
			6-4-1963

Short fall in Expenditure.

14. A ceiling of Rs. 45 lakhs was provided in the Third Five Year Plan for the Institute. Rs. 25 lakhs were provided under Capital and Rs. 20 lakhs under Revenue. The actual expenditure incurred on the Institute so far and the estimated expenditure are indicated below:

Year	Capital	Revenue	Total
1962-63 .	..	6,659	6,659
1963-64 . .	1,53,023	62,675	2,15,698
1964-65 (RE) .	..	1,49,000	1,49,000
1965-66 (BE) .	4,00,000	8,46,000	12,46,000
TOTAL . . .	5,53,023	10,64,334	16,17,357

Committee's Views.

The Committee regret to find that it would be possible to utilize only about Rs. 16 *lakhs from a Plan provision of Rs.* 45 *lakhs for the Institute. They cannot appreciate the leisurely manner in which the Union Government have gone about in developing the Institute which admittedly can play a very effective role in augmenting the scarce fodder and grass resources for animals. They consider that one of the chief reasons for this slow progress is the long time taken by Government in deciding about recruitment of the Director and Heads of Divisions for the Institute. The Committee are not able to appreciate as to why the post of the Director was not filled up as soon as preliminaries in connection with the Institute were over. It would have been invaluable*

to associate the Director in the selection of the site of the Institute and in planning and designing its lay out and research projects. Similarly the Heads of the Divisions could have played a very useful role in working out in detail the equipment and other requirements which are the pre-requisites for effective implementation of the research schemes. The Committee hope that the posts of the Director and Heads of Division required for the main Institute will now be filled up without further delay. The expert advice of the Director and the Heads of Divisions should go a long way in chalking out purposeful lines of research and development at the Institute. The Committee need hardly stress that Government as well as the Institute should approach the whole problem of fodder and grass resources with a sense of urgency so that it can play an effective part in increasing the scarce resources for feeding animals, particularly the milch cattle.

B. Project with United Nations Fund Aid

15. The Government of India approached the United Nations Special Fund for contribution totalling $11,13,740 to provide 35 man power years of expert services with parallel series of 10 man power of fellowships. The assistance of the short term consultants is required to advise on the overall policies and techniques adopted in the Institute and its sub-stations and to take active part in the training programme. Assistance has also been asked for importing equipment.

16. A Summary of the proposed project is reproduced in Appendix II.

17. The Committee understand that the Governing Council of the United Nations Special Fund have accepted the request of the Government of India at their meeting held in January, 1965 and have allocated the following amounts:

		Total Cost (In U.S. $)
Gross Project Costs :	Experts	10,21,200
	Fellowships	52,000
	Equipment	2,68,000
	Miscellaneous	61,300
	TOTAL	14,02,500
Executing Agency overhead Costs		1,32,600
Special Fund Direct Costs		1,100
GRAND TOTAL		15,36,400

The Committee note that the main idea underlying the project is to develop fodder resources for the growing dairy industry. The Commitee hope that with the assistance of the United Nations experts, it would be possible for the Institute to develop a crash programme for providing nutritious cattle feed at economic rates. Committee's Views.

The other important object in getting foreign experts is to impart training to the Indian scientists in the field. The Committee need hardly stress that every effort should be made to train Indian scientists in the field so that they can carry on research work without interruption and in fact break new ground even after the services of foreign experts cease to become aavilable.

It may not be out of place to mention that training facilities in most of the Union agricultural research institutes are not being put to full use for want of nominations by the State Governments. The Commitee would, therefore, suggest that the programme should from the very beginning be drawn up on a realistic basis in conjunction with the State Governments.

The Committee also hope that the amount earmarked for equipment would be put to good use at an early date.

C. Nucleus Seeds

18. The Committee are informed that no scheme for multiplication of seeds for grass and fodder crops has yet been drawn up. It is proposed that the nucleus seed of the successful grasses and fodder crops will be supplied to State Governments and interested private agencies for multiplication at their end.

The Committee hope that the arrangements would be made early for supply of nucleus seeds of successful grasses and fodders to the State Governments and other agencies.

D. Proforma Accounts

19. The Committee note that no special form has been laid down or direction issued for the maintenance of accounts of seeds for grass and fodder crops. The Committee are informed that as soon as the work progresses and sufficient seed is produced for multiplication, proforma accounts will be framed after consulting the various Institutes where such work is being done.

The Committee would stress the need for maintaining proforma accounts from the very beginning so that the future development does not lack sound financial basis.

CHAPTER III—MISCELLANEOUS

A. Need for close co-ordination with other Research Institutes and Dairies

20. The Committee understand that some research on grasses and legumes is being carried out in the Indian Agricultural Research Institute, National Dairy Research Institute and Indian Veterinary Research Institute. The Committee have been informed during evidence that the intention is that after the Grassland and Fodder Research Institute is developed, the work of research will be mainly centralised in the new Institute.

The Committee would suggest that there should be close and intimate co-ordination between the new Institute at Jhansi and the aforementioned three Institutes so that the more promising projects are picked up for further intensified research. They need hardly stress that as far as possible there should not be overlapping and duplication of work between the various agricultural research institutes.

They would also stress the need for close co-ordination between the Research Institute at Jhansi and the leading Dairies in the country because it is they who have first hand knowledge of the problems faced by the dairy industry.

B. Liaison with Cattle Feed Plants

21. The Committee understand that an automatic cattle feed milling plant has been established at Kanjari in Kaira district (Gujarat State) to produce 60,000 tons of nutritionally balanced cattle feed every year. If this proves a success, many more cattle feed milling plants are likely to be set up in the country to supply cattle feed at low cost.

As one of the objectives of the Institute is to apply existing knowledge and experience in pilot projects designed to promote and increase fodder production in dairy development areas, the Committee would suggest that there should be close liaison between such milling plants and the Institute so that low cost but nutritionally rich fodders and grasses are developed on priority basis.

C. Need for intensifying Research in Soil Conserving Grasses/Fodders

22. One of the objectives of the Institute is to carry out reserch on grasses and fodder crops from the point of view of soil and water conservation. The Committee are glad to note that a beginning has been made to find out whether clover or other fodders could be grown along with wheat for purposes of producing fodder and or green manure. The Committee would also like to refer to the experiments carried out in the Indian Agricultural Research Institute and Central Rice Research Institute on Blue Green Algae which are known to have the property of enriching the nitrogen status of the soil and thereby increasing the crop yield.

In view of the imperative need of conserving soil and enriching its production properties, the Committee would suggest that research in this promising field should be closely co-ordinated and intensified.

D. Need for Regenerating Village Pastures

23. The Committee would also like to refer to another important problem, namely, that of regeneration of village pastures. It is well-known that the condition of village pastures is generally poor and not infrequently they are completely denuded of grass cover as a result of sheer over-grazing. Now that Panchayats have been established in most villages, it should be possible to take in hand systematic measures to regenerate these pastures.

The Committee would suggest that the Institute should pay special attention to the problem of regenerating the village pastures. This problem may fittingly be the subject of study by the sub-stations which are proposed to be set up under the Institute. Efforts should be made to find grasses which are not only hardy but also nutritionally rich and suited to the local conditions.

E. Developing Grass Resources in Hilly Areas

24. It is well-known that grassy patches in the hills are used by "Gujjars" and other nomadic and migratory tribes for grazing of their cattle. Besides, the local inhabitants also turn their cattle loose for grazing on grassy patches in the hills. Grazing is confined largely to the fringes of the forests, bordering villages and around sources of water in the interior where cattle may be penned. Grazing incidence is apt to be inordinately high at these places. Over-grazing results in the depletion of the more palatable and nutritive

grasses and in general denudation and deterioration of resources. The policy of cheap or free grazing has encouraged the promiscuous breeding of uneconomic scrub cattle in the villages bordering the forests; the grazing incidence has, therefore, increased and so also the damage to the grazing grounds.

The Committee consider that apart from the necessity of regulating grazing in the forest areas, there is both scope and need for developing nutritious grasses in these hill tracts for grazing of cattle, particularly sheep, which yield precious wool. The Committee hope that the Institute and its sub-stations will take up this problem for urgent attention and research.

They need hardly stress that special efforts are also called for developing suitable grasses and fodders for supporting cattle in hilly strategic areas like Ladakh, Spiti, Lahaul, NEFA etc., where the need for economic development is urgent.

F. **Plans for future Development**

25. To sum up, the overall economic advantages expected from the setting up of the Institute are as follows:

(a) These activities will provide the secure fodder basis so essential for the full and efficient operation of dairy plants, ensuring that the expenditure on equipment in these plants shall be fully justified, that their capacities will be fully utilised, and that they will thus make a major contribution to the better nutrition of the Indian people in terms of animal protein.

(b) The improved feeding of draught animals will ensure more efficient farm operations, a higher standard of agriculture, and therefore more economic production of food and cash crops;

(c) The intensification of livestock production based in its turn on the production of high quality fodders and feeds in soil improving crop rotations in mixed farming systems will automatically ensure the overall raising of soil fertility;

(d) The serious erosion and excessive run off due to misuse of grazing lands will be greatly reduced, to the lasting benefit of all land use classes; and

(e) The introduction of economic incentives and returns based on better grassland management and fodder production will in the long run be an important contribution to India's cattle problem.

The Committee are, therefore, glad to note that it is proposed to provide an outlay of over Rs. 133 lakhs for the Institute in the Fourth Plan as per details given below:

Spill-over from the Third Plan to the Fourth Plan.	Rs.	24·98 lakhs
Revenue	Rs.	71·01 lakhs
Capital	Rs.	32·47 lakhs
Local Cost of Experts	Rs.	5·44 lakhs
TOTAL	Rs.	133·90 lakhs

The Committee have no doubt that Government would put their experience, gained in the Third Plan, to good use and would initiate timely action to ensure that the physical and financial targets set out in the next Plan are achieved in the early years of the Plan period.

SOIL CONSERVATION RESEARCH, DEMONSTRATION AND TRAINING CENTRES

CHAPTER IV.—INTRODUCTORY

26. Steps for control of erosion and conservation of soil had been taken on a very limited scale for a number of years in certain States like the Punjab (afforestation in the Sivalik Hills) and the erstwhile Bombay State (bunding and terracing work in the Deccan). The programme for soil conservation included in the First Five Year Plan, though small in comparison with the magnitude of the problem, marked the beginning of a country-wide effort to tackle it.

Soil conservation in its true sense is use of land according to its capability for maximum production consistent with building up soil fertility.

The fundamental bases that help to increase the agricultural production is the conservation of soil and water. These lie at the foundation of all improvement in agriculture in the country.

27. The problem of soil erosion exists all over the country and varies in extent and intensity with varying conditions of soil, climate, topography, vegetation and land use practices. Broadly speaking the problem of soil erosion can be classified as under:

(1) Problem of agricultural land,

(2) Problem of mountainous and submountainous regions,

(3) Problem of desert areas, and

(4) Problem of ravine areas.

