

REPORT
of the Working Group for
formulation of
The Fourth Five Year Plan Proposals
on
SOIL CONSERVATION



सत्यमेव जयते

MINISTRY OF FOOD AND AGRICULTURE
(DEPARTMENT OF AGRICULTURE)
GOVERNMENT OF INDIA

PREFACE

Preparatory work for the formulation of proposals for agricultural development under the Fourth Five Year Plan was taken up in the Ministry of Food & Agriculture in June, 1963 at the instance of the Planning Commission. Following the lines adopted in connection with the preparation of Third Five Year Plan, a Working Group on SOIL CONSERVATION was set up in the Department of Agriculture with the following terms of reference.

1. To make a critical review of the progress of the programmes and schemes in the Third Five Year Plan period;
2. To assess, in the light of current trends and other available data, the position likely to be reached at the end of the Third Plan period; and
3. To formulate proposals for the Fourth Five Year Plan in the perspective, wherever possible, of development over a 10-year period.

On the basis of the material that is available in the Department of Agriculture and the results of studies, if any, already made, the Working Group has attempted to make an assessment of the requirements, the potentialities for development and the organisational and technical considerations involved therein and has given broad indication of the physical programmes proposed and the financial outlays needed. The Report was transmitted to the Planning Commission on 9th July, 1964.

The proposals and recommendations made in this Report have been taken into account in the consolidated Memorandum 'Approach to Agricultural Development in the Fourth Five Year Plan' submitted by the Ministry of Food & Agriculture to the Planning Commission.

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on Soil Conservation*

C O N T E N T S

CHAPTERS	PAGES
Summary of the Report	iii
1. Introduction	1
2. Place of Soil Conservation in Agricultural Development	4
3. Nature of Soil Conservation Problems	10
4. Extent of Soil and Water Conservation Problems	12
5. Present Concept and Future Policies in respect of major Soil and Water Conservation Problems	15
6. Progress of Soil Conservation in retrospect	21
7. Anticipated Progress of Soil Conservation in the Third Five Year Plan	24
8. Experiences of First, Second and Third Five Year Plans in regard to Bottlenecks and Short-comings in the Planning and Implementation of various Soil Conservation Programmes	35
9. Proposed Soil Conservation Programme for the Fourth Five Year Plan	39
(i) Soil and Water Conservation on Watershed basis	39
(ii) Soil and Land Use Survey	41
(iii) Soil and Water Conservation in Watersheds of River Valley Projects for Protection of Reservoirs and Flood Control	42
(iv) Pilot Demonstration Projects on Watershed basis	45
(v) Stabilisation of Ravines and Protection of Table Lands	47
(vi) Reclamation of Saline, Alkali and Waterlogged lands and Acid Soils	48
(vii) Conservation Irrigation, Water Management and Field Drainage	50
(viii) Strengthening of Soil Conservation and Soil Survey Organisations	52
(ix) Training in Soil and Water Conservation	57
(x) Soil and Water Conservation Research	60
(xi) Central Arid Zone Research Institute	62
10. Essentials of Soil and Water Conservation Programme based on the Review of Important Recommendations made by various Committees, Surveys and Foreign Experts and Experience gained hitherto	70
11. Pattern of Subsidy for Soil and Water Conservation Programmes	74
12. Requirement of Personnel—(technical and non-technical) for Soil Conservation Programme in the Fourth Five Year Plan	77
13. Requirement of Key Materials, Instruments and Equipment	79
14. Projections for the Fifth Plan	80
15. Summary of Proposals for Soil Conservation in the Fourth Five Year Plan	82
16. Summary of Advance Work for the Fourth Five Year Plan, that would be necessary in the remaining period of the This Plan	83

ANNEXURES

ANNEXURE	PAGES
I (a&b) Table Showing Trend of Yields per acre for Foodgrains from 1900-01 to 1939-40 and from 1940-41 to 1959-60	85
II Progress of Soil Conservation in Second Five Year Plan (physical achievements)	86
III Progress of Soil Conservation in Second Five Year Plan (utilisation of funds)	86
IV (a) Progress of Contour Bunding and Terracing (Third Plan)	88
(b) Progress of Dry Farming (Third Plan)	89
V Progress of Afforestation, Pasture Development, Reclamation of Saline, Alkali Soils and Ravines (Third Plan)	90
VI Soil Conservation Research Stations in the States	92
VII Utilisation of Finances in Third Plan in respect of State Plan Schemes	93
VIII Progress of Centrally Sponsored Scheme of Dry Farming Demonstration Projects (Third Plan)	94
IX Progress of Soil Conservation in the Watersheds of River Valley Projects (Third Plan)	95
X Utilisation of Finances in respect of Soil Conservation Schemes in water sheds of River Valley Projects	98
XI Progress of Soil Survey under All India Soil and Land Use Survey Scheme during Third Five Year Plan up to 1963-64	99
XII Present Organisation in States for Soil Conservation	100
XIII Present position with regard to Soil Conservation Legislation, State Soil Conservation Boards and District Soil Conservation Committees	108
XIV Table Showing the likely built up of Technical Resources (trained personnel) in the Third Plan	112
XV Scheme for All India Soil and Land Use Survey	114
XVI Suggested Organisation for Soil Survey (with a schematic chart)	118
XVII Suggestions for an Effective Organisation for Soil Conservation (with a schematic chart)	120
XVIII Review of Important Recommendations and Suggestions made by various Expert Committees, Conferences, Seminars, Foreign Experts and Surveys	124
XIX Minutes of the Meeting held on the 29th and 30th September, 1964 in Vigyan Bhavan, to discuss with the State Representatives, the Soil Conservation Programme for the Fourth Five Year Plan	139

SUMMARY OF THE REPORT OF THE WORKING GROUP

PRESENT CONCEPT

1. Present approach to soil conservation programme lays emphasis only on engineering measures. Soil conservation has been pursued as a single practice programme with emphasis only on erosion control measures. In agricultural land, the programme emphasises only construction of contour bunds, either on dead contours or with some grade, and construction of level terraces in steep slopy areas. In non-agricultural lands, afforestation or pasture development is all that is considered necessary as a soil and water conservation programme. The fundamental basis of soil conservation programme, for increasing agricultural production on sustained basis through efficient use and management of soil and water, based on the nature of soil, its limitations for production and its capabilities for production, are left out, if not ignored. This over-simplification of the concept of soil conservation programme has reduced the otherwise highly technical and action programme virtually to an earth work operation.

2. Over-simplification of the programme and less critical approach spreads to all aspects of planning and implementation of soil conservation programme, as is evident from the following:—

(i) Soil conservation programme is taken up without any prior assessment of the problem of soil deterioration and waste, through any soil and land capability survey.

(ii) Contour bunding is regarded as the solution of all soil deterioration problems in rainfed areas.

(iii) In the watersheds of river valley projects, while contour bunding and terracing or afforestation and pasture development are done, measures for control of sediment from other sources, e.g., road side erosion, stream bank cutting, bed-scour, etc. which are often the major sources, are not adequately emphasised.

(iv) Work in the watershed areas is taken up without any prior survey, to determine the critical areas, locate the different sources of sediment, and to determine the extent of sediment hazards from various sources.

(v) In the programme for reclamation of water logged, saline and alkali soils, field drainage is left out. The approach to actual reclamation operation is over-simplified. Leaching or application of gypsum is regarded as the general approach to such problem areas. There is no emphasis on proper management of the reclaimed lands. There is wide diversity in the nature and severity of salinity and alkali problems. Not all problem areas are amenable for reclamation within economic and practical limitations. Even those that can be reclaimed, vary considerably, in the type and amounts of various measures needed for their reclamation. Intensive soil and underground hydrological investigations can only determine the suitability and sufficiency of various measures for reclamation.

(vi) In the training programme for soil conservation in the States, basic objective is limited largely to proficiency in use of survey instruments and ability for alignment of contour lines on the field by the trainees. The ability to identify the problems of soil deterioration from various causes and to determine the suitability of various practices under varying problem situations in a composite and comprehensive way is not emphasised.

(vii) The present over-simplified approach to soil conservation leads to a sense of complacency. Generally the increase in crop production following adoption of engineering measures for erosion control is regarded as automatic. There is no planned and critical field assessment of the benefits of erosion control measures, neither in physical units, nor in economic units. No field evaluation is done even in the watersheds of river valley projects to assess the extent to which the measures adopted have been helpful in reducing the sediment load.

(viii) Soil survey is carried out by All India Soil and Land Use Survey Organisation mainly in the watersheds of river valley projects for planning soil conservation programme and also in other areas for correlation and classification purposes. The present survey, however, falls short of the requirements and needs, for the following reasons:—

- (a) While All India Soil and Land Use Survey Organisation undertakes survey, no survey is done in a planned and systematic way in the States as a service and applied programme for development of soil and water resources and for efficient use of fertilizers, water, improved seeds and other agricultural inputs, like tillage etc.
- (b) There is lack of coordination between the soil survey carried out in the States and also soil survey undertaken by All India Soil and Land Use Survey Organisation.
- (c) Soil survey reports of All India Soil and Land Use Survey Organisation are not utilised for development programmes due to lack of adequate skill in soil survey in the soil conservation organisation in the States.
- (d) To a substantial extent lack of usefulness of the present soil survey reports is also due to the fact that these reports are weak in interpretation part. While data on soil characteristics are collected, the specific interpretation of this data in simple and practical terms which should show the practices, treatments and management required to give high and sustained production, as would be understood by the cultivators and field workers, is not given.

SOIL CONSERVATION IS NOT CONTOUR BUNDING

3. Contour bunding alone does not help to prevent soil deterioration effectively, if, soil of the area between these bunds is continued to be farmed in an exploitive way. Observations have indicated that in many cases the burrow pits dug up for contour bunds are filled in one or two seasons at the most. Accumulation of 30 to

50 tons of soil at the toe of bunds has been observed in many States. Movement of soil from upper part of the field and its accumulation at the toe of the bund is not soil conservation. Conservation of soil can occur only when soil is protected from detachability and transportation through run-off from its original place of occurrence.

4. Following construction of contour bunds, the benefits in respect of moisture conservation and increased production are not automatic. Studies at Bellary Research Centre have shown that graded bunds did not improve moisture conservation, nor did they improve the crop yield, because, apart from erosion, poor infiltration was the limiting factor for moisture conservation and crop production. No one single practice will ever increase crop yield significantly so long as some other adverse factor or factors are limiting the crop growth.

5. Often it is considered that soil conservation literally means only good farming, which includes use of good seed, manures and fertilizers, tillage and erosion control. As many of these practices like good seed, fertilizers, etc., are already being taken up under various programmes, it is felt that probably nothing more is needed by way of soil and water conservation than contour bunding. This is far from truth. We have been adopting good farming for quite a long time, but the increase in crop yields per acre has so far been rather marginal. Bringing water on the field, applying fertilizer to the soil and sowing good seed etc. do not yield sustained results if soil suffers from certain other limitations or ills of production, e.g., poor infiltration, hard sub-soil, acid or alkali conditions and poor drainage, etc. The good farming practices can only work if the basic ills of soil deterioration, as determined through proper soil survey, are corrected. Any good practice, when applied, will give some benefit, but the effect will be small and not sustained unless the practice applied is suited to the specific problem situation.

6. In the present approach to soil conservation programme, no consideration is given to the problem of use and management of water in an integrated way. The development and management of soil are inseparable from use and management of water. The water element cannot be separated from soil element in successful conservation effort. Water is used for growth of plants. Wherever water is used, without soil conservation there is always some degree of soil deterioration. The soil conservation problems in irrigated lands of Punjab, Uttar Pradesh and many other such areas result from an unbroken chain of misuse and waste of water.

7. Soil conservation is the only functional programme for increasing agricultural production, that has, and should have, four objectives, to prevent deterioration of soil and water waste, correct deterioration in areas where it has already set in and build up productivity for increased production on sustained basis by applying proper kind and amounts of various practices and measures suited to different problem situations, as determined by standard soil, land use and land capability survey. Any other approach will not only fall short of the objectives, but would not increase production on sustained

basis. However, any good agricultural practice, when applied, will give some increased yield, but the benefits will be only small and temporary unless these are suited to individual situation.

FUTURE APPROACH

8. Our national problem of soil and water conservation stems from our people. Our present population of 438 millions, plus the additional millions according to the population projections (489 million in 1966, 545 million in 1971, and 603 million in 1975) have to depend on soil and water for their daily living. In the coming years, with continuous increase in population and with no chance of any material increase in the land resources, our demand on land will be increasing continuously. To meet the demand of our growing millions, and make available adequate amounts of raw material for our expanding industry, which we must, we have to increase the productive capacity of each acre. This would call for an efficient use and management of soil and water resources.

9. There are a combination of practices that are needed for efficient use of soil and water. No single practice is enough to give optimum return from land. The different combinations of practices are suited to different soil types, climatic conditions and also economic condition of the farmer, who has to adopt and use them. Wrong combination can do more harm than good. Thus each situation has to be analysed individually, holding by holding and field by field for its problems and kinds and amounts of practices needed, if, we are to achieve the optimum production from our available soil and water resources. Soil conservation programme cannot be reduced to simple and standard formula as at present.

10. The problem is vast and the limitations both in respect of technical personnel and finances are many. Therefore, in our approach to efficient use and management of soil and water (soil and water conservation) due priority is to be given to areas that have high production potential and which are economically more sound. We cannot afford to tie up our technical and financial resources on areas which are less productive. We cannot afford to spread thinly our technical and financial resources on all types of problems. What we need is to concentrate our resources on areas which are capable of giving greater return in shorter period.

11. Soil and water conservation is a national problem, But, ultimately it is in the individual farmer who owns the land and lives by it, who has to adopt various practices, use them and maintain them for increasing production, on a sustained basis. A successful soil conservation programme has thus to be developed as a people's programme. Soil and water conservation has got to be developed as a way of living of the farmer if it is to succeed in a lasting and enduring way. Considerable and continued emphasis has to be given to "result demonstrations".

12. Soil and water conservation is a highly technical programme. It needs effective and coordinated application of the fundamentals of various scientific disciplines, e.g., agronomy, soil science, engineering, hydrology, geology and forestry etc. It will, therefore,

be necessary to have proper organisation that would be technically competent and numerically adequate to ensure effective planning and implementation of the programme.

13. In the Fourth Plan and after, following shall be the essentials of soil and water conservation programme :—

(i) Soil conservation will be taken up on watershed basis in a composite and comprehensive way to tackle not only the problem of soil erosion, but also other factors associated with soil and water use and management including reclamation of saline and alkali soils, improvement of soil physical condition, conservation irrigation, field drainage, sediment control and flood control etc.

(ii) Soil, land use and land capability survey will be an essential requirement for all soil conservation schemes.

(iii) There shall be no target for individual practices e.g. contour bunding or dry farming measures. The targets will be defined in terms of acres under various land uses that will be treated in a comprehensive way.

(iv) In ravine reclamation, emphasis will be given to treatment and protection of agriculturally productive table lands, and the stabilisation of marginal lands and gully heads. Reclamation of ravines proper for agricultural purpose will be limited to very shallow ravines near gully heads, as may be necessary for effective stabilisation purpose. Deep ravines would be developed as fodder and fuel reserves.

(v) For soil conservation in the watersheds of river valley projects, the programme will be prepared after making critical appraisal of the nature and extent of the problem through various surveys, e.g., engineering, hydrological, geological, soil and land use, and economic, by the regional planning units.

(vi) There shall be a systematic and rigid programme of field evaluation for all soil conservation schemes to assess the benefits that accrue both in physical and economic units.

(vii) With regard to reclamation of saline, alkali and water logged lands, the schemes will be prepared after adequate soil and underground hydrological surveys are completed.

14. For effective planning and implementation of the programmes proposed for the Fourth Plan, it would be necessary to have adequate organisation at State, Regional and Central levels. The organisation shall have to be technically competent and numerically adequate to make proper field appraisal of the problem for the purpose of planning, apply appropriate measures and carry out systematic field evaluation for the benefits in physical and economic units and also to ensure proper field guidance to the field workers in complicated problem situations. Future success of soil conservation programme will principally depend on the organisation for soil conservation and soil survey that should be technically competent and numerically adequate.

PROPOSED PROGRAMME FOR THE FOURTH FIVE YEAR PLAN

Programmes Proposed :

15. The major programmes proposed to be taken up in the Fourth Five Year Plan would be the following :—

- (i) Soil and water conservation on watershed basis.
- (ii) Soil and land use survey.
- (iii) Soil and water conservation in watersheds of river valley projects for the protection of reservoirs and flood control.
- (iv) Pilot demonstration projects on watershed basis.
- (v) Stabilisation of ravines and protection of table lands.
- (vi) Reclamation of saline, alkali and water logged lands.
- (vii) Conservation irrigation, water management and field drainage.
- (viii) Schemes for setting up and strengthening of soil conservation and soil survey organisations.
- (ix) Training in soil and water conservation.
- (x) Soil and water conservation research.
- (xi) Central Arid Zone Research Institute.

Scope and Extent of Various Programmes :

- (i) *Soil and water conservation on watershed basis :*

16. This programme will include work on agricultural as well as non-agricultural land. This replaces the earlier schemes for contour bunding and dry farming in agricultural land, and afforestation and pasture development in other areas that were being undertaken hitherto. The targets under the scheme will be defined in terms of acreage under different land use that will be treated. In the Fourth Plan about 20 million acres are proposed to be treated with various soil and water conservation measures under this scheme, in a composite and comprehensive way, with watershed as a unit for planning and implementation.

- (ii) *Soil and land use survey :*

17. In the Fourth Plan, soil and land use survey would be carried out prior to undertaking soil conservation schemes. The survey will be carried out both by the Central Organisation under the All India Soil and Land Use Survey Scheme and also by the State soil survey organisations. Central organisation may cover about 20 million acres largely in the watersheds of river valley projects and the State organisations may cover about 35 million acres as a part of the soil conservation programme.

(iii) *Soil and water conservation in the water sheds of river valley projects for the protection of reservoirs and flood control :*

18. At present, this programme is in execution as Centrally sponsored in 13 Watersheds. In the Fourth Plan, it may be extended to a few more watersheds. Besides, there are many more projects in the watersheds of which soil and water conservation will be necessary. For these new areas, States will have to take up the work under the State programmes. In the Fourth Plan, it is proposed to cover about 2.5 million acres.

(iv) *Pilot demonstration projects on watershed basis :*

19. In the Fourth Plan, it is proposed to set up pilot demonstration projects in agro-climatic regions, each project covering an area of about 400-600 acres. These projects will be instrumented to make a precise evaluation of the soil conservation practices. Demonstrations will also be laid on Pasture development particularly in States where such programmes have scope.

(v) *Stabilisation of ravines and protection of table lands :*

20. In the Fourth Plan, major emphasis under this programme will be on protection of agriculturally productive table lands, and stabilisation of marginal lands, gully heads, and reclamation of bordering shallow ravines. It is proposed to take up about one million acres under this programme. This may include about 0.8 million acres of table and marginal lands, and shallow ravines; and about 0.2 million acres of the ravines to be developed as fodder and fuel reserves. Reclamation of ravine for agricultural purpose will be confined largely to shallow ravines and the ones that are likely to come under irrigation command from new irrigation projects.

(vi) *Reclamation of saline, alkali and water logged lands :*

21. The programme will be taken up mainly as a promotional activity. No targets are fixed for the present. Only easily reclaimable areas as would be justified by economic and practical considerations, as determined through soil and hydrological surveys, will be taken. About 1.5 lakh acres are proposed to be covered, comprising of inland and coastal saline areas.

(vii) *Conservation irrigation, water management and field drainage :*

22. This programme is included under soil conservation in the Fourth Plan as an integral part of the comprehensive approach. Hitherto this has not received adequate emphasis. The programme will include measures like land levelling, alignment of field channels, field drainage, and proper water use. In the Fourth Plan, it is proposed to take up about 1.9 million acres.

(viii) *Schemes for setting up and strengthening of soil conservation and soil survey organisations :*

23. For effective planning and implementation of soil conservation programme in a composite and comprehensive way, it will be

necessary to have adequate organisation, that will be technically competent, and numerically adequate, at State, Regional and Central levels. Under this scheme, provision will be made for strengthening of the organisation at various levels for soil and water conservation and soil survey.

(ix) *Training in soil and water conservation :*

24. This will include all training programmes to be undertaken by the States and the Centre. It will comprise of (i) in-service training for field staff, (ii) training in water use and management, pasture development and management, and soil survey, (iii) training under foreign aid programme for specialisation in specific scientific fields related to soil and water conservation, (iv) training in the University at degree and post-graduate levels in soil and water conservation, (v) training of extension staff, (vi) training of farmers and (vii) training at high school level particularly in rural areas.

(x) *Soil and water conservation research :*

25. This will include the research projects to be taken up in the States and also those of the Central Government. In the States it will be necessary to have at least one research centre in each State. There may be necessity to have more in some States, depending on the nature and diversity of the problems to be tackled.

26. Research at the Government of India centres would be intensified considerably. For this, the centre at Dehra Dun will be adequately expanded to provide necessary facilities for fundamental research. Other centres would also be adequately strengthened. Under each of the existing centres, sub-stations will be opened to cover the regional variations in soil and climatic conditions. The centres at Dehra Dun, Kotah, Bellary, Ootacamund may have two sub-stations each. The centres at Chandigarh, Vasad, Agra and Ibrahimpatnam may have one sub-station each.

Research will also be taken up in drainage, irrigation and water use. A work unit may be established for watershed research and development also.

(xi) *Central Arid Zone Research Institute :*

27. Under Central Arid Zone Research Institute, the proposals for the Fourth Five Year Plan envisage the following :—

- (i) Setting up of the section of Soil Microbiology under Division No. 1 (Basic Resources Studies) and formation of Division No. III (External liaison in fields of physical and chemical engineering);
- (ii) Strengthening of Division IV (Human factor studies) and Division V (Special animal studies).
- (iii) Expanding Divisions I (Basic resources studies) and II (Resources utilisation studies) for more intensive research programme.
- (iv) Setting up of new research divisions.

SOIL AND WATER CONSERVATION—A KEY PROGRAMME FOR AGRICULTURAL DEVELOPMENT

28. Future hope of increasing agricultural production lies in the efficient use and management of soil and water resources, that will prevent soil deterioration, maintain and build up soil productivity. We may continue to emphasise the use of fertilizer, improved seed, water and other input factors, to increase agricultural production, but these measures will give only immediate and short term gains. It is a common experience that no two farms are alike and even within a farm the two fields do not behave the same way with the same kind and amounts of input factors. For optimum increase in production on sustained basis each input factor has to be suited to each soil type under varying climatic conditions. This, in effect, is soil and water conservation programme. Soil conservation is, therefore a key programme for increasing agricultural production.