In fact all the agricultural lands need some kind of soil conservation measures. The exact statistics regarding the nature and extent of erosion are not available. As a conservative estimate, it is felt that about 200 million acres of land, that is, almost a fourth of the country's land surface are in need of immediate protection by intensive soil conservation measures, e.g. agronomic, engineering and afforestation methods.

28. Effect of soil conservation measures on food production is considerable. Crop cutting experiments in the scarcity area of Maharashtra indicated that contour bunding increased food production by about 25 per cent. Another increase of about 25 per cent could be achieved by adoption of improved dry farming practices in bunded areas. Besides this, there will be more grass, healthier cattle, more milk and much less flood hazards.

Soil conservation is a people's programme. Soil conservation measures cannot be successful, unless the people are made conscious about the evils of soil erosion and benefits of soil conservation. As an aid to planning and work for the success of national programme for soil and water conservation and correct land use a continued programme of research is essential.

29. It was in the First Five Year Plan that need was recognised for taking up Soil Conservation Programme on a country-wide basis in a co-ordinated way covering survey, research, demonstration, training and extension.

A sum of about Rs. 1·6 crores was spent during the First Plan, largely for contour bunding and terracing of about 700,000 acres of agricultural lands, mostly in Maharashtra and Madras States.

30. In the Second Plan about Rs. 18 crores were spent on carrying out soil conservation works. Contour bunding and terracing made good progress and an area of 2 million acres was benefited. An integrated all-India Soil Conservation and Land Use Survey was also initiated. About 12 million acres were surveyed of which about 2 million acres were in the catchment area of river valley projects.

31. An outlay of about Rs. 72 crores has been provided for the execution of various soil conservation programmes during the Third Plan, and it is proposed to survey an area of over 15 million acres, most of which lies in the catchment areas of river valley projects.

CHAPTER V.—SOIL CONSERVATION BOARD

A. Constitution and Functions

32. A Central Soil Conservation Board was set up towards the end of 1953. The Board was charged with responsibility to initiate, organise and co-ordinate research in soil and water conservation, to train personnel, to assist States in carrying out soil conservation programmes and spread education. The main functions of the Board are as follows:

(i) to organise, co-ordinate and initiate research in soil conservation on various types of lands put to different kinds of land-use such as agriculture, forestry, grazing etc.;

(ii) to assist States and River Valley Projects in drawing up their schemes of Soil Conservation, in the enactment of legislation required for the purpose, and by tendering such technical advice as may be required from time to time;

(iii) to act as a clearing house of information on soil conservation and as storehouse of experience gained in various parts of the country. It will organise publicity and arouse public consciousness against misuse of land;

(iv) to arrange for the training of technical personnel of the upper as well as the lower grades required to implement soil conservation schemes;

(v) to provide such assistance as may be required in carrying out reconnaissance or detailed surveys in accordance with the standards laid down for the sake of uniformity throughout the country;

(vi) to recommend financial assistance for schemes of States and River Valley Projects on an approved basis. This would include research, demonstration and extension;

(vii) to co-ordinate inter-State Soil Conservation Projects; and

(viii) to undertake such cognate measures as are germane and relevant to the pursuance of the aims and objects of the Board.

The above functions are of advisory nature and actual execution of conservation work is carried out by the State Governments for which necessary technical and financial assistance is made available by the Central Government.

33. The Soil Conservation Board consists of the Union Deputy Minister of Agriculture (Chairman), Special Secretary to the Ministry of Food and Agriculture (Department of Agriculture) (Member), Secretary, Ministry of Irrigation and Power (Member), Agricultural Commissioner (Member), Inspector General of Forests (Member), Member, Water Irrigation, Central Water and Power Commission (Member), Deputy Financial Adviser (Member), Under Secretary, Ministry of Food and Agriculture (Secretary). Composition of the Board.

The Committee have been informed during evidence that the Chief Engineer, Flood Control would be appointed as Member in place of the Member, Waterways Irrigation. There will be three additional Members, viz., Joint Secretary (Agriculture) in the Planning Commision, the Soil Conservation Adviser, and the Deputy Secretary in charge of Soil Conservation.

34. It has been stated during evidence that the Soil Conservation Board meets only once a year. But an Advisory Committee under the Soil Conservation Board which is like an Executive Committee of the Board meets as and when necessary, at least two or three times a year. The composition of this Committee is as follows:

1. Special Secretary, Ministry of Food and Agriculture—Chairman
2. Agricultural Commissioner with the Government of India (I.C.A.R.)—Member
3. Inspector General of Forests (Ministry of Food and Agriculture)—Member
4. Soil Conservation Adviser (Ministry of Food and Agriculture)—Member
5. Director, Soil Conservation, Central Water and Power Commission—Member
6. Deputy Financial Adviser (Ministry of Food and Agriculture)—Member
7. Deputy Secretary (Incharge Soil Conservation)—(Ministry of Food and Agriculture)—Member
8. Under Secretary (Incharge Soil Conservation)—(Ministry of Food and Agriculture)—Member-Secretary.

The Committee are given to understand that the Soil Conservation Board has met only eight times since its inception in 1953. The last three meetings of the Soil Conservation Board were held on the following dates:

Meeting	Date
6th Meeting	21.7.1961
7th Meeting	4.3.1963
8th Meeting	5.2.1965

The Committee regret to note that the Central Soil Conservation Board, which is charged with the responsibility to initiate, organise and co-ordinate research in soil and water conservation, has not been meeting more frequently. The Committee recommend that if the Soil Conservation Board is to discharge its duty more effectively, it should meet regularly at least once a year, if not twice.

B. Soil Conservation Organisations in States

35. It has been stated that the soil conservation consists of works in three disciplines i.e. agriculture, forestry and engineering which necessitates co-ordination at all levels. But there is not a single State in which integrated arrangement is functioning properly.

It has been further stated that three States viz., Maharashtra, Assam and Gujarat do not have a State Soil Conservation Board. Even where there are Boards, their functions vary from advisory and co-ordinating type to those of scrutiny and execution of schemes. Many States have also not enacted legislation on soil conservation.

The Committe recommend that the Soil Conservation Board should examine and formulate the pattern of Soil Conservation Organisation in States and persuade them to enact legislation on soil conservation expeditiously. The Committee feel that this would accelerate the progress of soil conservation work in the States.

C. Progress in Soil Conservation Work

36. At the Seventh Meeting of the Soil Conservation Board held on the 4th March, 1963, the Minister of Agriculture observed *inter alia* as follows:

> "In the big river valley project areas, lack of proper watershed management has given rise to serious floods which cause great damage to soil and create sedimentation hazards to the dams. These problems require immediate attention.

It means that about 15.3 million acres of our watershed areas are in need of protection. In addition, considerable portions of our forests and grazing lands of villages, which are also vital adjuncts of a sound agriculture are in a bad shape."

"From a review of the progress made in the Second Plan and the rate of progress so far made in the Third Plan, it is evident that concentrated efforts are needed if we are to achieve the targets laid down in the Third Plan. The slow progress may be attributed to the newness of the programme, inadequacy of preparation of the people and the deficiencies in organisational set-up both at the State-level and at the Centre, and also the co-ordination of this programme with other agencies like Extension Service, Revenue Department, etc. The Third Plan targets themselves will hardly be able to touch more than two per cent of our problem area, though as compared with the Second Plan, the budget provision and the targets have been increased four times in the case of outlays and five times in the case of targets."

"The life of the dams and capacity of the reservoirs of the river valley projects will greatly diminish owing to deposition of silt etc., if soil conservation and afforestation programmes are not taken up in the right earnest. The reports that have so far received do not indicate satisfactory progress in the work except at Bhakra Nangal and Muchkund."

The Committee believe that though the actual execution of soil conservation work is carried out by the State Governments, the Soil Conservation Board can render considerable help by assisting States and River Valley Projects in drawing up their soil conservation schemes, reviewing them periodically and co-ordinating Inter-State Soil Conservation Projects. The Committee feel that the constantly changing conditions and increasing complexity of soil and water problems demand closest co-ordination between the Soil Conservation Board and the State Governments which are respectively responsible for formulating and carrying out the soil conservation programmes.

CHAPTER VI—SOIL CONSERVATION RESEARCH, DEMONSTRATION AND TRAINING CENTRES

A. Functions

37. With the setting up of the Soil Conservation Board, nine Regional Centres were established to deal with the problems of soil conservation. The functions of each of the nine Soil Conservation Research, Demonstration and Training Centres are given below:

(a) The Soil Conservation Research, Demonstration and Training Centre, Dehra Dun, (U.P.) was set up in September, 1954 with the following functions:—

(i) To carry out research in the soil conservation problems of the Himalayan Districts, by collecting and analysing data on soils, land use, rainfall, run off, soil wash under different conditions and effectiveness of various types of vegetative cover in arresting soil erosion.

(ii) To evolve methods for control of erosion, reclamation of chos and stabilization of land slides.

(iii) To evolve soil conservation practices suitable to the region and to demonstrate them to the cultivators of neighbouring areas.

(iv) To impart training in soil and water conservation.

(b) The Soil Conservation Research Demonstration and Training Centre, Kota (Rajasthan) was set up in September, 1954 with the following functions:

(i) To undertake soil survey of the ravine areas with a view to classify them and determine the rate of transformation of different land types into ravines;

(ii) To study suitable species of trees, shrubs, grasses and lagumes for stabilizing gullies, bunds etc.;

(iii) To study the engineering aspects of gully control and terracing e.g. levelling, designs for diversion ditches and spillways, construction of various types of bunds etc.;

(iv) To work out suitable types of crop husbandry to control erosion and run-off in the cultivable areas above the gully heads;

(v) To demonstrate the usefulness of soil conservation measures in checking advancement of gullies in ravine lands; and

(vi) To impart specialized training in Soil Conservation of the ravine areas.

(c) The Soil Conservation Research Demonstration and Training Centre, Bellary (Mysore) was set up in October, 1954, with the following functions:

(i) To undertake research on soil conservation problems of the region by collecting and analysing data on climate, soil and plant in relation to run-off and erosion losses.

(ii) To evolve suitable agronomic and mechanical measures for effective conservation of soil and moisture by field experimentation and demonstrating the efficacy of soil conservation methods to the farmers;.

(iii) To investigate the physical and micro-biological aspects of black soil with a view to increase the structural stability and moisture retentive capacities;

(iv) To impart specialised training in soil conservation of the black soil region.

(d) The Soil Conservation Research Demonstration and Training Centre, Ootacamund (Madras) was set up in October, 1954 with the following functions:

(i) To conduct research on the soil conservation problems of the region by collecting and analysing hydrological data and data on soil rainfall and effects of different vegetative covers in relation to run-off and soil losses.

(ii) To evolve suitable soil conservation techniques for the development of pasture, forests and

cultivated crops under varying soil-slope conditions and to work out the economics of measures.