29. Effective application of soil and water conservation measures can increase the yield very much. It has happened in U.S.A. and Australia where soil conservation measures have been adopted on an extensive scale. It has also happened under experimental conditions in India. Yield increases from 100-150 per cent have been obtained under experimental and demonstrational conditions in Maharashtra. In Uttar Pradesh at Rahemankhera farm, crop yields showed an increase by 986 per cent over nine year period as a result of effective soil and water conservation programme on the eroded lands.

SUBSIDY FOR SOIL CONSERVATION PROGRAMMES

30. Because of the national interest in the land and its use, it is necessary that soil conservation measures adopted by the farmers must be subsidised by the Government. The rational basis for subsidy would include cost of works and the nature of the benefit, whether it is for the individual or for the community. Further, the subsidy must enjoin on the farmer that he would maintain the structures, use them and adopt the minimum follow-up programme for use and management of soil and water that will make these structures useful and effective. The present pattern of subsidy in soil conservation programme is based largely on administrative conveniences. Subsidy is worked out on total cost of works which includes the cost of staff also. Subsidy does not enjoin on the farmers the responsibility for maintenance and use of the structures and follow-up programme. The guiding principles for subsidy in the Fourth Five Year Plan are suggested to be the following :—

(i) The subsidy should be based on cost of the actual works. The scale of subsidy should be higher for the measures that are more expensive than the ones which are less expensive.

(ii) Whether the measures adopted are for the benefit of the individual cultivator or for the benefit of the community. Thus some of the masonry or grassed structures for water disposal system which are for the benefit of a unit watershed or sub-watershed ought to carry higher rate of subsidy than

similar structures, small in size which may be constructed on an individual holding for the benefit of an individual farmer.

(iii) Cost of staff should not be charged to the scheme cost for working out subsidy to the cultivator.

(iv) Grant of subsidy should enjoin on the farmer or the community, the responsibility for maintenance and proper use of the various practices and measures.

(v) Grant of subsidy should also enjoin on cultivators that they shall ensure a minimum follow-up, that will make the practice effective and useful.

STATEMENT I—Showing tentatively the programme proposed to be taken up in the Fourth Plan with likely physical targets, financial implications and technical personnel required.

Sl. No.	Particulars of the programme	Proposed target for the 4th Plan area in million acres)	Financial implication (Rs. in million)	Requirement of technical personnel		
				Officers	Assistants	Sub-assistants
1	2	3	4	5	6	7
(i)	Soil and water conservation on watershed basis.	20.00	1825.00	435	4,350	16,700
(ii)	Soil and land use survey—					
	(a) All India soil and land use survey	20.00	2.50	..	..	..
	(b) State soil survey organisations.	35.00	38.50	102	219	290
(iii)	Soil and water conservation in watersheds of river valley projects.	2.50	510.00	112	749	2,573
(iv)	Pilot demonstration projects on watershed basis.	50 projects covering 0.1 million acres.	4.00	25	60	92
(v)	Stabilisation of ravines and protection of table lands.	1.00	144.00	4	52	208
(vi)	Reclamation of saline, alkali and water logged lands.	0.15	41.00	47	89	227
(vii)	Irrigation, water management and field drainage—					
	(a) Present waterlogged areas.	0.4	} 155.00	471	1,993	3,282
	(b) Areas to come under new irrigation command.	1.5				
(viii)	Setting up and strengthening of Soil conservation and soil survey organisations.					
	(a) State organisations.—Provided under respective State programmes		} 3.90	161	286	85.
	(b) Central organisation					

1	2	3	4	5	6	7
(ix)	Training in soil and water conservation.	..	25.00	50	115	100
(x)	Soil and water conservation research.					
	(a) State research schemes .		20.00	} 64	130	180
	(b) Central research schemes .		20.00			
(xi)	Central Arid Zone Research Institute.		7.70	81	175	47
	Miscellaneous		3.40	..	..	..
	TOTAL		2,800	1,542 or 1,550	8,218 or 8,300	23,734 or 24,000

STATEMENT II—Showing the nature of Advance Work necessary in the Third Plan for programmes to be taken up in the Fourth Plan and their financial implication, personnel required.

Sl. No.	Name of the programme	Nature of advance work in the Third Plan	Likely financial implication (Rs. in million)
1	2	3	4
(i)	Soil and water conservation on watershed basis.	Building up soil survey organisation and surveying about 4.0 million acres in the remaining period of the Third Plan.	5.50
(ii)	Soil and land use survey	(a) As above (b) Aerial photo interpretation will need to be developed.	Finances would be available from Plan allocation.
(iii)	Soil and water conservation in watersheds of river valley projects for protection of reservoirs and flood control.	(a) Making arrangements for training of specialists in scientific disciplines of geology, hydrology and economics in relation to watershed protection programme. This is for setting up 3-4 regional watershed planning units. (b) Strengthening of State organisation by adding design and construction engineers. (c) Starting 2-3 watershed protection pilot projects in the watersheds of major river valley projects. (d) Instrumentation and setting up of recording and gauging sites proposed in the Third Plan programme will need to be completed. (e) Facilities would need to be developed for manufacture of gauging instruments internally in the country.	.. 0.80
(iv)	Pilot demonstration projects on watershed basis.	—	—
(v)	Stabilisation of ravines and protection of table lands.	Aerial and ground survey to demarcate table and marginal lands.	Financial requirement will be met from the existing provisions for the survey of ravine lands.

1	2	3	4
(vi) Reclamation of saline, alkali and water logged lands.	To establish 2-3 pilot projects each covering about 300-400 acres particularly in the States of Uttar Pradesh, Gujarat and Punjab.	0.60	
(vii) Irrigation, water management and field drainage.		..	..
(viii) Strengthening of soil conservation and soil survey organisations.	(a) Steps would need to be initiated for building up and strengthening organisations in the States and at the Centre.	0.23	1
	(b) Field parties for consolidation of holdings will need to be strengthened by adding soil conservation supervisors to each party.		..
(ix) Training in soil and water conservation.	Building training facilities	1.00	
(x) Soil and water conservation research.	One research centre on salinity problems and two watershed units to be started	0.10	
(xi) Central Arid Zone Research Institute.	Proposals are under consideration.		..
TOTAL		8.23 million	

CHAPTER I

INTRODUCTION

1.1. In pursuance of the suggestions of the Planning Commission, for preparation of long term economic development Plans upto the end of Fifth Plan and more specifically for the preparation of projects for the Fourth Five Year Plan, the Ministry of Food and Agriculture (Department of Agriculture) constituted various Working Groups in the agricultural sector. One of the Working Group was set up for Soil Conservation with the following composition:—

Ministry of Food and Agriculture.

- | | |
|--|------------------|
| (1) Shri A. D. Pandit, Special Secretary. | <i>Chairman.</i> |
| (2) Shri V. S. Rao, Inspector General of Forests, later substituted on retirement by Shri Hari Singh, on his taking over as Inspector General of Forest. | <i>Member.</i> |
| (3) Dr. J. S. Patel, Agricultural Commissioner, Indian Council of Agricultural Research. | „ |
| (4) Dr. R. V. Tamhane, Adviser, Soil Conservation. | „ |
| (5) Shri F. C. Gera, Deputy Secretary, later substituted by Shri I. D. Khanna. | „ |
| (6) Shri J. K. Ganguly, Deputy Adviser, Soil Conservation (F) | „ |
| (7) Dr. S. V. Govindarajan, Chief Soil Survey Officer. | „ |
| (8) Shri B. D. Kapur, Under Secretary, later substituted by Shri V. S. Nigam. | „ |
| (9) Shri H. T. Khemchandani, Deputy Adviser Soil Conservation (I & C). | <i>Convenor.</i> |

Directorate of Economics and Statistics.

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| (10) Shri J. S. Sarma, Additional Economic & Statistical Adviser | <i>Member</i> |
| (11) Shri K. L. Chawla, Assistant Economic & Statistical Adviser. | „ |

Planning Commission.

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| (12) Shri D. P. Singh, Joint Secretary (Agriculture) | „ |
| (13) Dr. J. P. Bhattacharjee, Director, Programme Evaluation Organisation | „ |
| (14) Shri C. R. Seshadri, later substituted by Shri R. S. Singh, Chief (Agriculture). | „ |
| (15) Dr. S. P. Raychaudhuri, Senior Specialist, Land Resources. | „ |
| (16) Dr. W. B. Donde, Deputy Director, Programme Evaluation Organisation. | „ |
| (17) Dr. Vidya Sagar, Senior Research Officer (Agriculture Division) | „ |
| (18) Shri P. S. Sangwan, Research Officer, Programme Planning Division | „ |

Ministry of Community Development.

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| (19) Shri Ibae Ali, Director (Agriculture.) | „ |
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Ministry of Irrigation & Power.

- (20) Shri B. K. Uppal, Deputy, Secretary, later substituted by Shri G. K. Vij. *Member*
 (21) Shri V. K. Sharma, Director of Soil Conservation. "
 (22) Shri S. N. Misra, Under Secretary. "

Council of Scientific & Industrial Research.

- (23) Dr. K. N. Kaul, Director, National Botanical Gardens, Lucknow. "

Meetings were also attended by Dr. P. C. Raheja, Director, Central Arid Zone Research Institute, Dr. N. D. Rege, Deputy Adviser, Soil Conservation (R&T) and Shri Y. P. Bali, Assistant Adviser, Soil Conservation.

1.2. In the beginning, a Working Group was set up for "Soil Conservation and Land Reclamation". This Group was to consider the programmes of soil conservation, land reclamation and State mechanised farms. In the first meeting of the Working Group, it was felt, that the programme relating to State mechanised farms did not come within the purview of soil conservation. It was also felt that the programme of land reclamation required consideration of many other allied programmes, like land settlement, rehabilitation, land reforms policy and the question of economic and uneconomic holdings. Therefore, it was considered more appropriate that the Group that would look after these programmes should also consider the programme of land reclamation. Accordingly, the Working Group as initially constituted was modified as "Soil Conservation" working Group only. Hence, Shri I. P. Mathur, Deputy Secretary, who was initially a member of this Working Group for consideration of the programmes relating to land reclamation and State mechanised farms, later became the member of the Working Group on "Land Reforms and Resettlement of Landless Workers" which group was also to look after the programme of land reclamation.

1.3. Initially the programme of soil survey was to be discussed by the Working Group on "Land and Water Utilisation and Crop Planning". However, soil and land use survey being an integral part of soil conservation, it was considered more appropriate that it should be looked into by the Working Group on "Soil Conservation". Accordingly Dr. Govindarajan, Chief Soil Survey Officer, was also included as a member of the present Working Group.

Terms of Reference

1.4. The general terms of reference for the Working Group were as under :—

- (i) To make a critical review of the progress of the programme and schemes in the Third Plan period.
- (ii) To assess, in the light of current trends and other available data, the position likely to be reached at the end of the Third Plan.
- (iii) To formulate proposals for the Fourth Plan in the Perspective of ten year period, 1966-76.

1.5. The Working Group had, in all five meetings and prepared a tentative draft of the detailed proposals for soil and water conservation programmes, for the Fourth Plan, with projections for the Fifth Plan. The detailed draft was discussed with the technical and administrative representatives of all the State Governments and Union Administrations in a conference held on the 29th and 30th September, 1964, in Vigyan Bhawan. The recommendations made by the conference are incorporated in the final report of the Working Group as an Annexure.

1.6. The present report has 16 chapters dealing with (1) Formation of Working Group, (2) Place of Soil Conservation in Agricultural Development, (3) Nature of the problems, (4) Extent of the problems, (5) Present concepts and future policies, (6) Progress in retrospect, (7) Anticipated progress in the Third Plan, (8) Experiences of First, Second and Third Five Year Plans, (9) Proposed programme for the Fourth Plan, (10) Essentials of the programme, (11) Pattern of subsidy, (12) Requirement of technical and non-technical personnel, (13) Requirement of key materials, (14) Projections for the Fifth Plan, (15) Summary statement of the proposals for the Fourth Plan, and (16) Summary statement for advance work for the Fourth Plan. Besides, the report contains a complete summary and XIX annexures giving basic data and other relevant information.

CHAPTER 2

PLACE OF SOIL CONSERVATION IN AGRICULTURAL DEVELOPMENT

Soil Conservation a Key Programme :

2.1. Our national problems of soil and water conservation stem from our people. Our present population of 438 million, plus the added millions according to the population projections (489 million in 1966 ; 545 million in 1971 and 603 million in 1977); have to depend on soil and water for their daily living. All the food that they need, all the fuel, most of the fibre, and enormous quantities of raw material for industries have to come from proper use and management of soil and water—the two basic resources. Our livestock population today is about 330 million. This is to increase considerably in the years ahead. Fodder and feed required for the growing livestock have also to come from the same land.

2.2. In the coming years, with continuous increase in population, and with no chance of any material increase in land resources, our demand on land will be increasing continuously. If we have to meet the demands of our growing millions, and make available adequate amounts of raw material for our expanding industries, which we must, we have not only to protect our soil from deterioration, but also maintain and build up productivity further.

2.3. A close look at the way we have been using our soil and water resources does not present an assuring picture of efficient management of our soil and water resources. During the last two Five Year Plans, the production of foodgrains has gone up from 52.2 million tons in 1950-51 to 65.8 million tons in 1955-56 and 76.0 million tons in 1960-61. This is a laudible achievement. But a closer look at the productivity of soil as indicated by trends in production per acre tells a story that needs a careful thought. Annexure I(a & b) gives the trends in average yields per acre over a long period. An analysis of these figures shows, that, for the period from 1900-01 to 1939-40 (40 years) there has been a progressive decline in the production per acre of the major food crops. Again, from 1940-41 to 1959-60 (20 years) for which figures are compiled for individual crops, the picture is not encouraging either. While for rice, wheat, jowar, maize and gram, the production per acre has remained stable, in the case of bajra, barley, ragi and small millets, there is a positive decline. During the corresponding period and particularly during the last 10 years, there has been considerable increase in application of technology and production inputs to agriculture. Thus irrigation has increased by about 20 million acres, improved seeds have covered 85.7 million more acres (foodgrains only) and consumption of nitrogen (total for all crops) has increased 175 thousand

¹. Long term projection of demand of supply for selected agricultural commodities 1960-61 to 1975-76 By National council of Applied Economic Research.

tons. Besides, there has been increase in plant protection measures etc.

2.4. When the trends in productivity of soil as judged by yields per acre are analysed against the impact of technology and production inputs in agriculture, the only conclusion that comes to mind is that there are some adverse factors continuously at work which off-set the beneficial effects of technology and increasing inputs in agriculture. These factors are connected with loss and decline of soil productivity.

2.5. Deterioration and decline of productivity of soil occur due to soil erosion, loss of soil structure, loss of organic matter, loss of plant food, obstructed drainage and saline and alkali conditions of soil, and it results from misuse of the resources of soil and water. Though no comprehensive work study is undertaken to assess the rate of deterioration of soil productivity, but the data available from various surveys etc. do go to show that the deterioration is widespread and it is the most important cause of low productivity of our soils.

2.6. The situation in respect of waterlogging, soil salinity and alkali conditions arising in Punjab, Uttar Pradesh and many other States suggests the misuse and waste of water resources in agriculture on an extensive scale. In Punjab and Uttar Pradesh the estimates are that annually about 50,000 acres are rendered less productive or unproductive. Salinity is developing even in the areas newly coming under irrigation from new projects, e.g. Mysore, Rajasthan, Madhya Pradesh and other states.

2.7. Deterioration of soil productivity due to erosion is also widespread and serious. Although, no exhaustive surveys are carried out, however data available from surveys carried out in some parts of the country amply illustrate the seriousness of the problem. A survey in an area of Chota Nagpur region in Bihar showed, that, during a period of 45 years since the beginning of this century approximately, 17 per cent of the surveyed area has been lost to cultivation through gully erosion.¹ A similar survey in Maharashtra State showed that, in 75 years' time from 1870-1945, 17 per cent of soil of medium depth (more than 18 inches) deteriorated into shallow soils (less than 18 inches)¹. Yields decrease very sharply as the top soil is lost, and the depth of the soil is reduced. For instance, on the Dry Farming Station at Sholapur, the grain yield of jowar was 242 lbs. per acre on deep soils, 169 lbs. per acre on medium soils and only 69 lbs. per acre on shallow soils². In Madhya Pradesh in the three ravine affected districts of Gwalior, Morena and Bhind, a survey carried out in 1956 showed that, annually about 2000 acres of good agricultural land are thrown out of cultivation due to formation of new ravines, on account of serious soil erosion³.

¹. Group dynamics in North Indian village (From P. E. O. Report on study of soil conservation Programme of Agricultural land).

². Dry Farming in India, I. C. A. R. Monograph No. 15 by N. V. Kanitkar, 1944.

³. Report on Ravine Reclamation in Madhya Pradesh, Govt. of India, Central Water and Power Commission, 1956.

On the basis of an earlier estimate of ravine area made by Power Committee and the recent estimate made in 1956 about 3 lakh acres seem to have gone under ravines in 45 years. This, in other words means, that annually about 7000 acres are lost to ravines. This is besides many more acres of the table land in the contributing catchment, where productivity would have gone down as a result of sheet erosion. This figure would be staggering when we consider the problem of ravines in Uttar Pradesh, Rajasthan and Gujarat. These data though not exhaustive, do emphasise the rate at which soil deterioration and consequent loss in soil productivity is taking place.

2.8. How can we reach a high level of sustained production, in the face of progressive soil deterioration and water waste? Once the deterioration starts, it keeps on increasing at an accelerated rate. Without conservation of soil and water and proper and efficient use and management of these resources, we shall neither have abundance, nor even enough to hold our own.

2.9. We have no hope of raising agricultural production through extension of area. We have probably reached the end of our tether. Today, the net sown area in India is about 45 per cent of the total land area. Among the large countries of the world, India has about the highest percentage of land under cultivation. The arable land including current fallow and orchards farms is 30, 10 and 11.4 per cent of the land area in Europe, USSR and U.S.A.—Canada respectively¹. Whatever more land may be available in India under fallow, other than current fallow and culturable waste land, there is need to put that under forest and timber to achieve the targets of National policy of 1/3 land to be under forests rather than to put under cultivation.

2.10. According to the projection for area under cultivation, it is estimated, that, there may be a net addition to cultivated area by about 4 million acres by withdrawal from fallow and reclamation of culturable waste lands for the quinquennial period ending 1975. But during the same period there is likely to be a very significant withdrawal of land from agriculture too due to urbanisation, industrialisation and increasing road construction programmes. Therefore, the net effect on the possible extension of cultivated area, if any, is likely to be only marginal if not negative. The only way left for increasing the agricultural production, therefore, is to increase production per acre.

Table below gives the projected trend of expected per capita gross and net cropped area².

	1901	1921	1951	1961	1966	1971	1976
Gross area sown per capita (acres)	1.14	1.24	0.95	0.86	0.84	0.81	0.81
Net area sown per capita (acres)	1.03	1.11	0.94	0.73	0.67	0.67	0.60

It will be seen from the above table that progressively our demand from land will keep on increasing and we will be required

¹. Long term projection of demand for and supply of selected Agricultural commodities 1960—61 to 1975—76. By National Council of Applied Economic Research.

². Studies in Indian economics by J. P. Bhattacharjee.

to produce more and more from increasingly less and less area per capita. This trend will actually accentuate very sharply in the years ahead.

2.11. India has abundant resources of soil and water, and the potential for increasing production per acre. What is needed is high level of efficiency, in conservation, use and management of these resources to prevent their deterioration, and waste, maintaining and further building up productivity of land.

2.12. It seems self-evident, that, the national conservation problem is of considerable magnitude and of direct concern to all citizens in cities, towns and rural areas. The basic importance of land to the material and moral welfare of man makes conservation a must.

Soil Conservation is Not Just Good Farming :

2.13. Soil Conservation is often regarded as just good farming. This is further interpreted in terms of use of good seed, application of fertilizer and irrigation. It is often felt that once the irrigation water is brought on the field or fertilizer and good seeds are used, the problem of increased production from land is solved. We have been doing this good farming for the last decades. But this did not keep us from damaging and depleting our soil to a dangerous degree. No doubt these items of farming are constituents of good soil management, but soil conservation is more than mere good farming. Soil conservation means, taking care of fundamental problems of soil and water utilisation, as a foundation, on which to lay the super structure of good farming through proper seed, fertilizer and use of irrigation etc. Without taking care of fundamental problems of soil and water utilisation, good farming alone would not help in increasing the production from land in an enduring and sustained way. Thus applying fertilizer, or using good seed, on soils, with poor infiltration, or those suffering from obstructed drainage, or from salt concentration etc. will not help. In Soil conservation, therefore, the first things must come first, then alone the production per acre can increase on sustained basis.

Soil Conservation and Agricultural Production :

2.14. Effective application of soil conservation measures can increase the yields very much. It has happened in U.S.A. and Australia where soil conservation measures have been adopted on an extensive scale. It has also happened under experimental conditions in India. In U.S.A. as a result of adoption of soil conservation measures there was a big jump in farm production after 1940. The production went up to 5.5 billion bushels, which was an increase of 1.1 billion bushels, even though, fertilizer consumption had by then increased only slightly. Steep increase in fertilizer use in U.S.A. is essentially a post war development, but a spurt in production and per acre yield of all crops had taken place somewhat earlier. For nearly 75 years, upto 1940, the yield of corn, wheat, oats and barley had remained steady. After 1940, during the quinquennial period ending 1945, the yield of corn went up from 25.8 to 32.8 bushels, wheat from 13.8 to 17.5 bushels, oats from 30.2 to 32.3 and barley from 22 to 24.1 bushels per acre, although during the same period the

fertilizer consumption went up only slightly'. In 1958 more production was obtained from less area than in 1927'. Present trends indicate that by 1978 production will further increase from still fewer acres. In Australia, Yields have been even doubled on eroding lands at low capital cost, through adoption of effective soil conservation measures'. In India although extensive field data are not available about increase in production potential on account of adoption of soil conservation measures, but, studies carried out at Sholapur and Rahemankhera farms suggest tremendous possibilities. It is reported that at Rahemankhera, farm, crop yields increased by 986 per cent over 9 years period on eroded soils, as a result of effective soil and water conservation programme'. Besides, there was a tremendous shift in cropping pattern, with increasing area under finer crops than coarse ones. At Sholapur, under dry farming conditions, adoption of soil and moisture conservation practices increased the crop yield by more than 100 per cent as is evident from the following table :—*

(Yield of Sorghum in lbs per acre)

Period	Average rainfall	Practice	Soil type		
			Deep	Medium	Shallow
1	2	3	4	5	6
Average of 7 year 1934-41	24.64 inches	Bombay Dry Farming method.	242	169	69
		cultivator's method	110	80	33

Studies in pasture development and improvement carried out in Saurashtra and Rajasthan indicate a tremendous improvement in quantity and quality of Pasture-age. This is obvious from the following data :—

Effect of closure on improvement of pasture (Saurashtra)

Factor	Kind of grasses	Condition of grassland	
		Reserved (Closed to grazing).	Heavily grazed.
Present Basal cover (Annul)	(Perennial)	10.0	1.7
		18.3	8.6
Per cent Composition	(Perennial)	Total 28.3	10.3
		35.3	14.7
	(Annual)	64.7	83.3
Yield in pounds per acre		Tota 100.00	100
		1864	491

*Monograph on dry Farming in India 1944 by Kankar.

1. Agricultural production in India. Some lessons from America by M. S. Sivaraman.
2. Transaction of 7th International Congress of Soil Science 1960 Vol. I
3. Soil Conservation S. C. S. U. S. D. A., Vol. XXV No. 1, 1956.
4. Annual Report Rahemankhera for 1958-59.
- †. Report of Grassland Improvement Programme in Saurashtra, Bombay State 1956-58 by F. W. Abertson 1958.

2.15. The reason for misuse and waste of soil and water resources are many and varied. Exploitive cultivation, tilling the land with the slopes, frequent harrowing in rainy season, violating land capability in allotment of new lands for cultivation, and unjudicious and excessive use of water, are some of the few causes in the arable fields. Other causes are indiscriminate felling of trees, over-grazing, forest fires, shifting cultivation and excessive forest rights, and indiscriminate quarrying.

CHAPTER 3

NATURE OF SOIL CONSERVATION PROBLEMS

3.1 With a wide variation of soil and climatic conditions as prevail throughout India, and different types of agriculture, it is only but natural, that problems of soil and water conservation should be quite varied and different in different regions. Major problems of one region may not exist in another region.

Physiography and Soil Erosion :

3.2. Physiographically India is divided in three main regions the Himalayan region in the north, Peninsular region comprising of the Central India and Deccan Plateau and the Gangetic alluvial plains. Besides, there may be recognised two sub-regions, the Rajasthan desert and tidal lands along the coast line.

3.3 Geologic immaturity of the Himalayan region has made it more vulnerable to erosion. Major problems in this area comprise of seasonal torrents (chos), gulying, land slides and slips. Due to wide variation in rainfall which increases from West to East in the Himalayan region, the nature and severity of torrents and the type of debris carried by them, varies very considerably. When in the west near Hoshiarpur, the debris consists largely of sand, in the east in the catchment of Kosi and even beyond, the debris consists of very coarse material and big boulders. Because of variation of rainfall, while rehabilitation of denuded areas is faster in the east, it is often difficult in the far west, due to poor moisture conditions.

3.4. Entire Himalayan region is a big watershed for most of the important river valley projects that are constructed for irrigation, hydroelectric power, and flood control. Soil and water conservation of these areas, is of very great significance, for prevention of siltation of these reservoirs, and prolonging their useful life, to build the future prosperity of the country.

3.5. In the Peninsular India, comprising of the Central India and Deccan Plateau, major problem is sheet and gully erosion and moisture conservation. Deficiency of moisture is of particular significance in Deccan Plateau, due to low and precarious rainfall, poor infiltration capacity of soils, and high wilting co-efficient.

3.6. In the Gangetic alluvial plains, the problem is one of riverian erosion, drainage, salinity and soil alkali condition. Gangetic plains with deep rich alluvial soils are one of the most fertile soils. With proper soil and water management, these soils can be the inexhaustible granary of food.

3.7. In the arid Rajasthan desert, the problem is one of serious wind erosion, which not only lowers the productivity of desert soils, but also renders the adjoining fertile alluvial lands less productive by disturbing moisture and fertility balance adversely. Recent

studies at Central Arid Zone Research Institute have indicated, that, the moving sands of desert can be well stabilised through pasture development. Once reclaimed, these sands not only cease to be menace to adjoining good agricultural land, as at present, but will hold a great potential for developing the area for livestock industry, e.g., dairy and sheep. The problem of tidal lands along the coast line is of salinity due to sea water.

Major Soil Types and Soil Erosion :

3.8. Soil and water conservation problems also vary with the major soil types e.g. alluvial, black cotton soils, red and lateritic type of soils. Alluvial soils are characterised by great depth and good infiltration and permeability. But because of unstable structural conditions, the soil particles are easily detachable. These soils are very vulnerable to soil erosion, wherever there is perceptible gradient. These soils lend to easy formation of gullies, the example is formation of ravines. Black cotton soils are characterised by low infiltration and poor permeability. The structural development is good and stable. These soils do not lend easily to gully formation. Sheet erosion is a more serious problem on these soils. Lateritic soils are fair in infiltration and permeability, but because of poor structure and tendency to crust formation, these soils are subjected to excessive run off and consequently suffer from severe sheet and gully erosion. Red soils are generally good in infiltration and permeability, but due to light texture, poor depth, they are suffering from serious erosion problems etc.

Major Soil and Water Conservation Problems :

3.9. In summary, the particular soil and water conservation problems pertain to :—

- (i) agricultural land,
- (ii) forest areas,
- (iii) desert of Rajasthan,
- (iv) ravines,
- (v) watersheds of river valley project,
- (vi) saline, alkali and water logged lands,
- (vii) conservation irrigation, and
- (viii) miscellaneous soil problems.

CHAPTER 4

EXTENT OF SOIL AND WATER CONSERVATION PROBLEMS.

Soil Erosion :

4.1. This is the most serious problem in all areas. There has been no systematic survey, nor any work study to assess the extent of soil erosion problems. However, based on general topography, physiography, climate, soil types and their characteristics and the pattern of agriculture in different parts of the country, the extent of the area where soil erosion is recognised as serious, and hence needing immediate attention, is estimated to be about 200 million acres. Major problem areas are recognised to be,

(i) non irrigated, non paddy agricultural lands with uneven topography, mainly in Peninsular India, comprising of Central India plateau and Deccan plateau, Himalayan and sub-Himalayan region of Punjab, Uttar Pradesh, Jammu & Kashmir and Himachal Pradesh; plateau land of South Bihar, and undulating and dry areas of red and laterite soils of Orissa and West Bengal; and areas affected by shifting cultivation in Assam and in many other States.

(ii) Rajasthan desert.

(iii) Fallow, waste land and other mountainous areas.

Shifting Cultivation (forest areas) :

4.2. Deterioration of soil resources due to the widespread practice of shifting cultivation is a serious problem in number of States, notably, Assam, Orissa, Madhya Pradesh, Andhra Pradesh, Maharashtra and the Union Territories of Manipur and Tripura. According to estimates for 1956, about 13.5 lakh acres were utilised for shifting cultivation. However, the total area damaged by shifting cultivation is many times more. In Orissa alone, it is estimated that about 13,000 sq. miles or more than 8 million acres are affected by shifting cultivation practice¹.

Rajasthan desert :

4.3. The extent of Rajasthan desert is estimated to be about 50 million acres. Most of this, which comprises of sands, would need stabilisation.

Ravines :

4.4. Ravines along rivers Chambal, Yamuna and Mahi in Madhya Pradesh, Rajasthan, Uttar Pradesh and Gujarat are a significant problem. Rough estimates place the problem area at about 6 million acres, comprising of about 3.5 million acres in Uttar Pradesh, about 8 lakhs acres in Rajasthan, 6-7 lakh acres in Madhya Pradesh and about 10 lakh acres in Gujarat. These ravines need reclamation largely for timber and fodder purposes and only to a very limited extent for agricultural purposes.

¹Shifting Cultivation Practices in India, 1958 by D. C. Kaith.

4.5. Apart from the ravines proper, there is an equivalent area of the marginal land bordering ravines and the table land of the contributing catchment comprising 3 to 4 times the areas of ravines, that are exposed to serious erosion. With continuing erosion every year, more and more marginal and table lands are thrown out of cultivation, due to formation of new ravines. All this land needs effective protection, to prevent fresh ravine formation and maintain and build up the productivity on priority basis.

Watersheds of River Valley Projects :

4.6. Total watershed area of the river valley projects that are existing or which are just completed, those taken up during the Third Plan and are under construction, and those that are proposed, is estimated to be about 3.7 lakh sq. miles or about 237 million acres. Most of this area will need treatment and protection in varying degree. Most of the problem area under river valley projects is also the problem area under agricultural and non-agricultural watersheds. No demarcation can be made.

Saline, Alkali and Waterlogged lands :

4.7. In the irrigated areas the main problem is water logging, soil salinity and alkali conditions. Salinity and alkali problems occur in many dry areas and in tidal lands as well. There are no accurate statistics about the extent of these areas. However, whatever data are available which are on the conservative side, reveal that the magnitude of the problem is alarming. Table below gives the rough estimates of the problem in different States for which some information is available.

*Table showing the extent of saline, alkali and waterlogged areas.**

(Area in Lakh acres)

Sl. No.	Name of the State	Area affected by saline and alkali soils		Waterlogged area
		Inland	Coastal	
1	2	3	4	5
1	Punjab	30.0	..	25.13 (0'—5') 2.19 (5'—10') Potential pro- 1.49 (10 —15') blem areas.
2	Uttar Pradesh	31.0	..	
3	Deccan Canal areas	30.0	..	
4	Maharashtra and Gujarat . . . . .	..	60.0	0.55
5	Kerala . . . . .	..	0.35	..
6	West Bengal . . . . .	..	2.10	..
7	Rajasthan	10.0	..	..
8	Bihar	0.1	..	..
9	Delhi . . . . .	..	..	0.03
TOTAL		101.10	62.45	29.39

*Source of information is study of waste lands in India, including saline, alkali and waterlogged lands & their reclamation measures by Committee on Natural Resources, Planning Commission.

NOTE:—Apart from the States for which data have been available, problem exists in many other States as well, e. g., Madras, Mysore, Andhra Pradesh, & Madhya Pradesh.

Roughly the problem area is estimated to be about 10 million acres of saline and alkali soils and about 6 million acres of coastal saline lands and about 3 million acres of actually waterlogged land with immediate problem or with a potential to be a problem, in not too distant a future. If the information is compiled for other States and the future trends analysed, the problem will be more serious even, than what the available figures show it to be.

Conservation Irrigation :

4.8. Yet there is another problem of land levelling and land forming in irrigated lands to receive irrigation, and for judicious use of water. Without such a programme, efficiency of irrigation water will be much reduced. Almost all the new areas covered or to be covered by irrigation from new projects in the Second, Third and subsequent Plans need this programme.

Miscellaneous Problems :

4.9. Although, the major problems under soil conservation are recognised as, erosion due to water and wind ; reclamation and stabilisation of ravines; prevention, control and reclamation of saline-alkali and waterlogged soils; protection of watersheds of river valley projects and conservation irrigation etc., there are many soils problems which cause soil deterioration, lower productivity, and make the soils less responsive to inputs of good seed, fertiliser and irrigation etc. These include, poor soil structure, formation of soil pans, and poor soil physical conditions. For these problems, there are no estimates, and unfortunately no appropriate recognition in our agricultural development programme. Erosion control alone will not increase production, if some other soil condition is a limiting factor. Any scheme for soil and water conservation should recognise these problems and tackle them in a composite and comprehensive way. A comprehensive and correct appraisal of various such problems can be possible only through a detailed soil survey. Therefore, soil survey should be an essential requirement for any soil and water conservation programme.

4.10. Thus while above may be reasonable estimates of the priority problem areas, the extent of total problem areas needing protection in varying degree, in the long run, will be much large and may be of the order of 500-600 million acres. Although the paddy fields are recognised to be secure against erosion hazard, but in majority of cases, terraces already constructed need re-adjustment, besides these areas need a more effective water disposal system. Forests are considered as secure against erosion damage, however, serious damage is observed in so called forested areas, except probably in the reserve areas, because, most of forests are heavily burdened with private rights and are subjected to indiscriminate denudation.

CHAPTER 5

PRESENT CONCEPTS AND FUTURE POLICIES IN RESPECT OF MAJOR SOIL AND WATER CONSERVATION PROBLEMS.

Soil Conservation in Agricultural Land :

5.1. Present, concept of soil conservation on agricultural land is limited to erosion control through a programme of contour bunds, either on dead contours or with some grade and construction of level terraces in steep areas. There is no emphasis on management of soil in the bunded areas. Soil conservation schemes are prepared without any assessment or appraisal of basic soil and water problems. This is because, contour bunding has come to be recognised as synonymous to soil conservation. There is no system of any functional field evaluation of various practices in any planned way. Thus, no technical evaluation is made to assess the technical adequacy of various practices and measures. Generally, the gain due to increase in crop yields, on account of erosion control engineering measures is accepted as automatic. There is no critical field assessment of the benefits of erosion control measures, neither in physical units nor in economic units.

Contour Bunding Alone is Not Soil Conservation :

5.2. Bunding does not help to prevent soil erosion effectively, if the soil enclosed between these bunds is continued to be farmed in an exploitive way. Observations have indicated, that, in many cases, burrow pits, dug up for contour bunds, are filled in one or two seasons at the most with the soil that is eroded from upper side of the plots. Accumulation of 30-50 tons of soils at the toe of the bunds has been observed in certain studies. In more vulnerable areas such accumulation could be even much higher. Movement of soil from upper part of the field and its accumulation at the toe is no soil conservation. Conservation can occur only, when soil is protected from detachability and transportation through run off, from its original place of occurrence. This can take place, only when anti-erosion engineering measures are supported by proper soil management programme. Studies in U.S.A. for instance showed, that, on slope lengths ranging from 157.5 to 630 feet (these are about the lengths followed in contour bunding programme in India also) the loss of soil in four years varied from about 39.82 tons per acre for shortest slope length to 66.89 tons per acre for longest slope length, being more when the farming was done with the slope than with contour cultivation. During the period of study total rainfall was only 10.13, 26.88, 21.4 and 32.8 inches with effective rainfall only 5.94, 11.84, 7.87 and 11.99 inches respectively¹. Although, comprehensive field data on which such studies under Indian conditions are not available, but small plot studies have shown that, cultivation along slope increases soil loss many fold over contour farming.

¹Soil and Water conservation Investigations by G. W. Musgrave and R. A. Nortan.

5.3. Benefits of contour bunding programme, in moisture conservation and increased production are not automatic, once the practices are applied. Studies at Bellary Research Centre have shown that graded bunds did not increase moisture conservation, nor did they improve the crop yields, because, apart from erosion, poor infiltration was the limiting factor for moisture conservation and crop response. No one single practice will increase crop yields significantly, so long as some other adverse factor of soil unit is limiting the crop growth. In many field programmes, observations have shown, that contour bunds in many cases, instead of improving conditions for crop growth, resulted in unfavourable conditions of loss of crop due to water stagnation. This happened because no consideration was given to other soil conditions that were limiting production in those areas. The result was that farmers had destroyed bunds and probably with good reason.

Soil Conservation Is Efficient Use and Management of Soil and Water Resources.

5.4. In the present approach to soil conservation programme, no consideration is given to the problem of use and management of water in an integrated way. The development and management of soil are inseparable from use and management of water. The water element cannot be separated from soil element, in successful conservation effort. Water is used for growth of plants. Wherever water is used through irrigation, without proper conservation programme, soil deterioration sets in. Thus, soil conservation problems on irrigated lands of Punjab, Uttar Pradesh, and many other such areas, result from an unbroken chain of misuse and waste of water. One of our big opportunity for the future rests in getting more efficient use of water, through its proper management and development.

5.5. If our efforts at soil conservation are to yield good returns, soil conservation should include use, management, and development of soil and water on watershed basis. The programme should include, not only erosion control measures, but also management of soil, correction of other soil factors limiting production, and efficient water use and management. The last one should include field drainage, both surface and underground, proper alignment of field channels, and levelling and land forming to receive irrigation water. A comprehensive soil conservation programme should be prepared only after proper appraisal of problems of soil deterioration, through standard soil survey (detailed survey of agricultural land and reconnaissance survey of other areas). Thus, soil survey should be as an essential requirement for planning and implementation of an effective soil conservation programme.

Dry Farming Measures :

5.6. Dry farming is a system of soil and water management suited to arid and semi-arid areas for conservation and efficient use of soil moisture. The kind and amount of various practices that constitute dry farming, vary from region to region. When measures are not adopted effectively along with that in a coordinated way, then the effect of erosion control measures is likely to be marginal

only. At present dry farming measures are not being adopted along with erosion control measures in any coordinated way. Further, the contents of this programme are also not defined precisely and the responsibility for execution is loosely fixed which does not provide adequate checks for field evaluation. The States in many cases have not defined precisely the type and amount of various practices that will constitute dry farming. Even practice like line sowing (not contour sowing) is regarded as dry farming. Apart from arid and semi-arid areas, practices for management of soil and moisture are equally essential in other areas which receive more rain and where erosion control measures are being adopted as a soil conservation programme. The measures constitute conservation farming.

5.7. Contour bunds and terraces are only a means for conservation of soil and moisture. While these practices make conservation of soil and moisture possible, actual conservation benefits and increase in crop production can be achieved only when soil and moisture are managed according to the conservation principles. Thus, if soil conservation programme is to yield any good results, conservation farming including dry farming must be applied effectively in a coordinated way, with other erosion control measures, as an essential constituent of the comprehensive soil and water conservation programme.

5.8. In the Fourth Plan there would be no separate programme of dry farming (or conservation farming). Instead these measures would be an essential component of soil and water conservation programme in all agricultural lands.

Ravine Reclamation :—

5.9. At present, emphasis in ravine reclamation is on their reclamation for agricultural purpose. This programme is very expensive and not remunerative, commensurate with the cost of reclamation. Ravine soils are low in agricultural productivity. However, ravines have good potential for fodder and fuel resources at a very small cost. Bordering ravines, along the entire periphery are marginal lands, and productive table lands of the contributing catchment, which comprise about four to five times that of the ravines, in extent. These soils are exposed to perpetual hazard of accelerated erosion, and every year, large areas of these lands are thrown out of cultivation due to formation of new ravines. In Madhya Pradesh alone, in different surveys, it was estimated that new ravines develop in about 2,000 to 7,000 acres annually. When we consider the extensive periphery of ravines in Rajasthan, Gujarat and Uttar Pradesh, the rate at which fertile table lands must be going down in productivity or may be thrown out of cultivation due to formation of new ravines must be staggering. It is far more important to protect the fertile top lands to stop their plunder and stabilise marginal lands and gully heads of ravines than to reclaim a few thousand acres of ravines for agricultural land.

5.10. In the Fourth Plan and after, there would be no large target for reclamation of ravines for agricultural purposes. Major emphasis will be placed on treatment and protection of table and marginal lands and stabilisation of gully heads. Reclamation of

ravines proper will be done largely for fuel and fodder reserves. Development of ravines for agricultural purpose will be taken up only to a very limited extent and confined only to very shallow peripheral ravines and such others that may be coming under irrigation command.

Reclamation of Saline, Alkali And Waterlogged Lands :

5.11. This problem has not received much attention in the earlier Plans. In the Third Plan there are sizeable targets for Punjab, U.P., Mysore and to a limited extent in Madhya Pradesh, Madras, Rajasthan and Delhi. Besides, Maharashtra and Gujarat have also sizeable targets, but these are for coastal saline lands. In Punjab it is mainly reclamation of water-logged areas. Under the programme, only main drains are constructed at considerable distance, and there is no programme of field drains in any integrated and comprehensive way. Lateral movement of free water in the soil is limited, depending on the soil characteristics. Digging of main drains at considerable distance will benefit only the small area along the drain, leaving much of the affected area still in problem, from agricultural stand point.

In U.P. the major emphasis is on demonstrating the methods, and then leaving the initiative with the cultivators. This is not an effective approach. Reclamation of saline and alkali lands is a highly technical operation. It cannot be left to the initiative of the cultivators.

5.12. There are many complexities in the reclamation of saline, alkali and waterlogged lands. Nature and severity of the problem varies from place to place. Depending on these variations, the type and amounts of measures necessary will also vary. Successful implementation of the programme depends on :

- (i) Determining the location and distribution of the affected area;
- (ii) Diagnosis of the nature and severity of the problem ;
- (iii) Application of right methods in correct amounts ;
- (iv) Evaluating the progress of reclamation ;
- (v) Maintenance of reclaimed lands in productive condition.

Not all saline and alkali lands are reclaimable, nor all reclaimed land will be suitable for cultivation, and high level of productivity. Some of these soils can be suitably used, more profitably, for growing some forest species.

5.13. Hitherto, the approach to the problem of reclamation of saline and alkali soils has been over-simplified. Leaching or application of gypsum is regarded all that is needed for reclamation. Good results are not likely to follow simple and easy methods in reclamation. Intensive soil and underground hydrological studies are necessary for successful reclamation operations.

5.14. Future approach should highlight appropriate soil and hydrological surveys, diagnosis of the nature of the problem, delineation of easily reclaimable areas, application of appropriate measures

and proper maintenance of reclaimed areas. For successful reclamation operation, there should be close coordination of various specialists including agricultural chemist, irrigation engineer, drainage specialist and agronomist.

5.15. Yet another aspect of future programme of reclamation of saline, alkali and waterlogged lands is the observation of the changes in the water table, in the areas commanded or to be commanded by new irrigation projects. These observations may be taken from the observation wells or through piezometers installed for the purpose, so that, timely steps could be taken to prevent new areas from developing into problem. It is far more easy to prevent than to control salinity and water logging problems.

Soil Conservation in the Watersheds of River Valley Projects for Protection of Reservoirs and for Flood Control :

5.16. Present approach to soil conservation in the watersheds of river valley projects emphasises only simple erosions control measures of contour bunding and terracing in the agricultural land and afforestation and pasture development in non-agricultural lands. Sufficient emphasis is not given to control of sediment from other sources, e.g., road sides, bank cutting, bed scour and landslides etc. which are often the major sources in many areas. The approach is rather superficial than comprehensive. Because of this limited concept, the need for detailed survey to collect basic data about the watershed characteristics, to delineate the sources of sediment, and determine the types, amounts and locations of various measures and structures are not fully recognised. Even in soil survey, emphasis is voiced only on locating critical areas through aerial surveys. No doubt, it is easy to study aerial photographs to locate the critical areas, but such short-cut surveys, without careful study of soils themselves, are bound to be untrustworthy and ephemeral. Further, with only erosion control measures, without proper land use and management programme, based on complete soil survey, it will be only a matter of time, when simple erosion control measures will fail to achieve even what little is expected of them.