(iii) To demonstrate the most effective systems of hill-land management for different land-use capability classes in the Nilgiris region; and

(iv) To impart training in soil and water conservation.

(e) The Soil Conservation Research Demonstration and Training Centre, Vasad (Gujarat) was set up in May, 1955, with the following functions:

(i) To undertake soil surveys of the ravine areas with a view to classify them and determine the rate of transformation of different land types into ravines;

(ii) To study suitable species of trees, shrubs, grasses and legumes for stabilizing gullies, bunds etc.;

(iii) To study the engineering aspects of gully control and terracing e.g. levelling, designs for diversion ditches and spillways construction of various types of bunds etc.;

(iv) To work out suitable types of crop husbandry to control erosion and run-off in the cultivable areas above the gully-heads;

(v) To demonstrate specialised training in Soil Conservation of the ravine areas.

(vi) To impart specialised training in soil conservation of the ravine areas.

(f) The Soil Conservation Research Demonstration and Training Centre, Chatra (Nepal), was set up in June, 1957, with the following functions:

(i) Engineering: To undertake contour terracing with spillways, contour trenching, blasting of boulders in beds where they obstruct easy flows of water, revetments including cement grouting of hardy trees on beds of streamlets and gullies.

(ii) Forestry: To undertake the work of establishing grass waterways, turfing of steep slopes, afforestation along contour trenches and planting of hardy trees on beds of streamlets and gullies;

(iii) Agronomy: To study suitable species of trees, shrubs, grasses and legumes for stabilising gullies etc. and to work out suitable types of crop-husbandry to control erosion.

(iv) To demonstrate the usefulness of soil conservation measures to deal with the problems prevailing there.

(v) To impart specialised training in soil conservation of the Kosi catchment area.

(g) The Soil Conservation Research Demonstration and Training Centre, Agra (U.P.) was set up in 1957 with the following functions:

(i) To undertake soil surveys of the ravine areas with a view to classify them and determine the rate of transformation of different land types into ravines;

(ii) To study suitable species of trees, shrubs, grasses and legumes for stabilizing gullies bunds etc.;

(iii) To study the engineering aspects of gully control and terracing e.g. levelling, designs for diversion ditches and spillways construction of various types of bunds etc.;

(iv) To work out suitable types of crops husbandry to control erosion and run-off in the cultivable areas above the gully heads; and

(v) To demonstrate the usefulness of soil conservation measures in checking advancements of gullies in ravine lands.

(h) The Soil Conservation Research, Demonstration and Training Centre, Chandigarh (Punjab) was set up in October, 1957 with the following functions:

(i) To carry out research on the soil conservation problems of the Siwaliks of the Western Himalayan districts, by collecting and analysing data on soils, land use, rainfall, run-off, soil wash under different conditions and effectiveness of various types of vegetative cover in arresting soil erosion.

(ii) To evolve methods for control of erosion, reclamation of chos and stabilization of land slides; and

(iii) To evolve soil conservation practices suitable to the region and demonstrate them to cultivators of neighbouring areas.

(i) The Soil Conservation Research, Demonstration and Training Centre, Ibrahimpatan (Andhra Pradesh) was started in October, 1962 with the following functions:

(i) To undertake studies on nature and classification of red soils in relation to soil erosion, soil fertility, run-off and soil losses on a sub-water-shed basis;

(ii) To undertake trial of different varieties of crops, cultivation, manuring and rotation including strip cropping and mixed cropping etc.;

(iii) To undertake studies on afforestation, of denuded hills and eroded lands with indigenous and exotic species and to find suitable species and correct techniques for the region development of fuel, fodder reserves and pasture lands.

(iv) To undertake studies on constructions of earthern dams with proper spillway devices and farm-ponds; evolving suitable techniques for irrigating hilly areas and utilisation of hills stream; reclamation of gullies by boulders check-dams, brush wood, logs and bamboos etc.

38. When asked to indicate which of the above Centres deals with the soil conservation problems relating to Assam, West Bengal, Orissa, Madhya Pradesh and Maharashtra, as in these States no research centre of the Central Government exists, the representative of the Ministry has stated as follows:

State	Where dealt with
Assam. . .	The research carried out at Ootacamund on the hill erosion control and the research carried out at Dehra Dun and Chatra are applicable to Assam.
West Bengal	Though the Central Government had not set up any Centre, the D.V.C. has set up a Soil Conservation Centre at Hazaribagh for dealing with the problems of Soil Conservation in West Bengal and Bihar.

State	Where dealt with
Orissa	The State has a Soil Conservation Centre of their own at Udayagiri.
Madhya Pradesh	The problems relating to ravines are being dealt with at the Soil Conservation Research, Demonstration and Training Centres, Kotah, Vasad and Agra. As regards the problems of black soils, this is being dealt with at the Soil Conservation Research, Demonstration and Training Centre, Bellary.
Maharashtra	The problems relating to black soils are being dealt with at the Soil Conservation Research, Demonstration and Training Centre, Bellary. Besides, the State Government have their own research Centre at Sholapur to deal with the contour bunding and terracing etc.

The Committee have been informed during evidence that the Central Government have suggested the establishment of one sub-station each in Manipur and Tripura to take care of that region. There has been a proposal to start a Centre in Orissa to deal with the red soil under heavy rainfall but it has been deferred and will be taken up later on.

The Committee would suggest that while selecting sites to set up new Soil Conservation Research, Demonstration and Training Centres or regional stations of the existing Centres, preference should be given to those States which have at present none, of their own or of the Central Government. The Committee would further urge that as State Governments are the proper authorities to execute the soil and water conservation programmes, Central Government should persuade such of the States as have no soil conservation research centre to set up their own centres to carry out research on regional problems and demonstrate the results to the farmers.

B. **Achievements of the Centres as regards research**

39. It has been stated that the research schemes of the Soil Conservation Research, Demonstration and Training

Centres have been able to give specific information on:—

(i) Different methods of mechanical measures such as bunds, terraces, trenches, etc.

(ii) Different methods to reclaim the ravines through gully plugging, afforestation etc., different types of design for gully plugs, such as brushwood check dams, masonry and boulder dams, different species suitable for afforestation purposes.

(iii) Different grasses and clovers for using in soil conservation and pasture developments; and

(iv) Different cropping patterns to deal with soil erosion and water loss.

The salient achievements of all the Soil Conservation Research Demonstration and Training Centres are given in Appendix III.

C. **Achievement Audit Committee**

40. The Government of India constituted in 1961 the Achievement Audit Committee to review the work of the Soil Conservation Research, Demonstration and Training Centres at Dehra Dun, Kota, Bellary, Ootacamund which have been in existence for more than five years as well as the centres at Chatra (Nepal), Vasad, Agra and Chandigarh, as a special case, as those had not completed five years of their existence in 1961. Accordingly, the Achievement Audit Committee reviewed the progress and achievement in research, demonstration and training at each of the above centres except Agra and Chandigarh and suggested future programme of research and co-ordination for these centres.

Following are the main recommendations of the Achievement Audit Committee and action taken thereon by Government:

Recommendation	Action taken
(i) Modifications in the technical programme of research work.	Accepted.
(ii) Strengthening of staff of the Centres at Dehra Dun and Bellary.	Some posts have been sanctioned.

Recommendation	Action taken
(iii) Expansion of the demonstration activities in respect of the Centre at Dehra Dun by taking up work on two new experimental watersheds (One near Rajpur and the other in the Sivaliks), apart from improving the entire watershed near Kalsi in collaboration with the State Departments concerned.	Two work-sites (i) near Nalota Nala-land-slip about 10 miles from Dehra Dun on Dehra Dun-Mussorie road, and (ii) near Motidhara at a height of about 6000 feet in Mussorie hills have been selected. Work on the first is in progress and the detailed survey on the second is in progress. Development on the watershed at Kalsi has not been taken up.
(iv) Inclusion of additional members in the Regional Committee for Himalayan Region.	Accepted.
(v) Exploring the possibility of transferring the Centre at Chatra to the Kosi Project Administration, Government of Bihar.	The recommendation relating to the transfer of the Centre at Chatra, to the Government of Bihar was discussed with the State Government but the latter did not agree.
(vi) Promotion of extension work at Dehra Dun Centre.	Not accetped.

The Committee welcome the appointment of Achievement Audit Committee which was set up in 1961 *to review the work of the Soil Conservation Research, Demonstration and Training Centres. The Committee suggest that the next Achievement Audit Committee may also review the activities of the Centres at Agra and Chandigarh which have been in existence for more than seven years and which were not examined by the previous Achievement Audit Committee. The Committee would further recommend that performance reviews of all the Soil Conservation Research, Demonstration and Training Centres should be made on a regular basis coinciding as far as possible with the Five Year Plan periods.*

D. Plan Allocation and Expenditure

41. The total Plan outlay during the Third Five Year Plan for all the Soil Conservation Research, Demonstration and Training Centres was Rs. 50 lakhs. The Centre-wise break-up of the Plan allocation has not been made. Follow-

ing is the expenditure incurred upto 1963-64 and proposed to be incurred during the remaining two years of the Plan:

(Rupees in lakhs)

	Expenditure incurred upto 1963-64	Expenditure to be incurred in last two years of the Plan	Total
1. Soil Conservation Research, Demonstration and Training Centre, Dehra Dun.	0·78	5·50	6·28
2. Sil Conservation, Research, Demonstration and Training Centre, Kota.	0·22	1·35	1·57
3. Soil Conservation Research, Demonstration and Training Centre, Bellary.	0·21	1·35	1·56
4. Soil Conservation Research, Demonstration and Training Centre, Ootacamund.	0·69	1·35	2·04
5. Soil Conservation Research, Demonstration and Training Centre, Vasad (entire non-Plan expenditure).			
6. Soil Conservation Research, Demonstration and Training Centre, Chatra (till 1963-64 no Plan expenditure).		4·50	4·50
7. Soil Conservation Research, Demonstration and Training Centre, Agra (entire non-Plan expenditure)		0·25	0·25
8. Soil Conservation Research, Demonstration and Training Centre, Chandigarh (till 1964-65 no Plan-expenditure).			
9. Soil Conservation Research, Demonstration and Training Centre, Ibrahimpatan	0·92	2·81	3·73
	2·82	17·11	19·93

It has been stated that the Plan provision at the Soil Conservation Research Demonstration and Training Centres is mainly on account of subsidy payable to the State Governments in respect of the trainees deputed by them for training in soil conservation. It has also been explained that saving was mainly due to lesser number of trainees deputed by the State Governments than anticipated.

The Committee are distressed to find that only Rs. 2·82 lakhs have been utilised during the first three years and another Rs. 17·11 lakhs are expected to be utilised during the last two years of the Third Plan period out of the total allocation of Rs. 50 lakhs made in respect of all the Soil Conservation Research, Demonstration and Training Centres. The Committee need hardly emphasise that the growth and prosperity of the country depends mainly on its ability to maintain and increase the productivity of its soil for which intensive research is a necessity. The Committee cannot too strongly stress the need for proper phasing and expeditious finalisation of schemes to ensure that the objectives underlying the Plan provision are achieved.

The Committee note that training facilities in most of the Soil Conservation Research, Demonstration and Training Centres are not being put to full use for want of adequate number of nominations by the State Governments. The Committee would, therefore, suggest that the programme should, from the very beginning, be drawn up on a realistic basis in consultation with the State Governments.

E. Training

42. Out of the nine Soil Conservation Research Demonstration and Training Centres, the Centres at Dehra Dun, Kotah, Bellary and Ootacamund impart training to officers and assistants engaged in the soil conservation programmes of the States.

43. At the Soil Conservation Research Demonstration and Training Centre, Dehra Dun, training is imparted to the Gazetted Officers of the State Governments. Prior to 1st September, 1962, the duration of the course was 9 months and only one course was held in a year. Since 1st September, 1962, the duration of the course has been reduced (on the recommendations of the Achievement Audit Committee) to 5½ months and two sessions are held every year one from 1st April to 14th September and the second from 15th September to 14th February. Dehra Dun Centre.

The Centre has a capacity of 30 trainees for each session. Number of Officers trained during the last three

years in each Session is as under:—

Period of session	No. of officers trained
Nine months session	
1-6-61 to 31-5-62 . .	36
Five months sessions	
1-9-62 to 15-2-63	38
1-4-63 to 14-9-63	32
15-9-63 to 14-2-64	35
1-4-64 to 14-9-64	30
15-9-64 to 14-2-65	26
TOTAL	197

44. Besides the above course, Refresher Special Courses of 3 months duration for Extension and Block Development Officers of the State Governments were also conducted at the Soil Conservation Research, Demonstration and Training Centre, Dehra Dun upto September, 1962 when this was discontinued. 18 officers were trained at this Refresher Courses conducted at Dehra Dun.

45. In April, 1961, a Trainers Training Course for a period of one month was conducted at the Soil Conservation Research, Demonstration and Training Centre, Dehra Dun. 14 officers were trained in this course. In June, 1962, a fifteen days Refresher Course in Soil and Water Conservation was arranged, on behalf of the Indian Council of Agricultural Research for the benefit of agricultural teachers. Eleven teachers from the States attended this course.

Other Centres.

46. At the Soil Conservation Research, Demonstration and Training Centres, Kotah, Bellary and Ootacamund, training is being imparted for non-Gazetted assistants of the State Governments. Training is also being conducted at the DVC, Hazaribagh on behalf of the Ministry of Food and Agriculture (Department of Agriculture).

Two sessions of six months duration are being held each year—one session from 16th February to 14th August and the second from 16th August to 15th February at each of these Centres.

Each of the above three Centres has a capacity of 30 trainees for each session. The number of Assistants trained during the last three years is as follows:—

Period of Session	Total capacity	No. of Assistants trained	
16-2-61 to 14-8-61	120	97	
16-8-61 to 15-2-62	120	147	
16-2-62 to 14-8-62	120	92	
16-8-62 to 15-2-63	120	100	
16-2-63 to 14-8-63	120	108	
16-8-63 to 15-2-64	120	121	
16-2-64 to 14-8-64	120	122	
17-8-64 to 15-2-65	120	107	(under training)
TOTAL		894	

It has been stated that the shortfall in the number of candidates was due to non-deputation of candidates against the seats allotted to State Governments on the basis of their own requirements.

Proposal to train Assistants at Dehra Dun.

47. In September, 1960, the Government of Maharashtra had suggested that a training course of non-gazetted assistants may be started at Dehra Dun. It has been stated that efforts were made to start a training Centre at Dehra Dun for Assistants but the same had to be dropped for want of accommodation. As a matter of policy, it has been decided that State Governments should undertake the training of non-Gazetted staff, themselves. State Governments have already been informed about this.

Proposal to train Officers at Ootacamund.

48. At its meeting held on the 15th February, 1965, the Central Soil Conservation Board recommended that immediate steps should be taken to set-up an additional training centre for officers at the Soil Conservation Research, Demonstration Training Centre, Ootacamund with a view to train a greater number of personnel required for the implementation of soil conservation programmes in the Fourth Plan period.

Third Plan Requirements of trained personnel.

49. The total requirement of the States for the Third Plan is stated to be 228 officers and 1520 assistants. Till February, 1965 the Soil Conservation Research, Demonstration and Training Centres have been able to train about 197 officers and 894 assistants.

In view of the considerable deficiency in the number of trained assistants in the soil conservation work, the Committee cannot appreciate the decision of Government not to start training course for assistants at the Dehra Dun Centre. The Committee would urge that serious consideration should be given for training of assistants in soil conservation work on a priority basis at various Centres to meet the growing demands of the trained personnel.

F. Follow-up Action of Trainees

50. The Study Group of the Estimates Committee which visited the Soil Conservation Research, Demonstration and Training Centre, Dehra Dun in October, 1964 were informed that there were occasions where the trainees after completion of training were put on different work.

The Committee have been informed that in the beginning, "it was found that in some cases, officers and assistants trained in soil conservation were posted on jobs not directly connected with soil conservation. With a view to ensuring that their services are utilized for soil conservation work, the grant of Central financial assistance has been made subject to the production of a certificate from the State Governments to the effect that trainees have been employed on soil conservation work thereafter."

The Committee are surprised that when admittedly there is greater demand for trained personnel in soil conservation work, some of the State nominees, after completion of training, have been put on jobs not connected with the soil conservation work. The Committee need hardly stress that States should be impressed upon to depute only those persons whose services could be utilised in their soil conservation programmes, after completion of training.

G. Qualification of trainees

51. It has been stated that "the candidates deputed by States come from different disciplines such as Agriculture, Agricultural Engineering and Forestry. This creates certain amount of difficulty in getting these people trained in overall soil conservation aspect and bringing them up to the same level."

The Achievement Audit Committee observed as follows in respect of the trainees at the Soil Conservation Research, Demonstration and Training Centre, Ootacamund:

> "Regarding selection of trainees for the six-months Assistants course, it was suggested that as far as Forestry Department is concerned, pure matriculates or promoted Foresters should not be selected and deputed for training."

The Study Group of the Estimates Committee which visited the Centre at Dehra Dun in October, 1964 had found that the trainees deputed by the States were of different categories and status such as Deputy Collectors, Revenue Officers, Block Development Officers etc. The impression of the Study Group was that some of the officers had not the requisite qualification in agriculture, forestry or engineering. The Committee have been informed during evidence that "it is a mistake if persons without the requisite technical qualification have been admitted. It is a technical course and they cannot follow up."

The Committee suggest that the States should be advised to depute trainees having requisite qualifications and actually connected with the soil conservation work. As the State nominees are sent from different categories and with different levels of experience in soil conservation, the Committee recommend that every effort should be made to make the training sound and rational both from theoretical as well as practical point of view. The Committee suggest that the present syllabus may be reviewed so as to give more emphasis on practical field training.

H. Hostel Facilities

52. The Achievement Audit Committee which reviewed the work of the Soil Conservation Research, Demonstration and Training Centre Dehra Dun in 1961 observed as follows:—

> "Although the station is an important training centre for soil conservation officers deputed from the States all over India it has to manage with inadequate and dispersed accommodation of a makeshift and patch work character. Its officers are located in two different buildings and the classes are being held in class rooms borrowed from the local Rangers' Course School whenever the class rooms are vacant. The hostel is accommodated in another building which perhaps is sufficient to accommodate

the present number of trainees. When the Government is spending considerable amount of money on each trainee and when we are earnest about the necessity of training more and more of soil conservationists it is felt that the training centre should be properly housed on one site and facilities of hostel, laboratories, lecture rooms and transport etc. provided which are lacking at present."

* * * * *

"In the Ootacamund Centre, as the hostel accommodation is not adequate for a large number of trainees, the total working hours have been reduced from six to five hours. This has to be set right."

The Study Group of the Estimates Committee which visited the Soil Conservation Research, Demonstration and Training Centre, Dehra Dun in October, 1964 noted that there was lack of building facilities for laboratory and hostel accommodation which has hampered the efficiency of research work being carried at the Centre.

The Committee recommend that Soil Conservation Research, Demonstration and Training Centres should be properly housed and facilities of hostel, laboratories and lecture rooms should be provided urgently at these centres, if not already done.

I. Seminars

53. The Soil Conservation Board held only two seminars first in 1956 and the second in 1958. The Committee have been informed that the Indian Society of Soil Conservation, which is a private body, holds annual meetings as a regular feature. For financial reasons, the Society could not hold any meeting in 1963. A joint seminar, financed by the Ministry of Food and Agriculture, was arranged by that Society at Naini Agricultural Research Institute in 1964 and it was attended by the members of the Central and State Governments.

Regional Conferences.

54. The Committee have been further informed that the Soil Conservation Adviser has held several seminars of research workers and Soil Conservation Officers of States and Central Soil Conservation Research Centres in different regions practically throughout the year.

Following Regional Conferences were held during 1963 and 1964:—

Name of the Committee	Place	Date
1. Regional Co-ordination Committee for Ravine Regions.	Kota Junction	28th and 29th January, 1963.
2. Regional Co-ordination Committee for Himalayan Region.	Dehra Dun	2nd and 3rd April, 1964
3. Regional Coordination Committee for Southern Hilly Region.	Ootacamund	10th & 12th April, 1964
4. Regional Coordination Committee for Black Soil Region.	Bangalore	20th and 21st April, 1964
5. Regional Coordination Committee for Ravine Regions.	Vasad	18th and 19th September, 1964

The Committee welcome the regular meetings of the different Regional Coordination Committees, as these serve the useful purpose of coordinating the work carried out at the Central Government's Soil Conservation Research, Demonstration and Training Centres and the research on local problems of soil conservation done by the States. The Committee would suggest that Government should actively consider the holding of Seminars on Soil Conservation on a regular basis and by rotation at different places.

J. Annual Reports

55. The Study Group of the Estimates Committee which visited the Soil Conservation Research, Demonstration and Training Centre, Dehra Dun in October, 1964 was informed that the Centre had just brought out the Annual Report for 1961-62 and the Annual Reports for 1962-63 and for 1963-64 were under preparation. The reason for delay in publishing the Annual Reports was stated to be due to the non-availability of statistic assistance.

The Committee recommend that Annual Reports of all the Soil Conservation Research, Demonstration and Training Centres should be regularly published in time and supplied to the State Governments to keep them informed about the work that is being done by these Centres.

NEW DELHI;
April 11, 1965.
Chaitra 21, 1887 (*Saka*).

ARUN CHANDRA GUHA,
Chairman,
Estimates Committee.