5.17. With whatever erosion control measures are adopted as at present in the watersheds for sediment control, substantial quantity of sediment will still continue to flow to reservoir. Besides, there will be sediment from other sources as well. For effective sediment control, it is imperative to have structural work included in the programme, in a comprehensive way, for sediment detention, and stream and channel correction etc. for each small watershed area. Good and effective results will not follow the simple easy changes only, as are attempted at present.

5.18. In the present watershed treatment programme, there is no system of field evaluation, to assess the efficiency and effectiveness of various measures for sediment control. Without a rigid system of field evaluation through instrumentation and functional field inspections, we are more likely to be left with a sense of false security only.

5.19. Generally with every flood that occurs, the thought for prevention goes to construction of levees, dykes and embankments

etc. Although there are no exhaustive studies made to correlate intensity of flood with time, but, some indications are that since 1943 there has been some abrupt increase in the magnitude of flood. Although this is treated lightly, the fact however cannot be ignored, that levees, dykes and embankments are not full answer to control of floods. Prevention of floods must begin in the upper watersheds, where the rain falls. The programme of watershed protection can reduce the volume of water pouring out into the main streams and channels. Although this fact is recognised in principle but there is wide gap in the principle and actual practice.

5.20. The future approach to watershed programme for protection of river valley projects and flood control should highlight the following :—

- (i) A comprehensive planning, based on detailed surveys which should include hydrological, geological, engineering, soils, land treatment and economic surveys, to delineate various sources of sediment; their respective importance; type and amounts of various practices and structures needed, their location and standards and specifications necessary and cost benefit ratios should precede the treatment programme.
- (ii) For carrying out planning, and surveys as in (i) above, there should be planning units on regional basis under Centre for each river valley project.
- (iii) There should be a system of rigid and continuous functional field evaluation of various practices and structures through intensive instrumentation and field inspections.
- (iv) The treatment of watersheds should include not only the simple and easy erosion control measures as at present, but also structural works for sediment detention, bank cutting and stream training etc. for each small watershed.
- (v) Engineering schemes for flood control should assess the nature and extent of soil conservation needs of the watershed and the required programme should be included in the estimates of the scheme.

PROGRESS OF SOIL CONSERVATION IN RETROSPECT

*First and Second Five Year Plans.**First Five Year Plan :*

6.1. It was in the First Five Year Plan that need for taking up soil conservation programme on country-wide basis, in a coordinated way, covering survey, research, demonstration, training and extension was recognised. A Central Soil Conservation Board was set up towards the end of 1953. The Board was charged with the responsibility to initiate, organise and coordinate research in soil and water conservation, to train personnel to assist States in carrying out soil conservation programmes, and spread education. During the short period of First Plan only spade work was done. A sum of Rs. 16 million was spent on soil conservation schemes. A large part of this amount was utilised for anti-erosion measures like contour bunding, and terracing on 7 lakh acres of agricultural land, mostly in Maharashtra and Madras States. A beginning was made in establishing 8 research-cum-training-cum-demonstration centres at Dehra Dun, Chandigarh, Bellary, Ootacamund, Kotah, Vasad, Agra and Jodhpur.

Second Five Year Plan :

6.2. Soil conservation programme was pursued in a more intensive way in the Second Plan. Progress made is summarised below.

State Schemes—Achievement in physical units (Annexure II):—Under the State schemes physical targets were set at 3 million acres, comprising of 2 million acres of agricultural land for contour bunding and terracing and one million acres of other areas for afforestation and pasture development measures. About 2.5 million acres of agricultural land were protected with contour bunding and terracing. Besides, an area of about 0.44 million acres was brought mainly under afforestation as a soil conservation programme. This covered ravines, hilly areas, waste lands, desert and denuded forests. There was no special emphasis on soil conservation work in the watersheds of river valley projects. Only about 1.5 lakh acres were protected in the watersheds of D.V.C., Bhakra and Machkund as a part of regular State schemes.

6.3. Programme of ravine reclamation was taken up on a modest scale only, largely as pilot projects, or for developing these areas for fuel reserves. There was no scheme for reclamation of saline, alkali and waterlogged lands, except a pilot polder scheme for reclamation of coastal saline lands in Gujarat.

6.4. The programme of research and demonstration under State schemes was rather modest. No soil, land capability and land use

survey was taken up to any significant extent. Only contour surveys were taken up for preparing contour bunding and terracing schemes.

6.5. *Centrally Sponsored Schemes* (Annexure II):—Under Centrally sponsored schemes 46 demonstration projects (40 on dry farming in arid and semi-arid areas; 6 in the catchment of Bhakra for watershed protection) were taken up as an educative programme for farmers. Out of 40 dry farming projects, work could be taken up on 18 projects. The work in the 6 watershed demonstration projects in Himachal Pradesh and Punjab in the catchment of Bhakra was completed.

*Central Schemes of Survey, Research, Demonstration and Training
(Achievements in physical units—Annexure II)*

6.6. *Survey*.—Under All India Soil and Land Use Survey Scheme, soil survey both detailed and reconnaissance was completed for about 13.9 million acres. Out of this, 2.4 million acres were in the watersheds of Bhakra, Chambal, Machkund and Hirakud. (In D.V.C. survey was carried out by the project authorities under Central aid) and 11.5 million acres in other areas in the States of Maharashtra, Mysore, Madhya Pradesh, Andhra Pradesh, Madras, Kerala, Rajasthan, Punjab, Uttar Pradesh, Orissa, West Bengal, Delhi, Andamans, Tripura and NEFA.

6.7. *Research*.—Research was intensified at the centres set up in the First Five Year Plan. One more centre was set up at Chatra to take up research on soil conservation problems of the watershed of Kosi river valley project. The centre at Jodhpur was reorganised to Central Arid Zone Research Institute in collaboration with UNESCO. The scope of work at the Institute was enlarged to cover research in fundamental and applied aspects of physical and social sciences and human and animal studies connected with use, management and development of arid and semi-arid areas of the country. At Jodhpur, a pasture development scheme was started for stabilisation of drifting sand. Fifty one paddocks, each of 150-200 acres, in 18 extension blocks in 10 districts in Western Rajasthan were established for pasture development.

6.8. *Training*.—Training in soil conservation was imparted to about 170 Officers at Dehra Dun centre and about 900 Assistants at Bellary, Ootacamund, Kotah and Hazaribagh (D.V.C.).

6.9. *Legislation*.—The Board prepared a model soil conservation Bill for taking up soil conservation schemes on watershed basis and recommended to States for adoption with modifications, if necessary, for a preparation and execution of land improvement schemes including those for conservation and improvement of soil resources, prevention and mitigation of soil erosion, protection of land against damage by floods or drought and reclamation of waste lands. Out of 15 States and 5 Union Territories, 11 States and 3 Union Territories had some enactment for preparation and execution of soil conservation schemes.

Utilisation of Finances (Annexure III).

6.10. Total utilisation of finances for soil conservation schemes was about Rs. 203.7 million for State schemes, Rs. 3.0 million for

Centrally Sponsored Schemes and about Rs. 17.5 million for Central Schemes of survey, research, demonstration, training and pasture development programmes, against Plan outlays of Rs. 202.9, Rs. 6.2 and Rs. 20.9 million, respectively.

6.11. Judging from the progress, in individual States, in physical units and utilisation of financial resources, the progress may be reckoned as good in Maharashtra, Gujarat, Mysore and Madras; satisfactory in U.P., Bihar; fair in Madhya Pradesh, Andhra Pradesh; poor in Rajasthan, Kerala, Punjab, and very poor in rest of the States.

CHAPTER 7

ANTICIPATED PROGRESS OF SOIL CONSERVATION IN THE THIRD FIVE YEAR PLAN

Third Plan Programme :

7.1. In the Third Plan soil conservation received a high priority, second only to Minor Irrigation, after agricultural production programme. Financial allocation for the Third Plan was about Rs. 720 million. A significant point about this allocation was that, out of the total amount, a sum of Rs. 110 million was specifically allocated for soil conservation in the watersheds of river valley projects, as a Centrally sponsored programme, for protection of dams and reservoirs from siltation. Important physical targets included were, contour bunding and terracing of 11 million acres, adoption of dry farming practices 22 million acres, ravine reclamation 35,000 acres, reclamation of saline and alkali soils about 2 lakh acres, reclamation of waste lands 75,000 acres (under soil conservation only); afforestation and pasture development about 8 lakh acres-covering desert and hilly areas, waste lands and denuded forests, and soil conservation in the watersheds of river valley projects about one million acres. Other programmes included were survey, research, demonstration and training.

7.2. In the wake of national emergency, National Development Council emphasised the need for taking up soil conservation on much bigger scale, as an emergency measure, to increase food production on sustained basis. Recommendation was made to raise the contour bunding target by 50 per cent i.e. to 16.5 million acres and that of dry farming to 50 million acres. Subsequent to National Development Council's recommendation, a high level Central Team was formed, to go round the States and discuss the ways and means of stepping up the Plan targets under various agricultural programmes including soil conservation. As a result of these discussions, it came to be realised, that the original targets laid down for the Third Plan were not realistic and hence could not be fully achieved. In fixing these targets, it was originally assumed, that, there will be substantial contribution from voluntary cooperation of people, cooperative sector, block agencies and Land Mortgage Banks etc. in achieving the targets. However, later experience showed, that, this was not possible, and hence could not be realised. Achievement of the original targets and any further increase would be possible only, if additional funds were made available. The final position that emerged out of the discussions of the Central Team with the State officials was that the targets of contour bunding and dry farming could be revised only marginally to 11.7 million and 25 million acres respectively, provided additional funds to the extent of about Rs. 170 million could be made available to the States. Further, on the basis of the information from the States, the targets for afforestation and pasture development came to about 6.44 lakh acres and that of the programme in the watersheds of river valley projects to about 7.8 lakh acres.

7.3. It is yet too early to say with any certainty if provision of additional funds would make it possible to achieve the revised targets fully. The reasons for this outlook are, that, firstly, even if the funds are allocated by the Planning Commission, States' own financial resources may be a bottleneck. Secondly, that building up of adequate technical resources in the remaining only about 1½ years may not be fully possible. In most cases it may be difficult, if not impossible, for the States to get sufficient qualified persons trained, to match the targets. The general observation of some of the States is, that, they are short of trained personnel to fill the positions even for their normal programme.

PROGRESS OF STATE DEVELOPMENT SCHEMES

Achievement of Physical Targets.

7.4. *Contour bunding and terracing* (Annexure IV-a):—On the basis of the information available from the States, the anticipated achievement for first 3 years (1961-64) works out to about 4 million acres i.e. 35 per cent only. The proposed target for 1964-65 is 2.86 million acres. This together with the anticipated achievement for first three years works out to likely achievement of 59.5 per cent for the four years of the Third Plan thus leaving 40.5 per cent of the targets to be achieved in the last year.

7.5. Following important points emerge for consideration :—

(i) Of the total anticipated achievement for first three years, Maharashtra, Madhya Pradesh and Gujarat together account for 78 per cent of the total likely achievement. Of this, Maharashtra alone accounts for nearly 50 per cent of the total. Among various States, progress for first three years is more than 40 per cent of the target only in respect of Maharashtra (40.36%), Madhya Pradesh (41.33%) and Rajasthan (41.77%); progress works out to between 30 to 40% for the States of Gujarat (39.0%), Madras (38.0%) and Orissa (31.0%). In respect of Andhra Pradesh and Bihar the anticipated progress works out to between 20 to 30 per cent only. In the case of Assam, Kerala, Mysore, Punjab, Uttar Pradesh, West Bengal and Himachal Pradesh the anticipated progress ranges from as low as 3.7 per cent to 19.6 per cent only.

(ii) Targets for 1964-65 as compared to the anticipated achievements for 1963-64 seem rather ambitious for achievement particularly in respect of Mysore (430% more), Uttar Pradesh (148% more), Bihar (130% more) and Punjab (111% more). In respect of the States of Andhra Pradesh, Madras, West Bengal and Rajasthan also the proposed targets for 1964-65 are substantially more than the achievement of 1963-64. The main bottleneck obviously for achievement of such ambitious targets would be training of adequate personnel in such a short time to meet the additional requirement.

(iii) The balance of the Plan targets that will remain to be achieved in 1965-66 for most States would be very high and ambitious, compared to the proposed targets for 1964-65. These will be about 28 times for Assam, 10 times for Kerala, 4 times for Himachal Pradesh, 3 times for Mysore, Andhra Pradesh and Orissa, more than twice for Madras, West Bengal and Uttar Pradesh.

From the general trends, it would seem that most of the States will have to make big efforts to achieve full targets. It is doubtful if this would be possible by many of the States. The anticipations are, that the total achievement may be about 80-85 per cent of the Plan targets, the bulk of which will be contributed by only a few States.

7.6. *Dry farming* (Annexure IV-b):—This has been a rather undefined programme. In most States, various practices in kind and amount, that constitute dry farming for different regions, have not been clearly defined. Even practice like line sowing has been regarded as dry farming (not on contours). No particular arrangement has been made for adoption of these practices. There is no arrangement for any field evaluation, to make a proper field appraisal of the application of the practices. Whatever progress is reported by different States is to be interpreted with considerable uncertainty. Annexure (IV-b) gives the progress in different States. However, a policy decision has been taken in the first meeting of the Working Group on Soil Conservation, that, in the subsequent Plans, this programme will not be taken up with any fixed targets as in the Third Plan. Instead, these practices will be encouraged as necessary follow-on programme. No further appraisal, therefore, seems warranted.

7.7. *Ravine reclamation* : (Annexure V) :—The progress under-ravine reclamation is particularly poor. The anticipated achievement upto 1963-64 works out to 8,150 acres as against the target of 35,000 acres i.e., 23.3 per cent. In Uttar Pradesh no work has been taken up and in Gujarat work was started only towards the last quarter of 1962-63. In Rajasthan 1,800 acres were covered with afforestation till the year 1962-63 and about 1,350 acres are proposed to be covered in 1963-64. In the case of Madhya Pradesh, the original target of 2,000 acres is likely to be achieved.

7.8. Main reasons, for which, it has not been possible, for most of the States, to take up this programme to sufficient scale, has been, the high cost of reclamation which comes to about Rs. 800 to 1,000 per acre which is very much more than the cost of good land in the region. On this account, States have been wanting higher rate of subsidy to give a greater incentive to the people for agreeing for this particular programme. The pattern of assistance for ravine reclamation has since been revised with 50 per cent subsidy (to be shared equally by the State and the Centre) and 50 per cent loan as against the previous pattern of 25 per cent subsidy (to be shared equally by the State and the Centre) and 75 per cent loan.

7.9. The ravine lands are of low productivity. Production from reclaimed ravines seems to be only of the order of 200 to 300 lbs. per acre. This is highly an unremunerative operation. For the Fourth Plan working Group has recommended that, in future, the major emphasis and high priority should be given to protection and treatment of the table land and marginal land, and stabilisation of gully heads, to restrict the problem. Reclamation of ravines proper should be largely taken up for fuel and fodder reserve and only to a very limited extent for agricultural purpose.

7.10. *Reclamation of saline and alkali lands (Annexure V)* :—The Third Plan programme envisages reclamation of about 2 lakh acres, mainly in the States of Gujarat, Maharashtra, Mysore, Madhya Pradesh, Madras, Punjab, Uttar Pradesh and Rajasthan. In Gujarat and Maharashtra the schemes relate to coastal saline lands and the work is in progress. No critical assessment could be made of the actual area reclaimed, as it is a continuous process, and takes anything from 3 to 5 years to reclaim a particular area completely. It is expected however, that, these States may be able to achieve the targets. In Punjab, the main programme taken up is by the Irrigation Department and consists of laying main drains as an anti-waterlogging measure. There is no coordinated programme of field drainage. The effectiveness of the reclamation programme is likely to be rather limited. The available information indicates that about 19,000 acres were covered upto 1962-63 by main drains and for 1963-64 a target of 18,000 acres is envisaged. In Uttar Pradesh work is taken up only on demonstrational basis at Government farms, and there is no intensive field programme on cultivators' land. The progress is rather low. Against the Plan target of 10,000 acres, only 1,600 acres, are reported to have been covered upto 1962-63. For 1963-64 the target proposed is another 1,600 acres. In the case of Rajasthan, some work has been taken up. However, the progress is low. The anticipated achievement upto 1963-64 is about 2,150 acres against the Plan target of 10,000 acres. In the case of Madhya Pradesh, Mysore, Madras and Delhi the schemes are not taken up for want of technical competence for preparation and implementation of the programme.

7.11. Successful implementation of schemes relating to saline, alkali and waterlogged lands in the subsequent Plans would be possible only if there is technically competent organisation, comprising of field parties for surveys to identify the nature of problem, and application of right methods suited to each kind and type of problem area and to ensure proper field evaluation and maintenance programme of reclaimed areas.

7.12. *Afforestation (Annexure V)* :—The target for afforestation in the Third Plan under State schemes is very modest being only about 6.28 lakh acres plus road-side and wind break plantation over 1700 miles. This, however, excludes targets of afforestation in ravines. Upto 1963-64, about 46.2 per cent of the target under afforestation and about 46.2 per cent of shelter belt and road-side plantation are likely to be achieved. From the general tempo of work, the targets under afforestation would be achieved and even exceeded.

7.13. *Research* :—Annexure VI gives the position with regard to research schemes sanctioned in the Third Five Year Plan for various States and the progress so far made in taking up the work. Compared with the magnitude of the problems, the number of research schemes sanctioned can be regarded as small and not adequate for the needs of the country. Even with this small programme, the achievement is not encouraging at all. In Assam, Tripura, Manipur and NEFA, where the schemes were approved for research in shifting cultivation, no work has been taken up and the chances are that nothing would be done in the remaining period of the Third Five

Year Plan. Of the other States, where research schemes are sanctioned, no work is started in Gujarat. In rest of the States, although it seems, the work is taken up, no precise information is available, about the type of problems on which work is taken up, the type of studies undertaken, the methodology adopted and the results achieved, except for Rahemankhera Station in Uttar Pradesh, for which periodically research reports are being received. The Centre does not receive any research report, neither for the programmes, nor for the achievements. No critical appraisal could, therefore, be made about the goodness and usefulness of the research that is carried out.

7.14. *Training* :—There are in all about 21 training centres for Sub-assistants in the States of Maharashtra (4), Rajasthan (1), Orissa (2), Gujarat (2), Mysore (2), Andhra Pradesh (1), Madras (1), Uttar Pradesh (4), and Madhya Pradesh (4). The remaining States of Kerala, Jammu & Kashmir, Bihar, Himachal Pradesh, Assam and West Bengal do not have any of their own training centre. Information is not available from Punjab. For the general appraisal of the training programme *vis-a-vis* the achievements of physical targets, it would appear, that the present training facilities are not adequate in many of the States and would need to be strengthened substantially to achieve the targets both for the Third Plan and also to build up adequate potential for larger targets in the Fourth Plan.

Utilisation of Finances (Annexure VII)

7.15. On the basis of actual expenditure for 1961 to 1963 and anticipated expenditure for 1963-64, utilisation of finances works out to about 45.3 per cent of the Plan outlay. In addition to the above, out of the anticipated additional financial requirement of about Rs. 170 million for achieving increased targets, Rs. 23.45 million seem to have been allocated by Planning Commission for 1963-64 for the States of Bihar (Rs. 12 lakhs), Kerala (12 lakhs), Madhya Pradesh (120 lakhs), Madras (10 lakhs), Orissa (7 lakhs), Rajasthan (3 lakhs), West Bengal (5 lakh), Andhra Pradesh (30 lakhs) and Punjab (37.5 lakhs). The trends indicate that utilisation of finances was less than 20 per cent in the case of Assam (12.1%), between 20-30 per cent in the case of Kerala (24.9%), West Bengal (20.4%), and Delhi (30.0%), between 30-40 per cent in the case of Gujarat (35.4%), Jammu & Kashmir (39.0%), Punjab (37.5%), Rajasthan (30.8%), and Uttar Pradesh (39.1%). The overall utilisation of funds and achievements in physical units generally follow identical trends.

CENTRALLY SPONSORED SCHEMES.

Achievement in Physical Units

Dry farming demonstration projects: (Annexure VIII).

7.16. These projects were originally started in the Second Five Year Plan and were continued in the Third Plan also. The total number has increased from 40 to 45. The available information indicates that, so far, work is taken up on 43 projects. All the projects will be completed. However, there is much to be desired in the way these projects have been executed. The original object of these demonstration projects was, to run these as "result demonstration" to prove to the farmer through assessment of actual benefits in physical and economic units, the value of, and need for, such

a programme, and thereby, to induce them, to take up the programme on large scale. However, by and large, these projects have been executed only as "method demonstration" and not "result demonstrations." In almost all cases, only erosion control measures were adopted. Adoption of follow on soil management practices were limited to only distribution of seed and fertilizer or demonstration of contour sowing for a very small area. Soon after completion of the erosion control measures, generally, no definite arrangement was made to maintain these for any length of time. At least in some of the projects visited, these are again tending to develop into problem areas. While the data on run off and soil loss could not be collected for want of necessary equipment (being not available locally and also could not be imported), even the data on gains in economic units by way of increased production has not been collected comprehensively in any planned way, as was originally anticipated. To this extent, these projects have failed to achieve the objective which it was intended of them.

Survey of ravines :

7.17. Schemes for survey of ravines were sanctioned for Madhya Pradesh, Rajasthan, Gujarat and Uttar Pradesh. The Uttar Pradesh Government has not taken up any work. The Government feels that as they cannot take up the reclamation programme due to high cost and inadequate subsidy, no useful purpose would be served by taking up survey programme. The pattern of subsidy has already been revised favourably and the Government has been requested to consider the usefulness of undertaking the survey. In Gujarat, no survey was taken up during the first two years of the Plan. In 1963-64 a scheme was received from the State Government for undertaking aerial survey for an area of about 10 lakh acres, which is the estimated total problem area of ravines in the State. The survey was to be undertaken with the help of Surveyor General of India. Necessary administrative approval was accorded. However, from the information so far available, it seems, no work has been taken up. In Madhya Pradesh, about 27,000 acres have been covered upto 1963-64 and for 1964-65 a target of 24,000 acres is proposed. In the case of Rajasthan about 73,000 acres are expected to be surveyed by the end of 1963-64 and a target of 50,000 acres is proposed for 1964-65.