APPENDIX I

(*Vide* Para 12 of the Report)

Statement showing the plant materials multiplied, the total and per hectare yields together with its distribution

Name of the Crop	Area in Hectares	Total yield in Kg.	Yield per Hectare in Kg.	Remarks
1. M. P. Chari	1·25	1402	1113·6	800 Kg. has been supplied to U.P. State. The balance will be used for further seed multiplication and experiment purposes.
2. Russian Giant Variety of Cowpeas	1·45	937	646·2	750 Kg. has been supplied to U.P. State. The balance will be used for further seed multiplication and experimental purposes.
3. Pusa Giant Napier	0·41			The material is to be used for further mutliplication & experimental purposes.
4. Napier I (Pusa selection).	0·94			Do.
5. Napier II (Pusa selection).	0·94			Do.
6. Hybrid Napier—Poona	0·83	..		Do.
7. Hybrid Napier—Coimbatore	0·20			Do.
8. Sehima nervosum	0·41	11	27	This is still in establishment stage.
9. Chrysopogon Montanus	0·41	8	20	Do.
10. Atylosia Scarabaeoides.	0·21	91	433·3	This will be used for experimental work.

Name of the Crop	Area in Hectares	Total yield in Kg.	Yield per Hectare in Kg.	Remarks
11. Phaseolus aurens .	0·20	42	210·0	This will be used for experimental work.
12. Berseem	2·05	781 (Seed) 24252 (Green fodder)	386·6 118·30	24252 Kg. of green berseem was sold to Bharari Farm. The seed will be supplied to State Governments for multiplication.
13. Lucerne	0·41	13	32·0	This will be used for further multiplication.
14. Hubam Clover	0·41	89	219·5	This will be used for experimental work.
15. Vicia Sativa .	0·20	17	85·0	Do.
16. Peas .	0·20	35	175·0	Do.
17. Oats	1·21	933	771·0	This will be supplied to State Governments.

APPENDIX II

(*Vide* Para 16 of the Report)

Proposed Project for United Nations Special Fund—India

Grassl and Fodder Development in India

SUMMARY

The Government of India plan to initiate an intensive programme of grassland and fodder development in the major regions of dairy production and other types of economic animal husbandry in the country. As the administrative and organisational basis for this development programme, it is proposed to utilise the Indian Grassland & Fodder Research Institute which has been set up under the Third Five Year Plan.

This Institute with its five technical divisions and six sub-stations will be responsible for all research and development relating to major aspects of land use in India. Its programme of work cover the following aspects:—

(a) Apply existing knowledge and experience in pilot projects designed to promote and greatly to increase fodder production in dairy development areas and other types of economic livestock development;

(b) Advise on the technical aspects of development and extension projects of the Centre and the States;

(c) Provide training at the practical and research levels;

(d) Initiate and undertake fundamental and applied research on the grassland and fodder resources of India, especially on the many new problems which will arise from the pilot developmental projects indicated above; and

(e) Coordinate and render more effective existing research in progress at Central Institutes (Government of India) and State Research Stations.

Many Milk conservation projects have already been set up or are being erected or planned throughout India, with the financial and technical help of UNICEF/FAO and other international and bilateral agencies. It is now fully realised that the success, the full operation and economic production from these milk plants must depend in the final analysis on a great increase in the amounts of fresh or conserved feeds and fodders which may be made available for the feeding of

improved livestock. Any expenditure now on fodder development and at a latter date on the research which will be needed to support that development will pay a rich dividend on large investments being made in the dairy industry not only by Government of India but also by several U.N. and other agencies.

The overall economic advantages may be summarised as follows:—

(a) These activities will provide the secure fodder basis so essential for the full and efficient operation of dairy plants, ensuring that the expenditure on equipment in these plants shall be fully justified, that their capacities will be fully utilised, and that they will thus make a major contribution to the better nutrition of the Indian people in terms of animal protein.

(b) The improved feeding of draught of animals will ensure more efficient farm operations, a higher standard of agriculture, and therefore more economic production of food and cash crops;

(c) The intensification of livestock production based in its turn on the production of high quality fodders and feeds in soil improving crop rotations in mixed farming systems will automatically ensure the overall raising of soil fertility;

(d) The serious erosion and excessive run off due to misuse of grazing lands will be greatly reduced, to the lasting benefit of all land use classes; and

(e) The introduction of economic incentives and returns based on better grassland management and fodder production will in the long run be an important contribution to India's cattle problem.

The Indian Grassland & Fodder Research Institute has been established at Jhansi in Uttar Pradesh. Sub-stations are to be established in the main agricultural and animal husbandry regions of India as follows:—

Southern India,
North-eastern Paddy Region,
Western Grazing Region,
Central Deccan Region,
Western Region of Intensive Dairy Production,
Himalayan Region.

The scientific staff to be appointed to this Institute will be located not at the Centre in Jhansi but at the sub-stations from 1964-65 onwards for some four or five years. Their work at the sub-stations will be primarily devoted to the establishment of pilot projects of the

development nature in the agricultural areas around the major milk plants of the country.

The U.N. Special Fund is requested to provide 35 man-power years of expert services in the following subjects, with a parallel series of 10 man-powers of fellowships:

All these experts, apart from the Project Manager will also be posted to the sub-stations in order that they may take active part in the organisation and conduct of the pilot projects.

The assistance of short-term consultants is also required to advise on the overall policies and techniques adopted in the Institute and its sub-stations, and to take active part in the training programmes that will be such an important aspect of the Institute's activities.

Assistance from U.N. Special Fund is also required with regard to imported equipment.

The Government of India will provide land and buildings for the main Institute and the sub-stations, adequate technical, administrative and field personnel and various types of equipment and stores available in India.

The two proposed budgets are summarised as follows :—

(I) *GOVERNMENT CONTRIBUTION*	*Rupees*	*U.S Dollars*
A. *Capital*		
Land and land development	322,000	68,510
Buildings	4,195,645	892,690
Laboratory equipment	624,000	132,766
Field equipment	510,000	108,512
Vehicles	218,000	46,383
TOTAL	5,869,645	1,248,861
B. *Establishment* : TOTAL	6,678,000	1,420,851

C. *Operational Costs*

	Rupees	*US Dollars*
Library	115,000	24,466
Stores	623,500	132,660
Maintenance of vehicles etc.	200,500	42,650
Livestock	215,000	45,745

Labour	963,000	204,894
Contingencies	48,000	10,213
TOTAL	2,165,000	829,094
TOTALS of A+B+C=	14,718,645	3,130,340
. *Local Facilities* :		
(15% cost of experts)	544,000	115,695
GRAND TOTAL	15,256,645	3,246,035

(II) *U. N. SPECIAL FUND*:

Experts including consultants	771,300
Fellowships	50,000
Field equipment	50,000
Transport	35,640
Laboratory equipment	125,000
Supplies	38,000
Miscellaneous	43,800
	1,113,740

The total contribution of Government of India for the period November, 1962 to 1969 will be rupees to the equivalent of U.S. $ 3,246,035. The contribution requested from U.N. Spl. Fund is U.S. $ 1,113,740. The period of Government of India contribution has been taken as 1962 to 1969. The possible period of U.S. Special Fund Project has, for purposes of phasing and planning, been assumed to be 1965 to 1969.

APPENDIX III

(*Vide* Para 39)

Salient Achievements of Soil Conservation Research, Demonstration & Training Centres

Sl. No.	Name of the experiment	Results achieved
1	2	3
	(a) Soil Conservation Research, Demonstration and Training Centre, Vasad.	
1	To evolve a standard method of topographical survey for use in Soil Conservation Planning in the Ravine lands of Gujarat.	A method using the plane table and telescopic alidaide has been found to be very suitable.
2	Contour Vs. Up and Down cultivation of Bajri.	Contour cultivation gave higher yield of bajri (363 Kgm/Ha) than up and down cultivation. Grain— *a.* 363 Kgm/Ha. *b.* 269 Kgm/Ha. Fodder— *a.* 403 Kgm/Ha. *b.* 3379 Kgm/Ha.
3	Cover cropping of the land during intense rains as a soil conservation measure followwed by EPC. cash crop of bidi tobacco during the last stages of monsoon.	All the four legumanious crops (Sanhemp, Kulthi, Guar, Dhaincha) besides providing a good canopy and vegetative cover, increased the yield of bidi tobacco, sanhemp giving the maximum response.
4	To study the response of bidi tobacco to different forms of Nitrogen. 80 Lbs. N. per acre in combination with cover cum green manuring corp of sanhemp.	Both sulphate of ammonia and amonium sulphate nitrate gave significantly higher yield of good quality tobacco than Ammonium chloride.

1	2	3
5	To study the response of bidi tobacco to different dozes of nitrogen in the form of sulphate of ammonia supplemented by sanhemp green manuring.	All the additional dozes of 60, 80, 100 kgm. N. per hectare gave significantly more yield of bidi tobacco than green manure alone, but among themselves they did not differ significantly.
6	To study the response of cotton to different dozes of N. when sanhemp is grown as cover cum green manure crop in between cotton rows.	Additional dozes of 20, 40, 60 lbs. N. per acre did not increase the yield of seed cotton significantly as compared with green manuring alone.
7	Studies on stabilisation of gully heads and side slopes.	Easing of gully heads from the top is not suitable as it means encroachments into the table lands. It is better to fill the cave and the gully bottom to a certain height and establish vegetal cover. Run-off from the top is diverted by a peripheral bund. The filled in soil is sloped to 1 : 1 slope and *Dicanthium annulatum* is established.
8	Studies on gully plugging as a means of water conservation.	Brush wood dams were rendered useless due to white ant attach as well as rotting. Live hedge was also not very effective in the first two years. Sand bag dams were very costly and did not last even for one monsoon due to rotting and termite attack. All the earthern dams excepting a few functioned very well. If gully rims are protacted witl contour and peripheral bunds on the top earthern dams with grass land ramps are cheaper to considerably effective.

1	2	3
9	Grasses and legumes for stablization of structures.	*D. Annulatum* proved to be the best to stabilize and protect the terrace faces and to yeild nutritious green fodder.
10	To study the root development of different grasses with a view to assess their capacity to stabilize bunds.	Results so far achieved *D. annulatum* and *P. antidotale* proved to be the best soil binders due to their strong and extensive root system.
11	Studies on reclamation of shallow and medium gullies.	All the check dams were very effective and the terraces too gave good performance.

(*b*) *Soil Conservation Research Demonstration and Training Centre, Bellary*

	CULTURAL EXPERIMENTS :	
1	Introduction of crops	(*i*) None of the kharif crops are successful. (*ii*) Jowar M 35-1, M-47-3 are better than the local H-1 ; (*iii*) Cotton PRS 72 appears better than local Western -1 ; (*iv*) Safflower could be profitably introduced particularly in saline and alkaline patches where jowar and cotton fail. (*v*) Wheat is a failure in this tract.
2	Contour strip cropping	Contour strip cropping could not be successfully introduced because of uncertainty in kharif rains. This experiment was replaced subsequently by buffer strip cropping.

1	2	3
3	Spacing trials and inter-cropping studies.	(*i*) A 36'' row with 12'' between plants appears the best spacing for cotton. With this spacing an inter-crop of Bengalgram can be suceessfully taken.
		(*ii*) Also for jowar, a 36'' row spacing appears best. However, due to shading effect of the jowar crop no inter-crop appears possible.
4	Up and down *vs* contour cultination.	Contour cultivation increased yield by 15% over up and down method.
SOIL AGGREGATION STUDIES :		
5	Spartin Experiment.	No economic response to application of spartin in local black soils.
6	Long term Farm Yard manure experiment.	Application of F.Y.M. @ 2000/lb. /acre/year has neither produced higher yield nor improvement in soil aggregation.
MANURES AND FERTILIZERS :		
7	Micro-nutrient studies .	There was no response to micro-nutrients either as foliar application or application in soil.
MOISTURE CONSERVATION :		
8	Bunding .	(*i*) Contour bunds with no outlets are useless in this area for they lead to water stagnation and loss of 15% of the land for cropping. (*ii*) Broaching has not been a problem. (*iii*) Graded bunds and graded channel terraces are under study.
9	Moisture Conservation Study.	(*i*) Of the various treatments, tries, *viz.*, Bund-former bunds,

1	2	3
		corrugations, single listing, double listing and Tied ridge only the bund-former bunds resulted in higher yields over control.
10	Run-off plots . .	(*i*) No constant data has been obtained. (*ii*) The relationship between soil loss and slope is as follows : Erosion-(Slope).
SOILS AND LABORATORY :		
11	Saline lands of Tungabhadra Irrigation Project Area.	(*i*) These soils can easily be reclaimed by leaching. Their gypsum requirement is low. (*ii*) In certain area the boron content is high and additional leachings are required. (*iii*) Demonstration plots laid out in collaboration with Mr. George, C. Knierum, T.C.M. Expert on Irrigation. In the very first season, an yield of 2400 lb. of paddy recorded.
12	Effectiveness of Top dressed Superphosphate for rice.	(*i*) Admittedly the best way to apply superphosphate to a rice crop is in the puddle or earlier. (*ii*) If this is missed, economic response appears possible by top dressing even upto 30 days after planting.
13	Split application of Nitrogen in Rice.	(*i*) Half dose of N. in puddle & the other half 6-7 weeks after planting gives best results in the heavy clay soils. (*ii*) The activity of leaf in the indicas is much shorter than Japanicas after flower initiation.

1	2	3
14	Growth and uptake of Nutrients in Jowar and Rice.	(*i*) The growth and uptake of nutrients give a series of straight lines on a semi-log scale ; (*ii*) The grant period of growth for Jowar starts at about 40 days after sowing and last till the 90th day.
15	Miscellaneous :	
	(*i*) Reduction of Hydrocyanic Acid content of immature jowar	(*i*) By chopping the jowar straw and moistening. the Hydrocyanic acid content can be reduced to a non-toxic level overnight.
	(*ii*) Assam coal for relcamation of Alkali soil.	(*i*) Found not useful.

(*c*). *Soil Conservation Research, Demonstration and Training Centre, Kota.*

1	Investigations on manuring of jowar under rainfed conditions.	The results achieved show that by application of farm yard manure to jowar crop under rainfed conditions increases the yield from 98 kgs/acre with no manure to 258·56 kgs/acre with 80 lbs. Nitrogen applied in the form of F.Y.M. This resulted in a net profit of Rs. 40·84 over without application of manure.
2	Growing of legumes and cereal mixture under dry-farming conditions.	The results indicate that : 1. the mixture of cereal and legumes (wheat plus gram) raised from row to row gave higher yield as compared to when cereal and legumes were grown pure (separately) in normal years. The average of five years' results showed that the yield of wheat and gram when grown pure was 314·64 and

1	2	3
		315·20 kg/hectare respectively as compared to 445·70 kg/ hectare (238·00 and 207·70 of gram and wheat respectively) when grown in mixture. 2. In the years of severe drought growing cereal plus legumes mixture is insurance against total failure. 3. Growing of cereal and legume mixture under dry-farming conditions is more profitable and gave highest net returns 4. Legumes leave the soil richer in Nitrogen as compared to cereal alone. As most of rainfall is received during monsoon season and there is very little rain received during the rabi season which many times results in crop failure due to lack of moisture. The practice evolved is in surance against crop failure.
3	Studies on canopy percentage development and splash erosion under various legumes.	The results indicate that groundnut and cowpeas followed by black gram and green gram gives maximum canopy during early period of growth in August which is the critical period as far as soil loss is concerned. Soil loss was minimum under black gram. This information will be useful for selection of legumes for introduction in the cropping pattern.
4	Different dates of sowing wheat	Under dry-farming conditions it has been found that sowing of wheat on 1st November gives significantly highest yield as compared to early sowing in October and late sowing in November.

1	2	3
5	Extension block No. 1	The deep ravines can be controlled by closure to grazing and afforestation with suitable species like *acacia arabica, P. Prosopis Juliflora, Balanites rox bughii, Butea spp., Agave Americana, Azadirachta indica* and *Albizzia lebbek.* Practical utility: Checking the erosion and extension of the ravines and to utilize the marginal and ravine areas for fuel and fodder.
6	Afforestation Trials.	The suitability of the following species for afforesting the ravine and marginal lands has been found: *Holoptelia integri, folia, Pongamia pinnata, Glyricida maculata, Azadirachta indica, Cassia Siamea, Ailantus excelsa, Albizzia lebbek Aegle marmelos, Eucalyputs bybrid, Acacia arabica, Acacia leucophloea Ballanites Rox bughii, Butea spp., Prosopis juliflora.* Practical utility: Same as for serial No. 5 above.
7	Introduction of Bamboo (Dendro calamus Strictus) in the Chambal ravines near Kota.	Bamboo is found to be successful in the ravines. The oldest plantations of (1957) has 57% survival and has attained a maximum height of 32 feet. (The average height being 17½ feet). Practical utility: The chief utility is for preparing paper pulp.
8	Creating of live check dams in the gullies.	Four species. *viz., Ipomea carnea., Arundo donax, vitex rogundo,* and *Agave americana,* were found to successfully establish and act as effective check-dams in the gullies. Practical utility: Stabilization of gully beds by vegetation which can withstand submersion.

1	2	3
9	Forage grass introduction trial on the depleted ravine water sheds.	Species; *Dichanthium Annulatum*; it has been found that this grass, which is the local climate species and of good fooder value, can be successfully introduced on the depleted ravine water sheds. It grows and reproduces well. The spacing for introduction 60 x 60 cms. is found to be better than the other two spacings tried (90 x 90 cms. and 120 x 120 cms.) Practical utility Artificial introduction of the good fodder grass to reduce the period of rehabilitation.
10	Studies on brush wood and boulder checkdams.	It was found that the effectiveness of both types of checkdams was more or less same in the beginning. Subsequently due to termite attack the brush-wood checkdams did not last long in spite of repairs during first two years and wherever the bed slope was steep, small channel was reformed while in flat bottom, the growth of vegetation has stabilized the silt deposit. These brush-wood checkdams were also not effective where the run off water was too much. The boulder checkdams have functioned well with every minor repair once in a year.

(*d*) *Soil Conservation Research, Demonstration and Training Centre, Dehra Dun.*

1	Soil survey and land capability map.	Land capability map for the farm was drawn and farm planning was done. This work is necessary for all soil conservation planning.
2	Soil, plant and water analysis.	Laboratory results are supplied for various experimental projects.

1	2	3
3	Trial of legumes for the study of ground cover and find their suitability for soil conservation.	Cowpeas and Urd provided 100% canopy, 4—6 weeks after sowing. These legumes when included in Kharif cropping will serve as erosion resisting and soil enriching crops.
4	Study of crop-rotation.	Trends shall be analysed after the 3rd cycle.
5	Varietal trial of wheat.	N.P. 825 appears promising in getting high yields for this area.
6	Study of effect of vegetative mulch on moisture conservation and wheat yield (Rabi).	Maize stubble left on the surface and seed bed prepared by sub-surface, tillage gave the highest yield.
7	Study of the effect of different cropping system on soil-water loss from run-off plots (Plot size-72. 6 ft. x 6/-1/100 acre)	Giant starr grass gave the least soil and water loss followed by contour cultivation of maize legume. Local methods recorded highest loss. The information gained will be useful in planning soil management programme.
8	Experiment on channel tarraces.	The soil loss was 3 tons/acre/year (which is within the permissible limits) for various treatments namely two spacing (S/2+2 and S/2+3), type of terraces (Broad based,narrow based) and channel grade (0·4%, 0·6%) .
9	Effect of leaf litter on forest species	There is significant splash loss due to removal and burnning of leaf litter. Soil moisture was highest when the leaf litter was left in situ. The information can be used for proper water shed management programme.

1	2	3
10	Trial of Kudzu for erosion control	Plantings were successful on each problem sight and protected the soil against erosion. The technique can be applied to stabilize the eroded sites by planting kudzu.
11	Study on torrent training and bank protection in Bainkhala Nadi.	Permeable spurs functioned well. P. purpureum, A Donax, W. Negundo, L. grandis, A. catechu, Ipomea, carnea, Themeda sp. Kudzu did well for bank stabilization. The technique developed can be applied for torrent control work successfully.
12	Grassed water-ways . .	Panicum repens, Paspalum rotatum, Bracharia mutica are found best for grassed-water ways. The results will be of great use in stabilizing water-ways which are important, conservation practices.
13	Soil infiltration in the field for Doon Valley.	Soil infiltration studies were conducted in Doon valley and following infiltration data were obtained for soil conservation planning :—

S. No.	Crop-description	Infiltration rate Ca/hr As on water shed	Song Wsater-hed
1.	Cultivated bottom land in the valley.	1·91	2·05
2.	Cultivated Himalayan upland .	4·69	5·64
3.	Sal forest Himalayan upland .	3·83	1·71
4.	Sal forest, Siwaliks slopes	2·09	2·61

(*e*) *Soil Conservation Research Demonstration and Training Centres Ootacamund*

1	2	3
1	Replacement of Cytissus scoparius (broom) with suitable species using existing broom as a nurse, crop.	E. tereticornis, E. citiodora and A. Mollissima can be raised under broom successfully.
2	To study and compare the relative merits of graded bench terrace and graded contour trench on steep hill side.	Bench terracing is proved to be superior to graded trenching
3	Study of succession and coppicing capacity of shola species in shola forest.	Copping capacity of major species was good to fair. Shola species were found to be frost tender upto 10′ height and undergrowth, necessary for protection of natural regeneration.
4	To determine suitable length of graded bench for efficient soil and water conservation in Niligiris.	400 length of terrace has been found best from soil and surface run-off point of view.
5	To study the ecological succession of vegetation in "broom" area under different methods of clearing.	When broom not cut periodically, it becomes dense and dominant vegetation and slowly eliminate annual and perennial grasses and weeds.
6	To determine suitable vertical interval for graded contour trenches on slopes between 10 & 16% in Nilgiris.	From surface run-off, rill formation 8′ vertical interval adjuged best. A spacing formula V.I.—$\frac{S}{2}$0·6 has been evolved.
7	To study the effect of cropping system and cultivation methods on run-off and soil loss.	(*a*) permanent grass cover—(frequently harvested) recorded least soil loss (*b*) Potato—Potato cultivated up and down recorded high run-off and soil loss (*c*) Potato—Potato on contour found to conserve soil and water much better than up and down cultivation.