7.18. Present programme of survey of ravines was taken up mainly to prepare schemes for reclamation of ravines. A decision is however taken in the first meeting of the Working Group on Soil Conservation, that, henceforth major emphasis in ravine reclamation programme will be on protection of table land and stabilisation of marginal lands and gully heads. Reclamation of ravines will be for fuel and fodder reserve. In pursuance of this recommendation it is also recommended that aerial and ground surveys should be carried out to demarcate the table and marginal lands in the contributing catchment of ravines. This work is proposed to be taken up in the Third Plan as preparatory programme from the Fourth Plan. The funds available under this scheme in the Third Plan will be utilised for necessary aerial and ground surveys.

Soil conservation in the watersheds of river valley projects.
(Annexure IX)

7.19. The Plan targets include treatment of about 7.44 lakh acres comprising of the treatment of agricultural land, and afforestation and pasture development. Besides, land use survey is expected to be taken up for 12.7 lakh acres. Work could not be started in the first year of the Plan (1961-62) as it took some time, before the schemes were prepared and the States' machinery was set in mot on for execution of the programme. In the first two years of the actual implementation of this programme i.e. upto 1963-64 it is expected that an area of about 3.53 lakh acres would be treated with various soil conservation measures which works out to about 47.4 per cent of the Plan target. The provisional target for 1964-65 is about 1.9 lakh acres which is about 25 per cent of the Plan target. From these trends and the trends in the utilisation of finances by respective States, it is felt that the programme generally will be completed.

CENTRALLY SPONSORED SCHEMES.

Likely utilisation of Finances.

7.20. Utilisation of funds for dry farming projects (Annexure VIII), on the basis of actuals for the first two years and the provision for the third year is estimated to be about Rs. 19.3 lakhs which is about 69 per cent of the Third Plan outlay. For the remaining two years anticipated expenditure would be over Rs. 10 lakhs, thereby exceeding the Plan outlay by a small margin.

7.21. Under scheme for soil conservation in the watersheds of river valley projects (Annexure X), the likely expenditure upto 1963-64 works out to Rs. 528.5 lakhs which is about 47.7 per cent. The trends indicate that the funds will be utilised fully.

7.22. Under scheme for survey of ravines, only about Rs. 1.45 lakhs are utilised so far. However, it is expected, that, substantial funds will be utilised for aerial and ground survey, that are proposed for demarcating table and marginal lands, as preparatory programme in the Third Plan, for schemes to be taken up in the Fourth Plan.

PROGRESS UNDER CENTRAL SCHEMES.

All India Soil and Land Use Survey Scheme (Annexure XI).

7.23. Against the Plan target of 150 lakh acres, detailed and reconnaissance survey is covered for about 31.8 lakh acres upto the end of 1963-64. This comprises of about 31.8 lakh acres in the watersheds of Bhakra, Chambal, Machkund, Hirakud and Kundah and about 42.7 lakh acres outside these watersheds, in the States of Maharashtra, Mysore, Andhra Pradesh, Madra, Kerala Rajasthan, Tripura and Delhi. An air photo interpretation unit has also been added recently. Aerial photographs are undertaken by the Surveyor General of India for All India Soil Survey Scheme, for an area of about 70,000 sq. miles or 44.8 million acres. Utilisation of funds till 1963-64 is about Rs. 3 lakhs against a Plan provision of Rs. 25 lakhs i.e. about 12 per cent. indications are that about Rs. 19 lakhs may be utilised

Soil conservation research demonstration and training :

7.24. During the Plan, one new research centre was started, for taking up investigations in the soil and water conservation problems of red soils under conditions of low rainfall. Another centre, proposed for similar types of soils, under high rainfall conditions was however, kept in abeyance as an economy measure. Major emphasis in research continued to be on the applied aspects. The centre at Dehra Dun was strengthened with additional specialist staff, to meet the requirements of research and training appropriately.

7.25. Against the Plan outlay of Rs. 50 lakhs, the expenditure for first two years is Rs. 1.44 lakhs only. Low expenditure during first two years is due to the following reasons :—

- (i) Of the two research centres proposed to be set up, only one is established and the second one is kept in abeyance.
- (ii) The provision made for training compensation to the States, is not yet paid, as the claims are not received from the concerned States.

It is felt, that, about Rs. 30 lakhs may be utilised for the Third Five Year Plan when compensation for training is paid. This will be a substantial amount.

Central Arid Zone Research Institute :

7.26. The activities of the Central Arid Zone Research Institute, to some extent, were thwarted a little, due to the emergency conditions. The proposed five sub-stations could not be taken up. The work of the Institute, however continued, with increasing emphasis, both on fundamental and applied aspects of desert research. The scheme for pasture development, which was originally proposed to be passed on to the State Government, as a Centrally sponsored scheme, was finally decided, to be merged with the Central Arid Zone Research Institute.

7.27. Against the financial outlay of Rs. 40 lakhs, the expenditure for the first two years of the Plan is Rs. 0.88 lakhs only. The short fall in the utilisation of funds is for the following reasons :—

- (i) Regional sub-centres proposed to be set up in the Third Plan had to be kept in abeyance, due to emergency.
- (ii) The expenditure envisaged on the buildings could not be incurred as the construction work has started only recently.

The expenditure on the buildings which is about Rs. 18 lakhs will be utilised during the Plan period. Besides, the Pasture Development Scheme, which was originally proposed to be handed over to the State Government as Centrally sponsored scheme, is now merged with the Central Arid Zone Research Institute; the financial requirement for this scheme, in the remaining period of the Third Five Year Plan, will be substantial. Besides, funds would also be utilised for some expansion of the station. It is expected that the entire outlay, proposed for Central Arid Zone Research Institute, will be utilised in the Third Plan and may even be exceeded.

Training :

7.28. Up till 1963-64, 157 Officers and 611 Assistants were trained at various training centres. For the current session, 30 Officers and 133 Assistants are under training. The training facilities at various centres has been substantially increased. The Officers' Training Course has been revised and the duration has been reduced to 5½ months. With this, there are now two session annually each with a capacity of about 30 to 35 admissions.

Soil Conservation Organisation in the States (Annexure XII) :

7.29. Soil conservation in the States is carried out as one of the activities of the Agriculture, Forest and Irrigation Departments individually. While in some States, there is one Officer of the rank of Joint Director of Agriculture, in charge of the programme in the Agriculture Department, in many others, there is no such a separate arrangement. As would be seen, the organisation in the States, in the agriculture sector, which has major part of the programme, is built round the works relating only to contour bunding and terracing. In the States, there is no specialist staff, neither at the headquarter level, nor at the divisional level, in any scientific discipline of agronomy, engineering, forestry, irrigation, drainage, research and training, to make proper assessment of the problems of soil and water conservation to work with the farmers and help them to solve the problems of soil deterioration and water waste, carry out functional inspection of various programmes and practices, to assess their technical adequacy and working efficiency. In the States, at headquarters level, there is no planning cell, to collect and compile correct and reliable data, on the problems achievements, and benefits, in physical and economic units. There is no specialist at State level, for information and publicity in soil conservation, to bring out educative material for farmers and others. For comprehensive planning and effective execution of soil conservation programmes, it is necessary to strengthen the organisation adequately, to meet the requirements of a coordinated and comprehensive programme of conservation, use and management of soil and water.

Soil Conservation Legislation (Annexure XIII) :

7.30. The present position with regard to soil conservation legislation in various States is given in Annexure XIII. Out of 15 States and 5 Union Territories, some sort of enactment exists in 10 States and 3 Union Territories. Assam, Bihar, Rajasthan, West Bengal and Orissa have no enactment at present. However, the matter is receiving the attention of respective Governments. By and large, either the drafts are prepared or the bills are sent to Select Committees for consideration, or they are awaiting introduction in the State Legislatures. Of the States, that have enactments, in Andhra Pradesh at present two acts of Madras and Hyderabad Land Improvement Acts are in operation. The question of integration of the two acts on the basis of model bill, is under consideration of the State Government. In Orissa at present Agriculture Act of 1951 enforces measures for good land use programme. There is no proper Soil Conservation Act. However, the Government is considering enactment of proper Soil Conservation Act. In Punjab there are separate

acts for soil conservation in agricultural land, drainage and protection of forest areas. In Kerala, preparation and execution of soil conservation measures on agricultural lands are governed by the provisions of two separate enactments, the Travancore-Cochin Land Development Act XXXVI of 1950 and the Madras Land Improvement Act XXIII of 1949. The former applies to erstwhile Travancore-Cochin area, while the latter applies to the former Malabar area. A unified Act is under consideration of the Government.

7.31. Assam, Bihar, Rajasthan and West Bengal have no legislative enactments at present and there are no State Boards either. In Gujarat and Maharashtra while there is enactment, there are no State Boards. The two Governments do not consider it absolutely essential to form State Soil Conservation Boards at this juncture. In Kerala, while there is no regular State Soil Conservation Board, there is a Land Development Board with 5 members which controls the soil conservation programme. Other States have State Boards. Andaman Nicobar and NEFA territories do not have any Boards corresponding to State Soil Conservation Boards. Delhi territory has neither the act nor the Board.

7.32. District Committees are set up in Gujarat, Maharashtra, Madhya Pradesh, Mysore and Uttar Pradesh. In Jammu & Kashmir and Madras, formation of district Committees is under the consideration of the respective Governments. In Kerala and Orissa, there are District Development Councils, which discuss the subject of soil conservation. In Punjab, the Act is passed only recently and the District Committees are proposed to be set up shortly. Andhra Pradesh, Bihar and Rajasthan have provision for District Committees in the contemplated enactments. The Government of West Bengal does not think it worth-while to establish District Soil Conservation Committees at this moment. In Himachal Pradesh, Sub-committees are being formed at the district level, while Tripura being a single district, no separate committee other than Land Utilisation and Soil Conservation Board, which is already set up, is considered necessary.

7.33. It will be obvious from the above, that, there is considerable disparity in enactments, formation of State Soil Conservation Boards and District Committees in different States. Thus, while in some States, there is no enactment, they have committees at the State level. In others, while there is enactment, there are no State Soil Conservation Boards but there are some District Committees only.

7.34. Although in large number of States, there is some sort of enactment for preparation and execution of soil conservation schemes, in practice, except in a very few cases, the provisions of the enactment are not applied for preparation and execution of soil conservation schemes.

Technical Potential Likely To Be Developed :

7.35. In Annexure XIV an attempt is made to assess the area, that can possibly be covered in the Fourth Plan with the technical potential that will likely be available at the beginning of the Plan, assuming that the States will be able to complete the training schedule in full. On these basis, likely coverage with the above potential

works out to about 20 million acres of the present type of the programme in the Fourth Plan (annually about 4 million acres). However, allowing for the fact, that, there are likely to be short falls in the training programmes and the fact that in the Fourth Plan soil conservation schemes will be prepared in a comprehensive and integrated way, it is felt that with the technical potential that is likely to become available at the end of the Third Plan, it may be possible to undertake programme to the extent of about 2.7 million acres annually (about 13.5 million acres in the Plan period). The total potential is divided among different programmes as 2.3 million acre potential for soil and water conservation schemes on watershed basis, 0.2 million acre potential for ravine reclamation and about 0.2 million acre potential for soil conservation in the watersheds of river valley projects.

CHAPTER 8

EXPERIENCES OF THE FIRST, SECOND AND THIRD FIVE YEAR PLANS IN REGARD TO BOTTLENECKS AND SHORT-COMINGS IN THE PLANNING AND IMPLEMENTATION OF VARIOUS SOIL CONSERVATION PROGRAMMES.

Organisation :

8.1. Lack of proper soil conservation organisation both in the States and at the Centre remains to be one of the major bottlenecks, for effective planning and implementation of soil conservation programme. In the States there is no single agency with responsibility for planning soil conservation programme on a comprehensive and integrated basis. The responsibilities for planning are divided among Agriculture, Forest and Irrigation Departments. There is lack of coordination in the planning. The whole programme is more a patch work, than treatment of land on an integrated watershed basis in a comprehensive way. The staff for soil conservation in the States is inadequate, both technically and numerically, to initiate, direct and guide a comprehensive programme of land treatment and efficient use and management of soil and water resources. The organisation is not adequate to carry out any field evaluation, to assess the technical sufficiency and adequacy of various practices and measures. The staff is just sufficient only to undertake a programme of contour bunding and terracing which by themselves and without the measures for proper soil and water management are incomplete and not capable of giving proper and sustained benefits by way of increased agricultural production.

8.2. At the field level (Divisional level), there is no specialist staff to identify the local problems and needs, connected with soil and water use and management and give on the site advice to farmers or field workers to tackle the same. At the headquarter level in the States also, there is no specialist staff, to make any inventory of State's problems, make long range planning with due priorities, assess technical facilities needed and give adequate direction and guidance and ensure effective coordination in execution of programmes and give advice in different problems. In the State set up, there is neither planning cell, nor any information unit, to develop educational aids and programmes e.g. publications, posters, films, etc.

8.3. At the Centre, the organisation is inadequate in number and in technical competence, to give effective direction, guidance and advice in planning and execution of programmes and undertaking any effective field evaluation of benefits, in physical and economic units. The Central organisation does not have specialists in soil physics, watershed management, water use, drainage, pasture development and economics. There is no specialist for bringing out educational material for spread of knowledge and know-how of soil conservation among cultivators, who are finally to accept the programme, use the measures, adopt and maintain various structures etc. Neither in the Central set up, nor in the States, there is a single specialist in hydrology, hydraulics, design and construction

engineer and sedimentation specialist. Yet, all the above are very important scientific disciplines connected with important aspects of erosion control, and use, management and development of soil and water resources. At the Centre, there is no planning cell for making an assessment of national problems and needs. The organisation is built round the concept that soil conservation is only contour bunding and terracing. This has virtually reduced the otherwise vital programme to mere earth work operation.

8.4. The way soil conservation schemes are prepared by States and some time received in the Ministry (according to the current procedure States are not required to send even the schemes), there is not much technical bias in them, consequently there is nothing much to offer technically, even if it is intended to. The role of Central organisation, in scrutiny of such schemes is largely confined to safeguard financial principles and procedures of Central Government for such schemes, than offer technical advice.

Administration :

8.5. Delays in sanction of the schemes by the State Governments, due to administrative bottlenecks, handicapped various programmes to an appreciable extent. Experience showed, that, in many cases, while the schemes would be sanctioned, but the sanction would not be given for appointment of necessary technical staff and as such the work could not be started under the schemes.

Uncertainty of State finances :

8.6. There is always considerable uncertainty about the availability of finances in the States for undertaking soil conservation programmes. The reasons for this are :—

- (i) The financial allocations in the Plan are not made specifically for soil conservation programme. The allocations are made for the development head "Forestry and Soil Conservation". The States are free to transfer funds within the development head and sometimes even from one development head to other head. In this readjustment of the finances, the experience has been; that soil conservation has suffered the most.
- (ii) The Plan allocations are made on the consideration of the State's own internal resources. Often it so happens, that, even when the Planning Commission have allocated the funds, the State Governments do not find enough resources to undertake the programme. Accordingly they cut down the budget provisions for plan programmes and the axe is often hard on soil conservation.

In view of the uncertainties about the availability of the finances from year to year, the programme could not be planned effectively in a phased way with regard to physical targets, nor the technical requirements necessary, e.g. the training of personnel etc. In some cases, it even so happened, that, because of the cut in the State's budgets, the tempo had to be brought down abruptly leaving sufficient technical resources unused for soil conservation.

People's participation :

8.7. There has been no substantial and effective contribution by block agencies and Panchayats in soil conservation programme. Experience, particularly in Madras showed, that where the works were entrusted to Panchayats, the progress was slow and the quality only sub-standard. Soil conservation is such a technical job, that it cannot be entirely left to the resources of Panchayats. The responsibility of the Panchayati Raj bodies should be to mobilise the man-power required for the purpose and to carry out adequate propaganda among farmers and others covered in the working plan.

Soil survey :

8.8. The reports of soil survey for the watersheds of river valley projects generally were not utilised for planning soil conservation programmes. There were two probable reasons for this.

- (i) Those in charge of soil conservation programme in river valley project areas did not know precisely, how the objective soils data compiled in soil survey reports could be interpreted.
- (ii) The reports to a greater extent were weak in precise interpretation of soil survey data.

To make these reports useful, it would be necessary to strengthen the interpretation aspect of the soil survey data and also give proper orientation to workers in the field, on how to use the reports in planning an effective soil and water conservation programme.

Research :

8.9. Substantial progress has been made in research at various soil conservation research centres. Experiments so far conducted have been able to give a few useful recommendatory results to deal with soil and water conservation problems in the ravines, hilly region and black cotton soil areas. However, still there is much to be done to deal with the various problems connected with soil and water conservation, all over the country. Whatever results have so far been obtained through research, have hardly spread beyond the confines of the research stations. These have not been tried on any regional basis, nor demonstrated to evaluate the applicability of the results on large field scale basis. The main handicaps that have been responsible for these are :—

- (i) Non-availability of sufficient area in the farm and lack of any sub-station attached to the centres.
- (ii) Lack of necessary personnel and equipment.
- (iii) Very little data being available on fundamentals of soil, plant and water.
- (iv) Centres are also over-burdened with training schedule.
- (v) Lack of coordination between States and the centre regarding research and training.

Training :

8.10. Training is imparted in soils, agronomy, forestry and engineering. At present four centres are working round the year for imparting training to the State Government nominees. Though the training has been quite useful to a certain degree, yet the desired standard has not been achieved because of the following handicaps :—

- (i) Too much burden on the training staff, as they have to look after research and demonstration work also.
- (ii) The number of candidates admitted (35 to 40) is quite a large for getting the job effectively done.
- (iii) The candidates recommended by the States often have inadequate base, to imbibe the training fundamentals.
- (iv) The number of centres imparting training is not sufficient to cope up with the increasing demand of the States, thereby leading to the overcrowding at the existing centres.

Demonstration :

8.11. Demonstrations have been undertaken on farmers' fields both by the soil conservation research stations and also by various States. These demonstration projects have served only a limited purpose for the following reasons :—

- (i) The demonstrations were largely of the type "method demonstrations". No concerted attempt was made to evaluate the benefits from these demonstration projects in physical and economic units, to convince the farmers of the usefulness and practicability of such programmes.
- (ii) There was no follow-up of various demonstration projects. Many of the projects, because of lack of maintenance, ceased to serve any useful purpose.

The main reason for this was lack of provision of funds for maintenance and follow-up programme.

CHAPTER 9

PROPOSED SOIL CONSERVATION PROGRAMME FOR THE FOURTH FIVE YEAR PLAN.

Programme Proposed :

9.1. Major programmes proposed to be taken up in the Fourth Five Year Plan would be the following :—

- (i) Soil and water conservation on watershed basis.
- (ii) Soil and Land Use Survey.
- (iii) Soil and water conservation in watersheds of river valley projects for the protection of reservoirs and flood control.
- (iv) Pilot demonstration projects on watershed basis.
- (v) Stabilisation of ravines and protection of table lands.
- (vi) Reclamation of saline, alkali and waterlogged lands.
- (vii) Conservation irrigation, water management and field drainage.
- (viii) Schemes for setting up and strengthening of soil conservation and soil survey organisations.
- (ix) Training in soil and water conservation.
- (x) Soil and water conservation research.
- (xi) Central Arid Zone Research Institute.

(i) Soil and Water Conservation on Watershed basis.

Scope :

9.2. This scheme will include soil conservation measures on agricultural as well as non-agricultural lands. This scheme replaces the schemes of contour bunding and dry farming in agricultural lands, and afforestation and pasture development in other areas, taken up in the previous and in the current Plans. Under this scheme, work will be planned in a composite and comprehensive way on a watershed basis, according to the problem of each watershed unit, as determined through standard soil survey.

9.3. In the agricultural land, the programme will include erosion control measures, conservation farming, improvement and maintenance of soil fertility, correct water use and field drainage etc. There will be no targets as contour bunding or afforestation as such. Instead, watersheds will be taken up as a unit for planned treatment and within each watershed, work will be defined by areas under different land uses.

9.4. Before any comprehensive work can be prepared that will be capable of giving the desired benefits, it will be necessary to delineate the nature and severity of various problems through standard soil survey. Therefore, soil survey and soil testing will have to be functionally coordinated with soil conservation programme and shall be

the essential requirements for planning and implementation of soil conservation programme.

9.5. Priority for soil and water conservation will be given to areas that have high potential for production and where consolidation of holding is being done.

Physical targets and their phasing :

9.6. In the Fourth Plan about 20 million acres are proposed to be treated with various soil and water conservation measures. The problem of soil conservation is colossal. Besides, for sustained increase in agricultural production, soil conservation is the key programme. Unless soils are well protected from deterioration and rain and irrigation water properly conserved and efficiently managed, all the benefits of modern agricultural technology will not accrue to its optimum and the increased production on sustained basis will not be achieved. The target proposed is considered necessary and is based on the technical possibilities.

9.7. With the technical potential likely to be available at the end of the Third Plan, it is expected to cover about 2.3 million acres under this programme annually; thus, making a total of 11.5 million acres in the five years of the Fourth Plan. Further, during the Plan period, it is envisaged to build up an additional technical potential equivalent to about 0.85 million acres annually, commencing from the second year of the Fourth Five Year Plan, which would give a total achievement of about 8.5 million acres over the Plan period; thus making a total of 20 million acres to be achieved. Yearwise phasing of targets for the five years of the Fourth Plan would be 2.3, 3.15, 4.0, 4.85, and 5.70 million acres respectively.

Requirement of technical personnel :

9.8. To undertake soil and water conservation schemes in a composite and comprehensive way with watershed as a unit, it will be necessary to have adequate organisation at the Central, State, Regional, Divisional, District and field levels, that would be technically effective and numerically adequate for effective achievement of the proposed targets. The requirements of overall organisation for soil conservation programme are dealt with separately under programme No. viii. For the purpose of this programme, the requirement of technical personnel is estimated to be 435 senior level (Officers) staff, 4,350 junior level (Assistants) staff, and 16,700 field level technicians (Sub-assistant).

Financial implication :

9.9. It is envisaged that out of 20 million acres proposed to be covered under this programme, about 17.5 million acres would be crop land and about 2.5 million acres of forest and pasture lands. Reasonable average financial requirement for treatment of crop land is reckoned to be Rs. 70 per acre and that for forest and pasture land it is reckoned as Rs. 200 per acre. On these basis, total financial requirement for this programme, including the cost of specialist staff, and capital expenditure on transport and other equipment is estimated to be about Rs. 182.5 crores.