1	2	3
8.	To workout suitable crop rotation for effective soil and water conservation.	One year rotation of potato followed by leguminous crop peas and lupin has given yields of potato.
9.	To study the grassland types of Nilgiri plateau.	Taking advantage of definite progressive and regressive changes in the high altitude grasslands of the Nilgiris, the grasslands are classified into two types. I. Arundinella—Themeda—Chrysopogon type found in areas of rainfall between 50-70" e.g. Wenlockdowns. II. Andropogon—Eulalia type—in areas of rainfall above 75" e.g. Upper Bhavani.
10.	Growth studies of selected species of trees as an aid to plant introduction.	Out of the forty-five species, 14 species have been found to give better performance most of them are Eucalyptus and Acacia species along with Hakea Saligna, Frenella rhomboides, Cupressus torullosa.
11.	To study the effect of forest covers on run-off and soil loss.	Surface run-off from shola plots is about 0·02% of rainfall and was found to be significantly associated with mean monthly amount of rainfall.
12.	Studies of the flora of family Gramineae in the Nilgiris.	Rich gramineous flora. 98 genera and 204 species (exotic and indigenous) grasses are found in the Nilgiris. Kikuyu and a few other exotics have naturalised in the tract.
13.	Study of different types of bench terraces for heavy rainfall region with steep slope.	Puertoricotype terrace with vegetative barrier (Tripsacum Luxum) has been found to cost least, most economic as initial yield high due to no disturbance of soil and area in original. Tripsacum luxum suited ideally for its hardly, dense and tall growth.

1	2	3
14.	Nursery studies—(*a*) Grasses	Passpalum dilatatum Ergrostis Curvula, Digitaria spp. (Creeping), Festuca elator Cynodon suwanne, Dactylis glomerata and Phalaris tuberosa are found to be good as Soil conservation grasses. Digitaria-wallichiana is found to be growing very well under partial shade of tree covers where others fail. Digitaria creeping indicated highest fodder yield followed by Paspalum dilatatum and Chloris gayana.
15.	(*b*) Clovers	Trifolium incarnatum (crimson clover) T. subter aneum (clare strain) T. repens (Ladino) and T. globolosum are observed to be prom sing. T. repens (dutch clove) has been found to grow well in association with kikuyu and can be used for pashire improvement.
	(*c*) Lupins	White Lupin has been found to be more promising as green manuring crop than blue and spotted one, with its succulan skin short growing period and better canopy.
	(*d*) Mossing of seedlings.	Mossing of seedlings has been observed to be most economic and efficient for transplanting seedling in this region.
	(*e*) Tripsacum luxum (Gautemala grass)	Tripsacum luxum is found to be excellent and to grow under inferior conditions. For its height, strength recovery after getting frost bitten and luxurious growth it has been found to be multipurpose e.g. vegetative barrie in building terraces, limited grazing purpose compost stabilisation fills etc.

1	2	3
	OTHER STUDIES :	
17.	Mixed plantation for effective soil conservation in the Nilgiris.	Initial cost for raising a mixed plantation though slightly high but the return as fuel and ancillary is much more here than in pure plantation. Blugum and black wattle has been found promising.
	(*b*) Ecological studies in the Nilgiris.	Hypericum mysorense with members of compositate and leguminosae come first in area cleared of shola. Symplocos spicata first appear in Cytissus scoparius infested area and Rhodoendred Nilgirica comes first in grassland. Among grasses, the first to appear in are Erogrostis spp. Setraria glauca, Digitaria spp., Bothriochloa pertusa followed by either Chrysopogon Zeylan cus or Pennisetum clandestinum who are subsequently replaced by Arundinella or Themeda spp.
	(c) Determination of volume weight and variation under various covers.	Tube anger is found defective in measuring volume of soil, in situ for resultant compression of soil within it. The screw augar is found to remove soil for dry weight determination of soil, more efficiently and correctly. Volume is reliably determined by using washed dried and graded sand to fill the bare. Values determined have been consistent.
		Organic matter content was not significantly associated with volume weight-porosity and aggregation. Shola provides largest porosity whereas grass least indicating its doubtful influence on aggregation. The results are consistent with earlier findings of grassland

1	2	3
		having lesser porosity and total absorptive capacity. Hand fork is also responsible for relatively higher foarosity in the bench buraces.
1	Splash Erosion Studies	Grass recorded less splash loss than miscellaneous vegetation and shola. For Eragrostis curvula, phalaris tuberosa, Dactylis glomerata, Paspalum dilatatum and Eragrostis nigra the amount of splash on oven dry soil basis are less than the rest.
2	Infiltration studies	A constant head infiltration measuring apparatus has been designed and fabricated locally. Total absorptive capacity reported highest under shola and lowest under grass during three hours. Broom and miscellaneous vegetation were in between.
3	Porosity studies	Porosity was found highest under forest cover and least under grassland. Sub-soil also showed quite high porosity.
4	Development and fabrication of run-off and soil loss collection and measuring installation for experimental plots.	For accurate determination of run-off and soil loss with minimum installation a tank with partition and either with a multi-slot devisor or with V-notch and F. type automatic recorder has been developed fabricated, calibrated and used subsequently in other experiments.
5	Modification to the standard land use classification for the Nilgiris.	Tentative classification based on slope mainly, as drainage, soil depth etc. were followed by some subsequently in the Nilgiris.
6	Analytical design and estimation for bench terracing.	Provides a basis for designing the specification of benches, assuming the construction by half cutting and half filling method.

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	(*f*) *Soil Conservation Research Demonstration and Training Centre, Chatra.*	
1	Trial to determine the effect of Nitrogen & phosphorus on local maize & the study of residual effect of phosphate fertilizer on succeeding toria crop.	22·4 Kg. per hectare (20 lbs/acre) of Nitrogen gave significantly more yield of maize than control by 6·2 quintals per hectare (6·7 mds/acre).
	(*g*) *Soil Conservation Research Demonstration and Training Centre, Agra*	
1	Levelling and terracing the ravine lands for the Agricultural purposes.	Cost of levelling per hectare by man-cum-bullock power Rs. 2465·00 cost of levelling per hectare by macahnical means—Rs. 1615·00. It is seen from the observations that the levelling of the ravines by mechanical means is cheaper than the levelling by man-cum-bullock power. Though the man & bullock are available everywhere while machineries are not available every where the quality of work done by man-cum-bullock power is very poor while the quality of work done by mechanical means is excellent.
2	To find out suitable vertical fall between earthen gully plugs for soil and moisture conservation in ravines of Jamuna River.	The gully plugs constructed at 2'VF have been found to be unsuccessful while those constructed at the vertical falls of 3' and 4' have been found quite successful but the latter (at 4' VF) are move practicable and useful as each one of them controlled the bigger area resulting into sizable terraces (0·5 to 1·0 acre) where the Agricultural and other operations could be carried out easily and economically.

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3	To study the performances of different types of masonary waste weirs and grass outlets for disposing off surplus water.	It has been observed that the masonary outlets constructed for 1′ and 2′ vertical falls can safely be replaced by grasses outlets. The drop spillways for the clear over fall range for 4′—7′ having one foot spillway height are less susceptible to damage as compared with those having more height. The grassed outlets sodded with cynodon dactylon grass for the slope range of 4:1 to 6:1 have been found to be quite successful even for a vertical fall of 10′ but they are not to be recommended excepting for the special position of the terrrace. There is no better way of protecting the bunds of newly reclaimed agricultural fields of alluvial soil than to cover these with grasses. Grasses not only give the cheapest, easiest and permanent protection to the soil but also speak very sound in the economy of any agricultural undertaking. Cynodon dactylon is better in all respect. Its soil being capacity is indisputably better than other grasses. The second best is the *Dichanthium annulatum* and the *enchrus cilliaris* is third in order of merit.
4	To study performances of various grasses for effective soil conservation on the bunds.	
5	To compare the effect of different water dozes and watering cycles on the growth of plants in the nursery.	Extremes of climate and arratic rainfall effect the tender plant adversely, specially in seedling stage and sufficient quantity of water is the only remedy to combat this. Irrigation is very costly in these tracts due to very low water table and very few water reserevoirs. This experiment was taken into investigate the minimum quantity of water required to irrigate the beds in nursery so as to get good and sizable planting stock.

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6	To compare the effect of different dozes of farm Yard manure on the growth of plants in nursery.	A permanent forest nursery established in the reclaimed land from severly eroded and completely depleted ravines need regular manuring not only for maintaining the fertility but also for improving structure of the soil. This manurial experiment in nursery was taken up to explore the optimum quantity of Farm Yard Manure required for raising various forests eedlings.
7	To study the suitability of different Kharif crops for newly reclaimed lands. (top are of ravine).	Cowpea is undoubtedly the best crop and the next best are: Urd, Gwar, Moong and Bajra in order of merit. The lowest income was in case of Jowar. Tobacco crop was comparitively failure.
8	To determine the optimum seed rate and spacing for wheat under irrigation consistent with high yield and efficient utilization of soil moisture.	R_2 S_3 treatment was found to be better.
9	To find out the most suitable crop rotation practice to maintain the soil fertility and productivity.	Bajra-Cowpea rotation should be adopted in ravines lands. Bajra-Arhar continuous may also be recommended but Arhar being the frost susceptible crop it is a second in order of merit.
1	Studies on the spacing of contour bunds.	Least runoff and soil losses were recorded from bunds spaced at a vertical intervals of S—3 The spacing derived could be adopted on bunding of agricultural fields under similar conditions prevailing.

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	(h) Soil conservation Research Centre, Chandigarh.	
2	Studies on the effect of application of fertilizers on yields of grasses.	Application of nitrogen and Phosphorus in combination at the rate of 20 Lbs/acre were found to result in significant increases in yeield of natural grasses. The fertilizer application also brought about an increase in the stand.
3	Effect of structural treatments on yield and changes in botanical composition of natural grasslands.	Structural treatments such as contour furrowing, contour ridging and basin listing were found to increase. Grass yields in natural stands by about 20%. The treatments also brought about an increase of the more mutritive grasses such as Chrysopogon montanus and Dichanthium annulatum.
		The construction of pondage banks in unculturable lands brought about an increase averaging 35% in the yield of natural grasses. Studies are in progress on the botanical changes in the composition of the natural grasslands.