Preparatory work :

9.10. Soil conservation schemes in the Fourth Five Year Plan will be prepared after proper assessment of the nature and extent of soil deterioration, and soil and water management problems for every watershed as a unit, through a standard soil and land use survey. Thus, soil survey would be an essential requirement for all soil conservation schemes in the Fourth Plan. For taking up the programme under this scheme on an area of 2.3 million acres, in the first year of the Fourth Plan, it may be necessary, to complete soil and land use survey of about 0.4 million acres gross, in the remaining period of the Third Plan. To ensure this, it will be necessary, that, suitable soil survey organisation should be built up in the States where there is none and strengthen it in those States where already some organisation exists. Thus in the State, the soil survey organisation has to be suitably reorganised and strengthened to meet the requirement of soil conservation programme in the Fourth Plan. It is estimated, that, this may require about 75 field parties with supporting specialist staff at State and field level with adequate equipment and laboratory facilities. The requirement of technical personnel for advance work is estimated to be 17 Officers with specialisation in soil survey, 134 Assistants (agronomy, soils and general science with training in soil survey) and 184 Sub-assistants. The financial requirement for the advance work is estimated to be about Rs. 5.5 million.

*(ii) Soil and Land Use Survey**Scope :*

9.11. This scheme will include work on soil and land use survey to be carried out by the States as an essential requirement of all soil conservation schemes and also the work that will be carried out by the All India Soil and Land Use Survey Organisation.

Physical targets and their phasing :

9.12. The total area proposed to be covered under standard soil and land use survey will be 55 million acres. Out of the total proposed target, 20 million acres are expected to be covered by the All India Soil and Land Use Survey Organisation (details in Annexure XV) and 35 million acres by the State soil survey organisations as follows :—

(Million acres)

	First year	Second year	Third year	Fourth year	Fifth year	Total
All India Soil and Land Use Survey Organisation	4	4	4	4	4	20
State Soil Survey Organisations	5	6	7	8	9	35
TOTAL	9	10	11	12	13	55

Requirement of technical personnel :

9.13. At present a few States do have some sort of organisation for carrying out soil survey for specific purposes e.g., pre-irrigation survey, fertility survey, and salinity survey, etc. However, so far,

soil survey is not developed to take care of the soil and water conservation programme. Whatever the present organisation for soil survey exists in the different States, it has not been developed in a systematic and organised manner. In the Fourth Five Year Plan, standard soil survey will be an essential requirement for all soil conservation schemes. Hence, it will be absolutely necessary for the State Governments to build up adequate organisation for soil survey, to cover the needs of the proposed programme for soil and water conservation in the Fourth Five Plan. (A schematic chart of the suggested soil survey organisation for the States is given at Annexure XVI).

9.14. For the proposed soil survey programme, to be carried out by the State Soil Survey Organisation, the requirement of technical personnel is estimated to be 102 senior technical staff (Officers), 219 junior technical staff (Assistants) and 290 field level staff (Sub-assistants).

The programme proposed for the All India Soil and Land Use Survey Organisation will also call for strengthening of the present organisation with trained technical staff at senior, junior and field levels.

Financial implication :

9.15. Total financial implication of the proposed programme in the Fourth Five Year Plan is estimated to be Rs. 41:0 million comprising of Rs. 38.5 million for State programme and Rs. 2.5 million for expansion of the Central activity.

Preparatory work :

9.16. To develop adequate facilities in the States for undertaking soil survey on sufficient scale to take care of the needs of soil conservation programme in the Fourth Plan, advance work will be necessary in the remaining period of the Third Five Year Plan. This would consist of, firstly, building adequate organisation for soil survey in the States where it does not exist at present, or re-organising adequately the existing organisation wherever it exists, on the lines suggested above, to take care of the needs of soil conservation programme in the Fourth Plan and secondly completing standard soil survey for the areas proposed to be covered under soil conservation in the first year of the Fourth Plan. It is estimated, that, standard soil survey would be necessary for an area of about 4 million acres gross in the remaining period of the Third Plan. It may require 75 field parties to carry out the soil survey on about 4 million acres in the remaining period of two years. The estimated requirement of technical personnel for preparatory work would be 17 soil scientists (Officers), 134 Assistants and 184 (Sub-assistants). The financial requirement for the preparatory work, including the staff, will be Rs. 5.5 million.

(iii) *Soil Conservation in the Watersheds of River Valley Projects for the protection of Reservoirs and Flood Control.*

Scope :

9.17. This programme will be continued in the watersheds of major river valley projects. At present, the programme is proposed

for 14 river valley projects as Centrally sponsored. In the Fourth Plan, it may be possible to extend to a few more watersheds. Besides these, there are many more projects in the watersheds of which soil and water conservation will be necessary. For these new areas, States will have to take up the work under State programme. Even in the existing watershed areas, it may not be possible to continue this programme as Centrally sponsored all along. In the long run, it would be necessary for the States to take up increasing responsibility for undertaking these programmes under State Plan schemes.

9.18. The approach to soil and water conservation in the watersheds of river valley projects will be, to reduce the siltation of dam sites and thereby to increase the life of reservoirs and dam. It would, therefore, include, not only erosion control measures, as at present, but also measures for control of sediment from other sources, e.g., road side erosion, bank cutting and bed scour. It would also include putting structures for sediment detention and flood control in each watershed.

9.19. Planning will be done after carrying out appropriate survey of the watershed areas, which will include, soil, land use and land capability survey, hydrological, geological, engineering and economic surveys to assess sediment and flood problems, delineate and locate critical areas, and to determine types of measures to be adopted, kind and locations of each structure, benefits likely to be achieved and the benefit/cost ratio.

9.20. For undertaking necessary basic surveys and investigations, for preparing comprehensive plans, there will have to be separate watershed planning units comprising of Hydrologist, Geologist, Engineer, Agronomist, Forester and Economist. These units will be set up on regional basis under the Centre. There will be about 6—7 such units. These regional units will help in compilation, scrutiny and interpretation of hydrometeorological, hydrogeological and geomorphological data of watersheds and undertake various types of surveys, e.g., engineering and economic for effective planning. Planning will be done in collaboration with field staff of the States on the basis of the basic watershed data collected by these units. All the plans will be examined by the Centre jointly with states and the approved plans will be implemented by the field staff of the States.

Besides watershed planning work, the regional units will also help the States in the initial technical assessment of various soil conservation schemes and to carry out functional field evaluation of various practices and programmes to assess their technical adequacy and sufficiency. Such assessment and evaluation will be essential to develop proper standards and specifications for various practices suited to different problem conditions and to improve them further for better efficiency and economy.

9.21. There will be a planned and continuous programme of field evaluation of soil conservation programme to assess the efficiency of various structures and measures and the actual benefits achieved in terms of physical and economic units. For this purpose, bench mark watersheds representing regional characteristics, both treated and untreated, will be instrumented with stage level recorders, silt samplers

and self-recording raingauges. A minimum of 100-150 such units will be installed. Instrumentation of the watersheds will be done in a gradual and progressive way, so that adequate arrangements are made for collection of data correctly and its proper interpretation and use. Instrumentation will be a part of the scheme details for any particular watershed area.

Physical targets and phasing :

9.22. In the Fourth Plan it is proposed to protect about 2.5 million acres of the watershed areas. Tentative phasing for the five years of the Fourth Five Year Plan is envisaged as 0.2, 0.35 0.5 0.65, and 0.8 million acres in each of the five years respectively.

Requirement of technical personnel :

9.23. For undertaking the programme effectively, regional units will be set up under the Centre. Financial requirement for this is dealt with under programme item No. viii. In the States, field organisation for undertaking the programme will require to be strengthened, to include design and construction engineers, to meet the requirement of the constructional works and other soil and water use and management programme. Requirement of technical personnel for the programme envisaged in the Fourth Five Year Plan would be, senior technical staff (Officers) 112, junior technical staff (Assistants) 749, and field level technicians (Sub-assistants) 2,573.

Financial implication :

9.24. Financial requirement for taking up soil conservation programme in the watersheds of river valley projects, including structural works, in agricultural as well as non-agricultural land on an average is estimated to be about Rs. 200 per acre. Besides, there will be the cost of equipment, instrumentation and specialist staff. Total financial requirement for the proposed target of 2.5 million acres, including the cost of equipment, instruments and transport etc. and specialist staff, is estimated to be about Rs. 51 crores.

Preparatory work in the Third Plan :

9.25. For implementing the programme in an effective way, right from the commencement of the Fourth Plan, arrangements would be necessary, to set up 3-4 regional watershed planning units in the remaining period of the Third Plan. For forming these units, specialists in the fields of agronomy, engineering and forestry with training in watershed management can be available in the country. However, for specialists in the fields of hydrology, geology, sedimentation and economics, it will be necessary to select suitable personnel with basic background in these respective scientific fields and then give them extensive specialised training in watershed principles as related to their respective disciplines, under the foreign aid programme. About three persons, in each of the fields of hydrology, geology and economics will require to be trained in the remaining period of the Third Plan.

(ii) The organisation in the States will have to be strengthened by adding specialist staff in watershed engineering (construction and design) for each watershed project.

(iii) As a supporting programme to the watershed protection scheme, it will be necessary to set up pilot projects in watersheds of major river valley projects, particularly Bhakra, D.V.C., Chambal, Hirakud and Machkund by the Centre. These pilot projects shall need to be intensively instrumented to collect data so as to establish relationship between watershed characteristics, climatic elements, sediment production and flood flows and develop guide lines for preparation and implementation of such schemes. Two to three such projects may need to be initiated in the remaining period of the Third Plan and the rest in the Fourth Plan. The planning of projects as advance work in the Third Plan may be done by the soil conservation research centres of the Central Government, in cooperation with the States. Implementation will be done by the States on the basis of accepted programme. Cost for implementation of the projects will be met from out of the provisions in the Third Plan.

(iv) All the gauging and sediment recording sites proposed in the soil conservation programme for various river valley project areas in the Third Plan will need to be completed progressively in the remaining period of the Third Plan.

Financial requirement for the proposed preparatory work is estimated to be about Rs. 0.8 million.

(iv) *Pilot Demonstration Projects on watershed basis.*

Scope :

9.26. These demonstration projects will be taken up in agro-climatic regions. The area of each project will be about 400-600 acres. A few of the projects will also be taken up in the watersheds of river valley projects, the area for such projects being about 3000-5000 acres. Demonstrations will also be laid specifically for pasture development and improvement, in blocks of 100 acres and more in the States where pasture development has special significance e.g. Rajasthan, Punjab, Himachal Pradesh, Maharashtra, Gujarat, Madhya Pradesh, Orissa and Bihar. All these projects will be taken up as "result demonstrations" and the data will be collected to assess the benefits both in economic and physical units.

9.27. The object of these demonstrations is :—

(i) To make a reliable and realistic estimate of the problems of soil deterioration and water waste in different agroclimatic regions. Such information would be helpful for making a reliable inventory of the national problems, draw projections for future hazards and help in fixing the levels of performance needed, with due priorities for areas and regions. Our present knowledge about the problems of soil and water conservation is empirical and not based on any detailed field study.

(ii) These demonstration projects will also help in making reliable estimates of economic and physical benefits likely to accrue from adoption of soil and water conservation programmes.

(iii) These projects will be helpful in developing proper standards and specifications for various practices, measures and structures under different agroclimatic conditions.

(iv) The projects will be used for training local people, block staff and village leaders.

(v) The projects will serve as an educative programme for the people, to convince them of the benefits from soil and water conservation and thereby help them to adopt these programmes on a large scale in individual fields.

(vi) The information and data that will become available from these projects will be helpful in developing proper standards and criteria for soil survey interpretation.

(vii) In planning for these projects, there will be no stereotyped approach. The programme for each project will be worked out on the basis of the important problems of the area. Thus, in the districts which have assured irrigation, the programme will mainly emphasise water use and management, whereas, in districts where cultivation is dependent on rain, the programme will emphasise erosion control, moisture conservation, water disposal and soil management.

Physical targets and phasing :

9.28. About 50 demonstration projects are proposed to be laid out in the Fourth Five Year Plan. The area likely to be covered by these projects may be about 0.5 lakh acres. Every demonstration project will have a control watershed of similar characteristics for the purpose of comparison. All the projects will be instrumented to make precise evaluation of the benefits on account of soil conservation measures both in physical and economic units. All the projects will be completed in the first three years, taking one third the number each year. This will give at least two years for the last set of projects for evaluation during the Plan period.

9.29. For demonstrations on pasture development and improvement, about 50,000 acres may be covered in blocks of 100 acres and more. It is proposed to phase the proposed target to cover 5,000 acres in each of the first two years, 10,000 acres in the third year and 15,000 acres each in the fourth and fifth years of the Plan. Total area that will be covered by all these demonstration projects thus will be about 1.0 lakh acres.

Requirement of technical personnel :

9.30. For execution of this programme in an effective way, it will be necessary to have one field assistant (V.L.W. level) for every project. In the watershed areas, it would be necessary to have one senior technical officer (Officer) and two junior technical staff (Assistants) for each of the project for collection of necessary physical and economic data. For pasture development, one field assistant (Sub-assistant) may be required for every 1000 acres. For every five Sub-assistants there will be one Assistant. The overall supervision at field level will be provided by the Divisional Soil Conservation Officer. At the State level, subject matter specialists in agronomy, agrostology and forestry will guide the work and no additional specialist staff will be necessary. Adequate statistical assistance will be necessary at the State level for compilation and interpretation of data.

The requirement of personnel on the above basis is estimated to be, technicians at senior level (Officers) 25, at junior level (Assistants) 60 and field level staff (Sub-assistants) 92.

Financial implication :

9.31. Financial requirement for the programme including the requirement for instrumentation and staff is estimated to be about Rs. 4.0 million for the Plan period.

(v) *Stabilisation of Ravines and Protection of Table Lands.*

Scope :

9.32. Under this scheme, the programme would include treatment of the table land and stabilisation of marginal lands and gully heads with vegetative as well as structural measures. This will ensure to limit further deterioration of good land and protect those lands which are agriculturally productive, from developing into ravines. Reclamation of ravines proper for agricultural purposes will be confined only to shallow peripheral ravines as may be necessary for stabilisation of the marginal lands and protection of table lands of the contributing catchments and also include those areas which are likely to be commanded by new irrigation projects. Elsewhere, the reclamation of ravines would be taken up only as fuel and fodder reserves.

Physical targets and phasing :

9.33. It is proposed to take up about 1 million acres for protection and stabilisation in the Fourth Five Year Plan, comprising of about 0.8 million acres of table and marginal lands including peripheral shallow ravines and about 0.2 million acres of ravines, for reclaiming them mainly as fuel and fodder reserves. The programme will be phased, to cover 0.60, 1.3, 2.0, 2.7 and 3.4 lakh acres annually in each of the five years of the Fourth Plan respectively. This programme has greater potential in the States of Uttar Pradesh, Rajasthan, Madhya Pradesh and Gujarat.

Requirement of technical personnel :

9.34. It is expected that the technical resources developed during the Third Five Year Plan shall be available for undertaking this programme. Additional trained personnel will be required for structural works and other related programmes. Requirement is estimated to be, senior technical staff (Officers) 4, junior staff (Assistants) 52 and field level staff (Sub-assistants) 208.

Financial implication :

9.35. For treatment of table land and stabilisation of marginal lands and gully heads, which will involve structural work also, the average cost per acre is reckoned to be Rs. 125. The cost for afforestation of the ravines is reckoned at Rs. 200 per acre. On this basis the total financial requirement is estimated to be about Rs. 14.4 crores.

Preparatory work in the Third Plan :

9.36. As a preparatory work for undertaking the programme in the Fourth Five Year Plan, aerial and ground survey shall be necessary in the Third Plan to demarcate the table land of the contributing catchments.

Financial requirement for this purpose is expected to be available from out of the funds of Rs. 50 lakhs that are allocated for the scheme on Survey of Ravines under Centrally sponsored programme in the current Plan.

(vi) Reclamation of Saline, Alkali and Waterlogged Lands and Acid Soils.

Scope :

9.37. So far the approach to the programme of reclamation of saline and alkali lands has been rather over-simplified. In the reclamation of water logged lands, emphasis has been on main drains and there is no coordinated field drainage programme. After reclamation, there is no planned and systematic arrangement for maintenance of the reclaimed areas. In the coastal saline areas, emphasis is only on construction of protective dykes or bunds. No provision is made for drainage, without which, reclamation efforts are rather small and incomplete. Not much attention is being given to the areas that are newly being brought under irrigation. In fact, in quite a few areas that have newly come under irrigation command, water logging and salinity have already set in. In planning schemes for reclamation, the approach is generalised and rather over-simplified and is not based on any critical soil and hydrological survey. Further, commensurate with the extent of the problem, the programmes so far taken up have been rather very inadequate. While some work is done, largely in Punjab, under Irrigation Department and somewhat in Uttar Pradesh, no systematic work of any significance is started in any of the States.

9.38. The problem of reclamation of saline, alkali and waterlogged lands is rather complex. There is considerable diversity in the nature and severity of the problem areas. Not all lands are amenable for reclamation within economic and practical limits. Therefore, before taking up any area for reclamation, it is important to know the nature of the problem, demarcate reclaimable areas and adopt appropriate treatment methods, both in kind and amount and ensure effective follow-up and soil management programme on reclaimed areas, to keep them in productive condition. In reclamation of waterlogged lands, there has to be a coordinated programme, to include, field drains along with the main drains. In determining the drainage design, it is important to know the soil conditions, e.g., infiltration and permeability, to decide on the alignment, spacing and the depth of drains for installation and to find out the out-fall conditions at the outlet of the drains for their smooth and efficient working. For effective results therefore, rigid technical control and coordination is a primary factor. Good and lasting results will not follow simple and easy methods.

9.39. Following are the essentials of an effective programme :—

(i) It is essential that the areas to be reclaimed, and the types and amounts of various measures to be adopted, ought to be based on proper soil and hydrological surveys.

(ii) Only easily reclaimable areas, as determined through proper soil survey, should be taken up for reclamation as a first step in this programme.

(iii) The programme of main drainage channels should be well co-ordinated with field drainage measures.

(iv) There should be arrangement for proper follow-up programme to maintain the reclaimed areas in productive condition.

(v) There should be systematic and planned arrangement, for collection of data on salinity and water logging in new areas, as post-irrigation programme.

(vi) Reclamation of coastal saline areas must include drainage works for effective results.

The programme relating to field drainage is discussed and provided for under the programme item (vii) "Conservation Irrigation, Water Management and Field Drainage". Under the present scheme, details are given for reclamation of saline and alkali and acid lands.

Physical targets and their phasing :

9.40. In the Fourth Plan, sufficient emphasis will be given to prevention of this problem in the new areas. For this purpose, there would be planned arrangement for collection of data on salinity and water logging in the new areas. The soil conservation staff at the field level and also the soil survey staff of the States would carry out the required observations, to locate areas with a potential hazard needing immediate attention. This work will be coordinated with the programme of field observation which is undertaken by the Irrigation Department.

9.41. The reclamation programme will be confined mainly to the easily reclaimable areas, as determined by proper soil and hydrological surveys. Areas, where the reclamation cost does not go beyond Rs. 300 to Rs. 400 per acre, will only be taken. The programme will include large areas of coastal land for their reclamation also. The programme will be developed largely as a promotional measure. For this purpose, sufficient number of pilot projects may be set up in different problem States. The States may set up technical units for reclamation operations. For this purpose the States may either acquire the land, and after reclamation may auction it, or the States may carry out reclamation under the agreement with the owner. Although the emphasis in the programme will be as a promotional measure, yet sufficient technical personnel would be provided to cover an area of about 1.5 lakh acres of inland and coastal saline lands during the Plan period. The technical staff would include execution and maintenance sub-divisions.

In the first year of the Plan it will be necessary to carry out proper soil and hydrological surveys, undertake planning and build adequate technical resources. Achievement of physical targets is, therefore, expected to commence from second year. The programme is, therefore, phased to cover 15,000, 30,000, 45,000, and 60,000 acres in each of the four years, commencing from second year respectively.

Requirement of technical personnel :

9.42. The proposed surveys and laboratory studies for demarcating the areas for reclamation and adoption of adequate measures and exercising proper checks to determine the progress of reclamation process are expected to be carried out by the soil survey organisations of the States through their field parties and the soils laboratories. For taking up the work in the field there will be execution divisions. The reclamation programme will not be completed in one year. Usually it takes a few years for completion of the reclamation. It will also be necessary to ensure proper maintenance of the reclaimed lands. Therefore, there shall be maintenance sub-divisions for the reclaimed areas. An execution sub-division will consist of one senior technical staff (Officer); 2 junior technical staff (Assistants) and 4 field level technicians (Sub-assistants) to cover 2,000 acres annually. The maintenance sub-division will comprise of 1 Officer, 2 Assistants and 8 Sub-assistants for 8,000 acres of maintenance. On this basis, the requirement is estimated to be about, senior technical staff (Officers) 47, junior technical staff (Assistants) 89, and field level technical staff (Sub-assistants) 227.

Financial implication :

9.43. The average cost for reclamation of saline and alkali soils is reckoned to be about Rs. 250 per acre. Total financial requirement for the proposed target of about 1.5 lakh acres, including the cost for maintenance staff, is estimated to be Rs. 4.1 crores for the Fourth Five Year Plan.

Preparatory work necessary in the Third Plan :

9.44. To set guide lines for undertaking the required type of surveys and preparing a proper plan for reclamation of saline and alkali soils, it is proposed to set up 2-3 pilot projects in the remaining period of the Third Five Year Plan in the States, locating one each in Punjab, Uttar Pradesh and Gujarat or any other State as may be convenient. The financial implication of the proposed pilot projects is estimated to be about Rs. 6 lakhs.

9.45. While the type of organisation likely to be required for taking up this programme is suggested in para 9.42 above, the actual and effective organisation needed for taking up the programme particularly in the areas where salinity and alkali soil problem has become one of national consequence, can be determined after some experience is gained from these pilot projects and the implementation of the programme in the States. May be, in the long run, it may be necessary, to think of a special organisation like the Bureau of Reclamation for this programme but this must develop on the basis of the experience to be gained.

*(vii) Conservation Irrigation, Water Management and Field Drainage.**Scope :*

9.46 The problems of water waste and its misuse arise largely from lack of proper preparation of fields to receive irrigation water. Levelling of fields and land development, for proper alignment of irrigation channels, are important field operations for preparation of

fields, to ensure effective use of irrigation water. Besides, to prevent ill effects of improper use of irrigation water, it will be necessary to provide field drainage. This programme will therefore, include schemes relating to land development, levelling, alignment of irrigation channels, developing conservation irrigation system and field drainage.

9.47. All the above operations are technical in nature and cannot be carried out by the cultivators on their own. A large number of demonstrations in this respect will be good to educate the farmers about the goodness and value of these operations. However, for carrying out these operations in the field, each farmer shall need technical help for each of his plot. This programme, therefore, is of very great importance in ensuring efficient use of irrigation water and proper development of land for irrigated agriculture.