(i) Soil conservation Research Demonstration and Training Centre, Ibrahimpatan.

The Centre was set up in October 1962. Research experiments are in progress and none of these experiments have been completed.

APPENDIX IV

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

Serial No.	Reference to Para No. of Report	Summary of Recommendations/Conclusions
1	2	3
1	4	The Committee are surprised to note that Government have thought of setting up the Institute in such an important matter as grasses and fodders only in Third Plan particularly when fodder scarcity is almost a regular feature. They think that considering the importance of the subject Government should have taken steps to fill the gap during the preceding ten years. The Committee are distressed to find that despite adequate financial provision being made in the Third Plan there has been dilatoriness in setting up the Institute. The Committee hope that Government would lose no further time in developing the full potentialities of the Institute and achieving the objectives underlying its establishment.
2	14	The Committee regret to find that it would be possible to utilize only about Rs. 16 lakhs from a Plan provision of Rs. 45 lakhs for the Institute. They cannot appreciate the leisurely manner in which the Union Government have gone about in developing the Institute which admittedly can play a very effective role in augmenting the scarce fodder and grass resources for animals. They consider that one of the chief reasons for this slow progress is the long time taken by Government in deciding about recruitment of the Director and Heads of Divisions for the Institute. The Committee are not able to appreciate as to why the post of the Director was not filled up as soon as preliminaries in connection with the Institute were over. It would have been invaluable to associate the Director in the selection of the site of the Institute and in planning and designing its lay out and research projects. Similarly the Heads of the Divisions could have played a very useful role in

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		working out in detail the equipment and other requirements which are the pre-requisites for effective implementation of the research schemes. The Committee hope that the posts of the Director and Heads of Divisions required for the main Institute will now be filled up without further delay. The expert advice of the Director and the Heads of Divisions should go a long way in chalking out purposeful lines of research and development at the Institute. The Committee need hardly stress that Government as well as the Institute should approach the whole problem of fodder and grass resources with a sense of urgency so that it can play an effective part in increasing the scarce resources for feeding animals, particularly the milch cattle.
3	17	(i) The Committee note that the main idea underlying the project is to develop fodder resources for the growing dairy industry. The Committee hope that with the assistance of the United Nations experts, it would be possible for the Institute to develop a crash programme for providing nutritious cattle feed at economic rates.
		(ii) The other important object in getting foreign experts is to impart training to the Indian scientists in the field. The Committee need hardly stress that every effort should be made to train Indian scientists in the field so that they can carry on research work without interruption and in fact break new ground even after the services of foreign experts cease to become available.
		(iii) It may not be out of place to mention that training facilities in most of the Union Agricultural research institutes are not being put to full use for want of nominations by the State Governments. The Committee would, therefore, suggest that the programme should from the very beginning be drawn up on a realistic basis in conjunction with the State Governments.
		(iv) The Committee also hope that the amount earmarked for equipment would be put to good use at an early date.
4	18	The Committee hope that the arrangements would be made early for supply of nucleus seeds of successful grasses and fodders to the State Governments and other agencies.

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5	19	The Committee would stress the need for maintaining proforma accounts from the very beginning so that the future development does not lack sound financial basis.
6	20	(i) The Committee would suggest that there should be close and intimate co-ordination between the new Institute at Jhansi and the Indian Agricultural Research Institute, National Dairy Research Institute and Indian Veterinary Research Institute so that the more promising projects are picked up for further intensified research. They need hardly stress that as far as possible there should not be overlapping and duplication of work between the various agricultural research institutes. (ii) The Committee would also stress the need for close co-ordination between the Research Institute at Jhansi and the leading Dairies in the country because it is they who have firsthand knowledge of the problems faced by the dairy industry.
7	21	As one of the objectives of the Institute is to apply existing knowledge and experience in pilot projects designed to promote and greatly to increase fodder production in dairy development areas, the Committee would suggest that there should be close liaison between such milling plants and the Institute so that low cost but nutritionally rich fodders and grasses are developed on priority basis.
8	22	In view of the imperative need of conserving soil and enriching its production properties, the Committee would suggest that research in this promising field should be closely co-ordinated and intensified.
9	23	The Committee would suggest that the Institute should pay special attention to the problem of regenerating the village pastures. This problem may fittingly be the subject of study by the sub-stations which are proposed to be set up under the Institute. Efforts should be made to find grasses which are not only hardy but also nutritionally rich and suited to the local conditions.
10	24	(i) The Committee consider that apart from the necessity of regulating grazing in the forest areas, there is both scope and need for developing nutritious grasses in these hill tracts for grazing of cattle, particularly

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		sheep, which yield precious wool. The Committee hope that the Institute and its sub-stations will take up this problem for urgent attention and research.
		(ii) The Committee need hardly stress that special efforts are also called for developing suitable grasses and fodders for supporting cattle in hilly strategic areas like Ladakh, Spiti, Lahaul, NEFA etc., where the need for economic development is urgent.
11	25	The Committee have no doubt that Government would put their experience, gained in the Third Plan, to good use and would initiate timely action to ensure that the physical and financial targets set out in the next Plan are achieved in the early years of the Plan period.
12	34	The Committee regret to note that the Central Soil Conservation Board, which is charged with the responsibility to initiate, organise and co-ordinate research in soil and water conservation, has not been meeting more frequently. The Committee recommend that if the Soil Conservation Board is to discharge its duty more effectively, it should meet regularly at least once a year, if not twice.
13	35	The Committee recommend that the Soil Conservation Board should examine and formulate the patteren of Soil Conservation Organisation in States and persuade them to enact legislation on soil conservation expeditiously. The Committee feel that this would accelerate the progress of soil conservation work in the States.
14	36	The Committee believe that though the actual execution of soil conservation work is carried out by the State Governments, the Soil Conservation Board can render considerable help by assisting States and River Valley Projects in drawing up their soil conservation schemes, reviewing them periodically and co-ordinating Inter-State Soil Conservation Projects. The Committee feel that constantly changing conditions and increasing complexity of soil and water problems demand closest co-ordination between the Soil Conservation Board and the State Governments which are respectively responsible for formulating and carrying out the soil conservation programmes.

(1)	(2)	(3)
15	38	The Committee would suggest that while selecting sites to set up new Soil Conservation Research, Demonstration and Training Centres or regional stations of the existing Centres, preference should be given to those States which have at present none, of their own or of the Central Government. The Committee would further urge that as State Governments are the proper authorities to execute the soil and water conservation programmes, Central Government should persuade such of the States as have no soil conservation research centre to set up their own centres to carry out research on regional problems and demonstrate the results to the farmers.
16	40	The Committee welcome the appointment of Achievement Audit Committee which was set up in 1961 to review the work of the Soil Conservation Research, Demonstration and Training Centres. The Committee suggest that the next Achievement Audit Committee may also review the activities of the Centres at Agra and Chandigarh which have been in existence for more than seven years and which were not examined by the previous Achievement Audit Committee. The Committee would further recommend that performance reviews of all the Soil Conservation Research, Demonstration and Training Centres should be made on a regular basis coinciding as far as possible with the Five Year Plan periods.
17	41	The Committee are distressed to find that only Rs. 2·82 lakhs have been utilised during the first three years and another Rs. 17·11 lakhs are expected to be utilised during the last two years of the Third Plan period out of the total allocation of Rs. 50 lakhs made in respect of all the Soil Conservation Research, Demonstration and Training Centres. The Committee need hardly emphasise that the growth and prosperity of the country depends mainly on its ability to maintain and increase the productivity of its soil for which intensive research is a necessity. The Committee cannot too strongly stress the need for proper phasing and expeditious finalisation of schemes to ensure that the objectives underlying the Plan provision are achieved.
		The Committe note that training facilities in most of the Soil Conservation Research, Demonstration and Training Centres are not being put to full use for want of adequate number of nominations by the State Governments. The Committee would, therefore, suggest that the progamme should, from the very beginning, be drawn up on a realistic basis in consultation with the State Governments.

(1)	(2)	(3)
18	49	In view of the considerable deficiency in the number of trained assistants in the soil conservation work, the Committee cannot appreciate the decision of Government not to start training course for assistants at the Dehra Dun Centre. The Committee would urge that serious consideration should be given for training of assistants in soil conservation work on a priority basis at various Centres to meet the growing demands of the trained personnel.
19	50	The Committee are surprised that when admittedly there is greater demand for trained personnel in soil conservation work, some of the State nominees, after completion of training, have been put on jobs not connected with the soil conservation work. The Committee need hardly stress that States should be impressed upon to depute only those persons whose services could be utilised in their soil conservation programmes, after completion of training.
20	51	The Committee suggest that the States should be advised to depute trainees having requisite qualifications and actually connected with the soil conservation work. As the State nominees are sent from different categories and with different levels of experience in soil conservation, the Committee recommend that every effort should be made to make the training sound and rational both from theoretical as well as practical point of view. The Committee suggest that the present syllabus may be reviewed so as to give more emphasis on practical field training.
21	52	The Committee recommend that Soil Conservation Research, Demonstration and Training Centres should be properly housed and facilities of hostel, laboratories and lecture rooms should be provided urgently at these centres, if not already done.
22	54	The Committee welcome the regular meetings of the different Regional Coordination Committees, as these serve the useful purpose of coordinating the work carried out at the Central Government's soil Conservation Research, Demonstration and Training Centres and the research on local problems of soil conservation done by the States. The Committee would suggest that Government should actively consider the holding of Seminars on Soil Conservation on a regular basis and by rotation at different places.

(1)	(2)	(3)
23	55	The Committee recommend that Annual Reports of all the Soil Conservation Research, Demonstration and Training Centres should be regularly published in time and supplied to the State Governments to keep them informed about the work that is being done by these Centres.

APPENDIX V

(*Vide* Introduction)

Analysis of Conclusions/Recommendations contained in the Report.

I. Classification of Recommendations

A. Recommendations for improving the Organisation and Working:

Serial Nos. 1, 2, 3(ii), 3(iii), 3(iv), 5, 6(i), 6(ii), 11, 12,15, 16, 21 and 23.

B. Recommendations for effecting economy :

Serial Nos. 3(i), 10(ii) and 17.

C. Miscellaneous Recommendations:

Serial Nos. 4, 7, 8, 9, 10(i), 13, 14, 18, 19, 20 and 22.

II. Analysis of more important recommendations directed towards Economy

Serial No.	Serial No. as per Summary of Recommendations (Appendix IV)	Particulars
1	3(i)	The Institute should develop a crash programme for providing nutritious cattle feed at economic rates.
2	10(ii)	Special efforts should be made for developing suitable grasses and fodders for supporting cattle in hilly strategic areas like Ladakh, Spiti, Lahul, NEFA etc., where the need for economic development is urgent.
3	17	There is an urgent need for proper phasing and expeditious finalisation of schemes to ensure that the objectives underlying the Plan provision are achieved.

GMGIPND—LSI—75(Aii) LS— 5-4-65—1135.