Technical considerations of the programme :

9.48. Success of field drainage programme depends on careful study and analysis of soil physical properties and the coordination of the programme with the flood storm drains that are being constructed as drainage works by Irrigation & Power Ministry. Following considerations, therefore, are essential for an effective programme :—

(i) In planning, a complete and detailed study will be necessary of the physical properties of soils. There are certain problem soils, e.g., deep black soils which have different physical conditions. Programme of field drainage cannot be extended indiscriminately on such soils without careful study of soils. Some exploratory work therefore may be necessary on black soils to work out appropriate drainage specifications, before works could be taken up on more extensive basis on such soils.

(ii) The work shall need to be effectively coordinated with the work of Irrigation & Power Ministry on flood storm drains.

(iii) Priority for field drainage will be necessary in areas where flood storm drains are proposed or are taken up by the Irrigation & Power Ministry.

The programme of land levelling may in many cases involve a heavy earth work which may not be possible by individual farmers to undertake on their own. In such cases, it may be necessary for the Government to maintain tractor units to be loaned to the cultivators on hire basis.

Physical targets and phasing :

9.49. The problem of field drainage and land levelling can be categorised separately for older areas where the main work will be to lay down field drains and the areas which are coming under new irrigation command which will involve surface and sub-surface drainage and land levelling. It is proposed to treat about 0.4 million acres of older irrigated areas and about 1.5 million acres of the new command areas.

In the first year, it will be necessary to organise the technical personnel, arrange for their training and undertake necessary surveys for planning. As such, no physical targets are likely to be achieved

that year. In the subsequent years, the targets are phased to cover 0.75, 3.5, 6.0 and 8.75 lakh acres from second to fifth year of the Plan respectively.

Requirement of technical personnel :

9.50. Technical personnel will be required for execution of works on the field and for their maintenance, particularly drainage and conservation irrigation systems, till these are fully established. An execution sub-division will comprise of senior technical staff (Officers) 1, junior technical staff (Assistants) 4, and field level technicians (Sub-assistants) 8 with one draftsman and one tracer for 2,500 acres of annual execution, Maintenance sub-division will comprise of 1 Officer, 2 Assistants and 8 Sub-assistants for maintenance of 20,000 acres. On these basis, the requirement of technical personnel is estimated to be, senior technical staff (Officers) 471, junior technical staff (Assistants) 1993, and field technical staff (Sub-assistants) 3,282.

Financial implication :

9.51. Under this programme, it is expected that most of the earth work involved will be carried out by the farmers on their respective fields. For execution staff and other operations, it is estimated that the average cost per acre may be about Rs. 50. Besides, there will be cost of specialist staff, maintenance sub-divisions and equipment. The financial requirement is estimated to be Rs. 15.5 crores.

9.52. As a supporting programme, it will be necessary to undertake research and training in water use and management including field drainage. Research may be taken up in collaboration with the existing Central and State Research Institutes. Training in water use and management will be necessary for irrigation engineers and technicians engaged in the field programmes.

(viii) Strengthening of Soil Conservation and Soil Survey Organisations.

9.53. To pursue soil conservation as a positive programme, in which, the projects will be prepared in a composite and comprehensive way with watershed as a unit for planning, which will include not only measures for erosion control, but also proper soil and water use and management, flood control, sedimentation control, field drainage, and conservation irrigation, it will be necessary to have well-knit organisation that is technically competent, and numerically adequate, both at the States level as well as at the Centre. Experience and observations, so far, have indicated that inadequacy of the organisation has been the major bottleneck in effective planning and implementation of the present soil conservation programme.

9.54. In the States, at present, the responsibilities for soil conservation are diffused among various departments, e.g. Agriculture, Forestry, and Irrigation. There is lack of coordination in collecting basic data, in planning and implementation of the programme on watershed basis and there is no long range planning of the facility needs (training of technical personnel, etc.) for soil conservation programme in an integrated way.

9.55. The present organisation in the States is built round the object of undertaking erosion control measures only, consisting of contour bunding and terracing in agricultural land and afforestation and pasture development in non-agricultural land. In the States, except for execution staff at the field level, there are no technical personnel in any scientific field, at the State or zonal level, to direct and guide the programme of soil and water use and management in systematic manner or to prepare an inventory of States' problems and facility needs, to carry out any field evaluation of the programmes to assess their adequacy or to determine the feasibility and practicability of various standards and specification that are adopted for different measures. The approach is broad, generalised and not critical. Further, there is no proper coordination between the extension agencies and soil conservation organisation.

9.56. For undertaking soil conservation as a positive programme in a composite and a comprehensive way, it would be necessary to carry out soil survey as an essential requirement to determine the nature and severity of various problems of soil deterioration and water waste. At present, most of the States do not have properly developed soil survey organisation. The States that do have some sort of soil survey unit, carry out survey for specific purposes and it is not coordinated with the programme of soil and water conservation for efficient use and management of soil and water resources.

9.57. At the Centre, the organisation is mainly advisory. It is therefore, ineffective for pursuing with the States any national policies and programmes in technical fields effectively. In number, the organisational set up is inadequate, to carry out any effective functional field evaluation of soil conservation schemes. At present, the method of evaluation or inspection is only very general and further it lacks completely follow-on with the States.

9.58. From the technical stand point, the organisation even at the Centre is inadequate. While there are specialists in the sciences of agronomy, soils, forestry and engineering, there are no specialists in the fields of drainage, hydrology, geology, socio-economic and water use and management, which are intimately connected with land treatment and watershed management programmes. This limits the field of technical advice that the Central organisation can give in soil and water conservation programme.

9.59. Essential considerations for competent organisation at State level would be :—

- (i) Ensure coordination among various departments.
- (ii) Ensure planning in a comprehensive way for general soil and water conservation programme and watershed protection.
- (iii) Make a realistic inventory of the present problems of soil deterioration and water waste and draw up projections of future hazards through proper field studies.
- (iv) Make a review of the activities and levels of performance, develop adequate projections of future trends, and set needs for the task ahead, and the level of performance required.

(v) Maintain good and reliable records of performance, e.g., progress in physical units, economic benefits by way of increase of yield and reduction of damages due to erosion, floods, water logging, salinity and sedimentation, etc.

(vi) Ensure follow-up of the programme of soil and water use and management, bring about close coordination with extension agencies, and provide sound technical advice and assistance to field workers under difficult situations.

(vii) Carry out field studies to develop standards and specifications for application under local problem situations.

For a competent organisation for soil conservation in the States it would be necessary to have :—

(i) State Soil Conservation Board which should serve as an advisory body for laying broad policies for undertaking soil conservation programme in a coordinated way on watershed basis.

(ii) Make one Department responsible for integrated planning. This should preferably be the Department of Agriculture.

(iii) Have an officer of the rank of Additional Director of Agriculture in charge of soil conservation programme alone.

(iv) Have subject matter specialists at the State levels in the fields of agronomy, engineering, soils, forestry, watershed management, water use and information. These subject matter specialists should be held accountable for technical excellence in their particular fields, but the State Additional Director for Soil Conservation must integrate their skills and efforts into an effective programme.

(v) In the case of soil survey organisation, it would be necessary to have specialist staff for field supervision, interpretation, cartographic work and for classification and correlation, supported with field parties and laboratory facilities.

(vi) Coordination of the State soil survey organisation would be necessary with the Central soil survey organisation for developing a uniform terminology and techniques for classification, correlation and interpretation of soil survey data. For this it will be necessary to have a Soil Survey Coordination Committee (Annexure XVI).

9.60 The organisation at the Centre has to be adequately strengthened. The essential consideration for organisation at the Centre would be :—

(i) Develop national policies, procedures and criteria for planning, implementation and field evaluation of all programmes.

(ii) To ensure coordination of soil conservation programme on national basis.

(iii) To make technical scrutiny of State schemes and carry out functional field evaluation of programme, in order to determine their technical adequacy and suggest improvement for economy or better efficiency.

(iv) To ensure that progressive improvement in technology and improved conservation methods are developed for use and management of soil and water and their effective execution is carried out throughout the country.

(v) To plan, direct and guide research and training in soil conservation and develop demonstration programmes.

(vi) To make inventories of the national problem and needs for research training and development programmes.

(vii) To help in planning watershed projects.

Consistent with the above requirements, the Central organisation would need additional strengthening. At the Centre, there should be established a position, which should provide inter-departmental coordination on conservation matters with irrigation, public works and other functions of the Central Government relating to soil and water conservation. All administrative and technical authority essential to the conduct of the national soil and water conservation programme should be assigned to this position. He should have specialists (besides the ones already assigned) particularly in the fields of economics, information, watershed management, hydrology, water use and field drainage with adequate supporting staff. It is very necessary to have regional units. About 6-7 regional units are envisaged.

Schematic charts of the proposed organisation in the States for soil survey and soil conservation are given in Annexure XVI and XVII respectively.

9.61. The type of organisation given above is what is considered essential. However, this does not enjoin that the complete organisation whether at the Centre or in the States has to be built up all at once. The organisation should be built up gradually and in a progressive way, as competent men become available in respective fields. A planned arrangement would also be necessary for proper specialised training of promising men to occupy positions of higher technical responsibilities.

9.62. Building of adequate organisation in the States as well as at the Centre is proposed to be taken up in a phased way as follows :—

First phase to be completed in the remaining period of the Third Plan
State organisation :—

(i) To organise the existing soil conservation set up in the Agriculture Department as a separate unit responsible only for soil and water conservation programme of the State under the charge of Additional Director or Joint Director of Agriculture with supporting staff particularly in conservation planning, soil survey, engineering, agronomy and forestry.

(ii) To set up Soil Conservation Boards wherever these are not set up.

(iii) To strengthen the organisation of river valley projects by addition of construction and design engineers.

(iv) To organise and develop soil survey organisation with specialist staff, for direction, supervision and execution of field work and also for interpretation, classification and correlation of field and laboratory data.

(v) To strengthen the existing revenue set up for consolidation of holdings by having one soil conservation supervisor with each party.

Central Organisation :--

(i) To enlarge and strengthen the existing set up with addition of specialists in information, water use and economics.

(ii) To develop 3 to 4 regional units for planning of soil conservation programme in the watersheds of river valley projects.

SECOND PHASE TO BE COMPLETED DURING THE FIRST TWO YEARS OF THE FOURTH PLAN.

State organisation :--

(i) To strengthen the organisation at State level by addition of specialists in water use, information and drainage.

Central organisation :--

(i) To strengthen the staff with addition of junior level specialists (Assistant Advisers) to various senior level specialists (Deputy Advisers).

(ii) To develop three additional regional watershed planning units.

(iii) To strengthen soil survey organisation for aerial photo-interpretation.

THIRD PHASE TO BE COMPLETED IN THE LAST THREE YEARS OF THE FOURTH PLAN PROGRESSIVELY.

State organisation :--

(i) To complete the strengthening of State organisation.

(ii) To complete strengthening of soil survey organisation with adequate facilities for cartography and laboratory work and also to develop aerial photo interpretation unit.

Central organisation :--

(i) To strengthen the organisation to complete the final development as envisaged.

Financial implication :

9.63. The financial implication of the proposed strengthening of the organisation is estimated to be about Rs. 1.80 crores for State soil survey and soil conservation programme and Rs. 0.39 crores for the Central organisation. The financial provisions required for the State organisation are covered under the respective State soil conservation programmes. The provision, only, for strengthening of the Central organisation which is Rs. 0.39 crores is indicated here. Compared to the overall programme which is envisaged, the estimated financial requirement for strengthening and building up of adequate and competent soil conservation and soil survey organisations is only a very small per cent of the total envisaged Plan outlay. However,

the entire success of the programme hinges round this and hence it is of very vital necessity.

Advance work in the Third Plan :

9.64. Advance work needed in the remaining period of the Third Five Year Plan would be the proposed strengthening of the organisation under first phase above. The financial implication of the advance work for the Central organisation is estimated to be about Rs. 2.3 lakhs

(ix) *Training in Soil and Water Conservation.*

9.65. Experience in the past has clearly indicated that the lack of availability of trained personnel has been the major bottleneck in soil conservation programmes. Success of soil conservation, above all things, will, therefore depend on maintaining a continued training programme at various levels.

9.66. The training programme would include (i) in service training for field staff, e.g. Officers, Assistants and sub-assistants; (ii) training in water use and management, pasture development and management and soil survey; (iii) training under foreign aid programme for specialisation in specific scientific fields related to soil and water conservation; (iv) training in the University at degree and post-graduate levels; (v) training of extension staff (vi) training of farmers and (vii) training will also be necessary at high school level particularly in rural areas. Besides the actual training programme as indicated above, the programme would also include measures necessary for developing adequate audio-visual training aids, e.g., films, film strips, posters, pamphlets and other suitable material.

(i) *Training in soil and water conservation for field staff.*

9.67. This will include training of Officers, Assistants, and Sub-assistants. Under the present arrangement, the training of Sub-assistants is undertaken by the State Governments and that of the Officers and Assistants it is mainly carried out at the centres of Government of India. In the Fourth Plan, it would be desirable to encourage more States to take up the training of Assistants, wherever the States' requirement is sufficiently large and a full-fledged training centre can be efficiently operated by the States independently or cooperatively with the other States. To encourage States to undertake training of Assistants, a liberal financial assistance of 100 per cent subsidy may be necessary for training cost, except for the capital cost of buildings and land etc. needed for the training centres. It would be necessary to ensure that a uniform standard of training curricula is adopted. Government of India centres would continue to impart training to Officers and undertake major responsibility for training of Assistants also.

9.68. The total requirement of trained personnel is estimated to be about 1550 senior technical staff (Officers), 8300 junior technical personnel (Assistants) and about 24,000 field level technicians (Sub-assistants). Out of the total requirement, the personnel needed for execution of field programme is estimated to be about 1200 Officers, 7,400 Assistant and 23,000 Sub-assistants for whom adequate facilities for training in soil and water conservation including water use

and pasture development and soil survey have to be developed. Other personnel will be needed largely for research, training and the specialist staff in various disciplines. The requirements for field execution, are over 3, 4 and 2.5 times those estimated for the Third Plan for Officers, Assistants and Sub-assistants respectively. The technical staff at senior and junior levels required at the State and Central levels for overall direction, guidance, supervision and conduct of research and training will be largely personnel with good academic specialisation in different scientific disciplines. Many of these would also need facilities for training under some foreign aid programme for further specialisation in their respective fields with special reference to principles and practices of soil and water conservation.

(ii) *Training in Water Use and Management, Pasture Development and Soil Survey.*

9.69. To support the programme of water use and management, pasture development and soil survey in the States, it will be necessary to have intensive training programme. Training in water use and management would be necessary for Assistant Irrigation Engineers of the Irrigation Department and also for senior and junior technical staff in soil conservation who will be in charge of the execution of the field programme. This type of training has to be organised in the irrigation command areas of some projects. Bellary and Kotah could be considered suitable places. The course may be of about two to three months' duration.

The training in pasture development will be needed at the level of senior staff (Officers) and junior staff (Assistants). This training could be organised at the Central Arid Zone Research Institute or Fodder and Grassland Institute.

For undertaking the programme of soil survey, which, as stated before, would be an essential requirement for all soil conservation schemes in the Fourth Plan, it would be necessary to train adequate personnel at senior level (Officers) and junior level (Assistants). The training could be arranged under All India Soil and Land Use Survey Organisation training centres of the Indian Agricultural Research Institute.

(iii) *Training under Foreign Aid Programme*

9.70. In developing soil and water conservation as a science and technology, it is essential to have close coordination of many biological, physical and social sciences e.g., agronomy, soils, forestry, engineering, hydrology, hydraulics, geology, soil physics, plant physiology and soil conservation economics, etc. At present, in the entire soil conservation organisation, both in the States and at the Centre, specialist staff is drawn only from the scientific fields of agronomy, soils, engineering and forestry. There is absolute dearth of competent scientific personnel in other scientific fields related to soil and water conservation. Therefore, under the foreign aid training programme, opportunities shall have to be availed of for specialisation in the scientific fields indicated above, to ensure availability of adequate number of competent personnel both in the States and at the Centre.

(iv) *Training in Soil and Water Conservation at the University level.*

9.71 To meet the requirement of high level technicians for the future programmes, it is necessary that the training in soil and water conservation should be imparted at the degree and post-graduate levels in agricultural and engineering institutions. In all agricultural colleges at degree level the syllabus should provide a comprehensive course in land and water management. It would also be necessary to take steps to introduce soil conservation in engineering and forestry colleges also. Facilities should be developed for post-graduate work in soil and water conservation in the important universities in the country.

(v) *Training of Extension Staff.*

9.72. Extension agencies have important role to play in furthering soil and water conservation programme in the field. If they are to make an effective contribution, it is essential that the extension staff i.e. Block Development Officers, Agricultural Extension Officers and Village Level Workers ought to be given sufficient training, so that they should be able to recognise the problem of soil deterioration on the field and judge the feasibility and practicability of various measures. The present syllabus of V.L.Ws course does not lay adequate emphasis on soil and water conservation programme. It provides for only a few lectures which is not enough to equip them technically for any useful work. The syllabus needs to be strengthened in soil and water conservation. Besides theory, it should provide "On Job" training on project work near the centre. While for the new entrants the training could be imparted through the regular syllabus adequately strengthened in soil conservation, for those in service, training could be arranged through some refresher courses. In the case of Agricultural Extension and Block Development Officers, those in service, training can be organised at extension educational institutes for refresher training by adequately strengthening the syllabus in soil and water conservation. For new entrants, special intensive short training course may be arranged in the States, if there are facilities or else they may be given regular training at Government of India training centres.

(vi) *Farmers' training.*

9.73. Training of farmers is essential to develop proper understanding of the need and value of soil conservation measures in maintaining and improving the productivity of land. Training of farmers is also necessary to develop village leadership. The generalised training of farmers may be carried out through field demonstrations. The training for development of village leadership may be taken up through organised intensive field training camps of one week to ten days' duration. The nature and substance of training will vary with local problems. Thus in dry areas, emphasis will be on erosion control, moisture conservation and soil management; in irrigated areas the emphasis will be on water use and management, and correcting, and improving of soil conditions, e.g. drainage, salinity and soil structure etc. Farmers' training programme ought to precede undertaking of intensive soil and water conservation programmes in any particular area.

(vii) *Training at High School level.*

9.74. India being essentially an agricultural country, whole nation must be inspired with the concept and need of conservation of nation's soil and water resources. While we may continue to apply various educational and extension methods with the present generation, we cannot neglect the generation in the making. Those now in schools who are to be the future farmers of the country must grow to be the future progressive farmers. To achieve this, conservation education must go to schools at higher secondary level. If the young, would be farmers, continue to grow with the traditional outlook to agriculture, it will be hard to change the face of India's agriculture. It is therefore envisaged that in the Fourth Plan a beginning would be made to introduce some lessons in soil and water conservation with job work exercises, in the high school curriculum and arranging soil conservation camps for a fortnight or a month's duration.

Essential requirement of Training Programmes.

9.75. It need hardly be emphasised that the success of entire soil conservation programme depends on the availability of trained personnel. Therefore, training in soil conservation is the key to the success of soil conservation programme. To achieve the goals of training it will be necessary that :

- (i) Requirement of trained personnel by category and number be worked out for the entire plan period with yearwise phasing.
- (ii) Schedules of training should be strictly adhered to according to phased requirements.
- (iii) States and the Centre must assess the present facilities available *vis-a-vis* the future requirements and necessary steps be taken well in advance to build up the required facilities.

Financial implication :

9.76. The financial implication of the proposed training programme including development of adequate proposed audio-visual aids in the Fourth Plan is estimated to be about Rs. 25.0 million.

Preparatory work in the Third Plan :

9.77. Advance work will be necessary to build up training facilities in the last year of the Third Plan. Financial implication of the proposed advance work is estimated to be about Rs. 1.0 million.

(x) *Soil and Water Conservation Research.**Scope :*

9.78. Consistent with the increased activity for application of soil and water conservation measures on the field, there would be need for expansion of the research facilities, both by the Centre for study of regional problems, and by the States for study of the local problems. It will also be necessary to undertake fundamental research, to lay sound basis for application of various practices and carry out research in watershed management. The provision under

this scheme includes the programme envisaged both by the Centre as well as by the States.

Programme for the Fourth Five Year Plan :

Regional Research Centres :

9.79. In the Fourth Plan it is proposed to have sub-stations attached to the existing regional centres and develop facilities for research in drainage and water use, reclamation of saline and alkali lands, watershed management and fundamental research in soil and water conservation. Following is the proposed programme :—

(i) Twelve sub-stations are proposed to be set up with 2 each for Dehra Dun, Kotah, Bellary and Ootacamund centres and one each for Chandigarh, Vasad, Agra and Ibrahimpatnam.

(ii) For taking up research in drainage and water use, it is proposed to set up four research centres, one each in Uttar Pradesh, Punjab, Rajasthan and Gujarat. In addition to these, two-research centres are envisaged for taking up research in the problems relating to soil salinity in coastal saline areas.

(iii) For taking up research in watershed management, it is proposed to have research units attached with four of the existing regional centres.

(iv) The facilities for taking up the fundamental research in soil and water conservation are proposed to be developed at 2 of the existing centres in the first instance. These centres will be strengthened with additional staff and equipment.

(v) The staff at the existing regional research centres is not adequate to take up full work-load of research and training. This would also need strengthening in an appropriate way.

Research in the States :

9.80. It is necessary that each State should have at least one research centre in soil and water conservation. In some cases it may be necessary even to have more, depending on the physiographic and climatic variations. At present, only a few of the States do have centres for taking up research, to solve the local problems. In the Fourth Plan it is proposed to add 7 centres in the different States.

Phasing of the programme :

9.81. With regard to sub-stations to the existing regional research centres, it is proposed to set up three sub-stations each year starting from the first year of the Fourth Plan. With regard to research centres for drainage and water use, two centres are proposed to be set up each year starting from the first year of the Fourth Plan. Two of the centres on salinity problem may be taken up in the last year of the Third Plan and the other two in the first year of the fourth plan. Of the watershed units, two may be started in the fifth year of the Third Plan and the other two to be taken up in the first year of the Fourth Plan. Basic research is proposed to be started from the first year of the Fourth Plan at two centres.

Requirement of technical personnel :

9.82. The requirement of technical personnel for the proposed research programme is roughly estimated to be 64 senior level technical staff (Officers) specialised in different scientific disciplines, 130 junior level technical staff (Assistants) and 130 field level staff (Sub-assistants). In addition to this, non-technical personnel required are estimated to be 108 ministerial and 182 Class IV.

Financial implication :

9.83. For the proposed programme in the Fourth Five Year Plan, the financial requirement is estimated to be Rs. 40.0 million (being Rs. 20.0 million for Central stations and Rs. 20.0 million for research Stations in the States).

Preparatory work :

9.84. As a preparatory work in the Third Plan, it is proposed to start one research centre on salinity problems and two watershed units in the last year of the Third Five Year Plan. The financial implication of the proposed preparatory work is estimated to be about Rs. 1 lakh.

*(xi) Central Arid Zone Research Institute.**Scope :*

9.85. The Central Arid Zone Research Institute was started in 1959, with the collaboration of UNESCO, by reorganising the Desert Afforestation and Soil Conservation Station. The Institute has five main Research Divisions of (a) Division I for Basic Resources Studies, (b) Division II for Resources Utilisation studies (c) Division III for External Liaison in fields of Physical and Chemical Engineering, (d) Division IV for Human Factors Studies, (e) Division V for Special Animal Studies.

Proposals for the Fourth Plan :

9.86. Proposals for the Fourth Plan envisage the following :—

(A) Expansion of the existing divisions to provide facilities for research in the fields where the facilities do not exist, but the problems are very pressing. These proposals include strengthening of junior staff and reorganisation of some of the sections into new divisions.

(B) Starting new divisions at the Institute consistent with its enlarged activities.

A. Expansion of the present sections including the reorganisation of some of the sections into new divisions as follows.

*Division I—Basic Resources Surveys.**Scope of Present Work :*

9.87. This division is to obtain a comprehensive knowledge and understanding of physical resources of the arid and semi-arid regions. The work of the division is carried out through the sections of soil science, plant physiology, plant ecology, geomorphology,

irrigation-cum-hydrology and climatology. Section on soil science includes, soil science and analytical chemistry; plant ecology section includes, ecology and systematic botani; the section on geomorphology includes geomorphology, cartography, and geology; irrigation hydrology section includes, ground water hydrology, irrigation hydrology and surface water hydrology.

Soil Science Section :

9.88. Present Programme:—Present staff of the section mainly conducts soil survey of arid zone, analyses soil samples for correlation work. The section has an integrated programme of work with other sections of Basic Resources Studies Division and studies soil profile of the region in relation to geomorphology, vegetation and classifies lands according to capability classes.

9.89. Proposals for the Fourth Plan :—In the Fourth Plan, it is proposed to strengthen this section to be able to carry out work on the following aspects of arid zone soils :—

- (i) Soil genesis of arid zone soils.
- (ii) Chemical nature of arid zone soils.
- (iii) Geochemistry of sedimentary, metamorphic and igneous deposits of arid and semi-arid regions of Western Rajasthan.
- (iv) Micro nutrient status of arid and semi-arid zone soils.
- (v) Physical properties of arid zone soils.

Irrigation-cum-Hydrology Section :

9.90. Present Programme :—Present programme under this section covers the fields of survey of water resources, fundamental studies in hydrology, soil mechanics, ground water flow, irrigation and soil water management. Technical sub-committee has recommended that the programme of this section should also include studies on evaporation losses in channels and irrigation tanks, and different methods of canal lining.

9.91. Proposals for the Fourth Plan :—In order to carry out the expanded programme of work as recommended by technical sub-committee, it is considered necessary to expand this section to include :—

- I. Irrigation Engineering sub-section.
- II. Irrigation Forestry sub-section.

Plant Physiology Section.

9.92. Present Programme :—The object of this section is to study the plant physiological problems of the arid zone plants, with special reference to factors which are limiting, for propagation, optimum growth, and development of plants under arid environments. The programme of work includes studies on plant water relationship, assessment of drought and frost hardiness, moisture requirements, and effects of dehydration, conditions for optimum propagation and

germination of desert plants, nutrient requirements of plants and relative growth rates, and salinity effects.

9.93. Proposals for the Fourth Plan :— In the Fourth Plan, the work of this section will expand, as there will be need for more fundamental research on various studies now under way. It is, therefore proposed, to strengthen the section as follows :—

- I. Strengthen the Staff for present work.
- II. Set up sub-section on salinity studies.
- III. Set up sub-section on nutrient studies.
- IV. Set up sub-section on tree physiology.
- V. Set up sub-section on plant chemistry.

Plant Ecology Section.

9.94. Present Programme :— This includes the sub-sections of ecology and systematic botany. Major work at present is plant introduction by systematic botanist, along with silviculturist. Studies are also carried out in plant ecology as a basis for plant introduction.

9.95. Proposals for the Fourth Plan :— Present activities are limited in extent. In the Fourth Plan, it is proposed to reorganise this section for more effective work. This would cover procurement of species from potential sources, test their viability, keep records of incoming and outgoing species, storage and other work connected with it.

Climatology Section.

9.96. Present Programme :— At present the major work is statistical studies of the available climatic data and their relationship to other characteristics of the environment. The section is expected to carry out studies in the comprehensive field of plant-soil atmosphere, complex, and water and energy relationship.

9.97. Proposals for Fourth Plan :— In the Fourth Plan, it is proposed to set up new sub-section to carry out comprehensive studies on the following aspects :—

- I. Artificial rain making.
- II. Evaporation control.
- III. Micro-climatology.

Geomorphology Section.

9.98. Proposals for Fourth Plan :— This section includes sub-sections on geomorphology, cartography and geology. In the Fourth

Plan, it is proposed to strengthen this section on the following lines :—

- (i) Strengthen the sub-section on geomorphology with more staff.
- (ii) Reorganise the sub-section on cartography to a full fledged section with the following sub-sections :—
 - (a) Map compilation and Research.
 - (b) Drafting and Editing.
 - (c) Map Reproduction.
 - (d) Photography.
- (iii) Strengthen the sub-section on geology with more staff.

Soil Microbiology Section.

9.99. Proposals for Fourth Plan :—Studies in microbiology were envisaged when the station was being reorganised. However, it was suggested that, this field should be developed only after the need for this work at the Institute has been created and the problems requiring urgent attention of such specialists are developed. A stage has now reached where the need for setting up a section of Soil Microbiology is felt as urgent. This section is proposed to be set up in the Fourth Five Year Plan.

Division II—Resources Utilisation Studies.

Scope of Present Work.

9.100. This division is concerned more specifically with studying the practical problems involved in the reclamation, utilisation, management, maintenance and improvement of resources. The work of the division is carried out through the main sections of agronomy, silviculture, and agrostology. In addition, there are range management and soil conservation and afforestation units. In view of the expanded activities of the Institute, it is considered necessary to strengthen various sections for greater responsibilities in the Fourth Five Year Plan.

Agronomy Section.

9.101. Present Programme :— The main research activities of the agronomy section include determination of land suitable for cultivation on the basis of land capability and efficient use of soil moisture, soil conservation including soil fertility aspects, as well as soil erosion. These studies involve a wide range of experiments on species and varieties, time and type of cultivation, time, rate, and method of planting, bunding, sub-soiling, mulching, ridging, strip crop cultivation, and water and soil conservation, practices, cover crops, manuring, mixed cropping, and crop pasture rotations, and the interaction between many of these factors. At present, large number of experiments in the field, in pot culture and in the laboratory are undertaken at the main Institute at Jodhpur. Besides, there are number of field experiments located at various centres

also. Apart from these, there is need for taking up work on irrigated crops, on vegetables and also undertake studies on plant breeding and plant nutrition.

9.102. Proposals for the Fourth Plan :— The development programme of this section in the Fourth Plan envisages the following:—

- I. Strengthening of the present organisation of the agronomy section.
- II. Setting up of sub-section on irrigated crops.
- III. Setting up sub-section on plant breeding and genetics.
- IV. Setting up sub-section on vegetables.
- V. Setting up sub-section on plant nutrition.

Silviculture section.

9.103. Present Programme :—Present activities of the section include work on plant nutrition (tree species), developing techniques for raising various tree and shrub species, and management of trees and shrubs in arid areas.

9.104. Proposals for the Fourth Plan :— In the Fourth Plan development of this section is proposed as follows:—

- (i) Strengthening the present unit.
- (ii) Set up sub-section on selection and breeding of tree species.
- (iii) Set up sub-section on tree physiology.
- (iv) Set up sub-section on minor forest products.

Agrostology Section.

9.105. Present Programme :— At present the section of agrostology is engaged in collection, introduction and selection of types of grasses and legumes, suitable for various tracts of arid and semi-arid regions of the country, study of grass species suitable for desert areas and its distribution for pasture development work, pasture development, management, and ecological studies, with particular reference to succession in grasslands in Western Rajasthan.

9.106. Proposals for the Fourth Plan :— The experimental programme at present is limited by the limited staff. However, the results so far obtained, from various studies have been useful and have opened new fields of investigation for proper development of pastures in Rajasthan. To equip the section adequately, for effective work, it is proposed to develop the section in the Fourth Plan as follows :—

- (i) Set up sub-section on plant breeding.
- (ii) Set up sub-section on pasture development and pasture ecology.
- (iii) Set up sub-section for seed studies.

- (iv) Establish section on pasture utilisation as suggested by Mr. C. S. Christian, UNESCO Adviser, in his report.

Range Management and Soil Conservation section.

9.107. Present Programme :— This section is concerned with the studies of range management and soil conservation, to evolve suitable practices which will be conducive to greater production of forage on the range and reduce soil erosion from the areas where water and wind erosion are very serious.

9.108. Proposals for the Fourth Plan :— Recently experimental programme of this section has been revised and work on more scientific lines has been initiated. To carry out the programme, it is considered necessary to augment the staff under this section in the Fourth Five Year Plan.

Range Management and Soil Conservation Units.

9.109. Present Programme :— There are at present 5 research units at Jodhpur, Jaisalmer, Bikaner, Churu and Gadra Road for undertaking silvicultural, agronomical and agrostological experiments under different soil and climatic conditions, in Rajasthan.

9.110. Proposals for the Fourth Plan :— In the Fourth Plan, it is envisaged to strengthen the existing 5 units and establish 2 more units one each at Jaipur and Udaipur.

Division III—External Liaison.

(Division of Physical and Chemical Engineering).

9.111. Present Programme :— This Division is not yet set up, although it was suggested by the UNESCO Adviser when the Institute was formed.

9.112. Proposals for the Fourth Plan :— UNESCO Advisor had recommended in his report that a Physico-Chemical engineering studies division be set up at the Central Arid Zone Research Institute. This proposal was reiterated in the report of the Colombo Plan Adviser also. In view of these recommendations, and the need for research, it is proposed to set up a division of Physico-chemical engineering with sections on:—

- I. Saline water conservation.
- II. Solar energy.
- III. Bio-gas.
- IV. Wind Power.
- V. Sociology (Extension).
- VI. Instrumentation and workshop

Division IV—Human Factors Studies.

9.113. Present Programme :— At present under this division studies are taken up on human sociology only, to a limited extent, because of the limited staff.

9.114. Proposals for the Fourth Plan :— In the Fourth Plan, it is envisaged to strengthen the division by setting up sub-sections on rural sociology, agricultural economics, social anthropology and agricultural extension.

Division V—Special Animal Studies.

9.115. Present Programme :— There are a variety of special problems, in the field of animal nutrition, physiology and ecology, related to arid and semi-arid environments, that need to be tackled for proper development of these areas. For this purpose, Division of Special Animal Studies was set up. The proposed division was to take up studies to cover fields of animal ecology, physiology, zoology, entomology and animal nutrition. At present there is only a limited staff in the section. Obviously, therefore, the scope of work is very much limited.

9.116. Proposals for the Fourth Plan :—To undertake essential studies in various fields in the Fourth Five Year Plan, it is proposed to strengthen the present section of animal ecology and set up sub-sections on :—

- I. Animal Physiology.
- II. Animal nutrition.
- III. Plant protection.
- IV. Animal toxicology.

B. Starting of New Divisions at the Institute consistent with the enlarged activities.

9.117. In the Fourth Plan it is proposed to set up new divisions of :—

- I. Division of Radio Biology.
- II. Division of Soil-Plant-water Relationship Studies.
- III. Division of Bio-mathematics Studies.
- IV. Division of Wind Erosion Studies.
- V. Division of Environmental Physiology Studies.

Division of Radio Biology :— Proposed division of Radio Biology will have sub-sections on :—

- (i) Animal Physiology.
- (ii) Plant Physiology.
- (iii) Electronic unit.
- (iv) Radio Physics.
- (v) Radio Chemistry.

Division of Soil-Plant-Water relationship Studies:—Proposed Division will have two sections.

- (i) Soil Physics section.
- (ii) Geophysics section.

Division of Bio-mathematics Studies.—In the Fourth Plan, it is proposed to set up a Division of Bio-mathematics studies with following sections :—

- (i) Mathematical section.
- (ii) Biometry section.
- (iii) Agricultural Statistics section.

Division of Wind Erosion Studies :—In the Fourth Plan it is proposed to set up a Division of Wind Erosion studies with following sections :—

- (i) Aerodynamics section.
- (ii) Agricultural Physics section.
- (iii) Engineering section.

Division of Environmental Physiology :—In the Fourth Plan, it is proposed to set up a Division of Environmental Physiology with following sections :—

- (i) Eco-physiology section.
- (ii) Human Environmental Physiology section.
- (iii) Animal Environmental Physiology section.
- (iv) Service section.

In addition to the setting up of new divisions for research work, as above, it is proposed to develop facilities for post-graduate research work also.

Financial implication :

9.118. The detailed proposals for strengthening of existing divisions of research and setting up of new divisions are under the scrutiny of Scientific Advisory Committee of Central Arid Zone Research Institute. Tentatively a provision of Rs. 7.7 million is envisaged.

Requirement of technical personnel :—

9.119. For the proposed expansion and strengthening of the Central Arid Zone Research Institute, the requirement of technical personnel is estimated to be about 81 senior level technical staff (Officers) specialised in different scientific disciplines, 175 junior level technical staff (Assistants), and 47 field level technical staff (Sub-assistants). In addition, the requirement of non-technical staff is estimated to be 49 ministerial and 49 Class IV.

CHAPTER 10

ESSENTIALS OF SOIL AND WATER CONSERVATION PROGRAMME BASED ON THE REVIEW OF IMPORTANT RECOMMENDATIONS MADE BY VARIOUS COMMITTEES, SURVEYS AND FOREIGN EXPERTS AND EXPERIENCE GAINED HITHERTO

(Details of recommendations are given in Annexure XVIII)

10.1 From time to time a number of conferences and seminars—both national and international—have been held and surveys are conducted to review and discuss various aspects of soil and water conservation programme. Recommendations of far reaching importance have been made by the above groups. Besides, many foreign experts of international reputation have been invited to review our programmes and to make suggestions for improvement. All such recommendations have been sent to the States for consideration and necessary action. These suggestions are of very vital importance and make all the difference between success and failure of soil and water conservation as an enduring and sustained programme. However, when it is considered as to how much of actual action has been taken in implementing the suggestions, the situation is not re-assuring at all. In the Fourth Five Year Plan we are at a stage where soil conservation programme must develop so as to generate a momentum that would carry the programme forward in an enduring and sustained way. Taking into consideration the earlier suggestions and the experience gained so far, it may be emphasised that if soil conservation programme is to succeed in increasing agricultural production on sustained basis, action would be necessary on the following :—

10.2. Organisation :—

(i) The responsibility for planning soil and water conservation programme in a composite and comprehensive way must be given to one authority (preferably the Agriculture Department). If the States are not agreeable to setting up a single authority for this purpose, it would well be necessary to consider setting up of Central Soil Conservation Service.

(ii) The organisation for soil and water conservation must be technically competent and numerically adequate both at the Centre and in the States.

(iii) The States must also build up adequate organisation for undertaking soil survey as an essential part of soil conservation programme.

(iv) The programme for soil conservation should not be dispersed within various agencies. e.g., block, man-power programmes and soil conservation organisation, etc. as at present. Funds for soil conservation may be provided to different agencies but the planning should be the responsibility of one organisation as at (i) above.

10.3 Planning and Implementation of the Programme :—

(i) The working concept of soil and water conservation should be broadened, to include not only the erosion control measures, as at present, but it must cover all practices for efficient use and management of soil and water, that will be needed, to achieve sustained production of crops, grasses and trees for specific kinds of soil at the highest practicable level.

(ii) No scheme for soil and water conservation should be accepted unless standard soil survey of appropriate scale and detail has been made or is included in the Plan for completion, prior to actual conservation planning. Standard soil and land capability survey should be the pre-requisite for all soil and water conservation schemes.

(iii) The methods and practices to be adopted for soil and water conservation programme should be fully standardised and established and should be supported by research results, field studies and field experience.

(iv) There should be a planned and continuous system of field inspection of all soil and water conservation programmes and practices that are applied to the field, by the States and the Centre, to ensure adherence of standards and specifications. There should be effective follow through of such inspections.

(v) Grant of financial assistance to States for soil conservation programme must be subject to the acceptance by the States of the national policies and procedures for the programme as may be laid down by the Centre. Failing this if the States are allowed a *lassiez faire* policy in implementation of soil and water conservation programme, there would be many faces of the programme and no one face would be a true soil conservation programme.

(vi) There is a great and urgent necessity of a close functional co-ordination among soil conservation, soil survey and soil testing.

(vii) There should be proper arrangement to ensure a continuous follow through of soil conservation programme planning in order to be sure that works of importance are maintained and that the cultivators are given full practicable assistance for further improvement.

(viii) Every scheme of soil and water conservation before implementation must be scrutinised by the Centre cooperatively with states for technical adequacy and sufficiency of measures needed for achieving the desired benefits.

(ix) Soil and water conservation measures in the watersheds of the river valley projects must emphasise the engineering works for sediment detention and flood control; and also the measures necessary for erosion control.

(x) Reclamation of saline and alkali lands must be approached on a technically sound basis. After reclamation, adoption of proper soil and water use and management practices, including cropping systems must be ensured to maintain areas in productive conditions, as otherwise, the results will be disappointing.

(xi) Adequate technical and administrative sanctions must be adopted to control the problem of over-grazing.

(xii) The programme of road construction should be effectively coordinated with soil and water conservation programme for prevention of road side erosion and proper location and construction of culverts etc. to avoid damage to soil by formation of new gullies, flooding during rainy season and obstructing drainage.

(xiii) Forest rights must be reviewed and revised in keeping with the national needs and preservation and expansion of forest cover.

(xiv) In all future river valley projects, appropriate surveys and necessary investigations and collection of basic data, to assess the problem of soil erosion and sediment hazard, should form a part of the project surveys.

(xv) Proper coordination of soil conservation staff and the block staff must be ensured. The Village Panchayats must be given definite responsibility to develop local leadership and enlist local cooperation in undertaking soil and water conservation programme, leaving all technical decisions of the programme to the technical personnel of soil conservation organisation.

(xvi) Future land clearing for settlement or allotment, must be based on detailed soil and land capability surveys. Besides, the allotment order must specify the types and amounts of soil and water conservation measures that the allottee must carry out within specified time. If the allottee fails to fulfil this requirement, the allotment should not be confirmed and may even be cancelled.

(xvii) Consolidation of holdings must take into consideration the soil and water conservation needs of the area. Common lands should be left for proper drainage and water ways.

(xviii) All States must have proper legislation, State Soil Conservation Boards and District Committees, for planning and implementation of the programme.

(xix) Grant of subsidy for soil conservation programme must be subject to the guarantee by the farmer to maintain the structures and carry out the minimum practices for soil and water management that will make the programmes useful and effective.

10.4. Training and Education.

(i) Appropriate steps must be taken by the Centre to help develop satisfactory soil and water conservation curricula in agricultural and engineering colleges.

(ii) Due consideration should be given to training for specialisation in scientific disciplines of soil physics, drainage, watershed hydrology, watershed geology, watershed engineering and water use etc. both by the Centre and the States.

(iii) Training in soil conservation must be given to block staff, village leaders and groups of farmers.

(iv) Sufficient audio-visual material and published literature must be developed by the States and the Centre as an educational material.

(v) The training requirement for the Plan period should be carefully worked out and phased by the States at the beginning of the Plan by number and category. Adequate facilities should be created and arrangements made for proper accomplishment of the same.

(vi) Academic training must be supplemented by practical on-the-job training under supervision of experienced technicians on pilot projects which must be laid down on an extensive scale and carried to completion till the results are fully evaluated. Such result demonstrations should be used extensively for training of the farmers as well.

(vii) The type of demonstration, as above, must be laid down on all types of soil deterioration problems.

10.5. Research :—

(i) Arrangements must be made for full appraisal of additional research needs from time to time, in all phases of soil and water use and management and specific research needs should be fully compiled with due priority, for future works.

(ii) There should be close coordination among various institutes carrying out fundamental and applied research in various scientific disciplines associated with use and management of soil and water, e.g., soil science, agronomy, forestry, hydrology, hydraulics, biology etc.

(iii) Future research programme must emphasise adequately, fundamental research in soil physics, hydrology, hydraulics, engineering, soils, watershed management, drainage, salinity problems and water use and management etc. For applied research, emphasis should be given to field scale research, than small plot as at present.

10.6. If the above mentioned essentials are not taken care of, the effectiveness of the programme will be undermined.

CHAPTER 11

PATTERN OF SUBSIDY FOR SOIL AND WATER CONSERVATION PROGRAMMES

Need for Subsidy and Loans :

11.1. Interest in land is more national than individual. A farmer is more interested in the immediate return from land. In that, he does not mind using exploitive methods of farming. He is not likely to be interested to invest in land for some future gains. However, nation cannot afford exploitation of land and water resources. It is necessary that Government should have some responsibility for the programme.

11.2. Soil conservation measures need labour, material and cash investment in advance of the returns which may take sometimes 5-10 years to be fully realised. Besides, the programme necessitates change in the traditional methods of farming. If a farmer is to carry out soil conservation programme to the benefit of the nation, it is necessary that he should have some incentive by way of subsidy. Apart from subsidy, farmer would also need the facilities for credit, to be able to carry out the practices. Subsidy and loan are, therefore, the important factors for success of soil conservation programme.

Present System of Subsidy :

11.3 At present, subsidy for soil conservation programme is based mainly on administrative convenience and not so much on any technical or economic considerations of the programme. Main programme at present is soil conservation on agricultural land. This programme (except when carried out in hilly regions) carries a subsidy of 25 per cent (to be shared equally by the State and Central Government) and the balance 75 per cent cost is treated as long term loan, to be recovered from beneficiaries, with interest. In determining the cost of a scheme, the State Governments add the cost of staff to the cost of works and then work out the subsidy. As for instance in the case of Andhra Pradesh, Madras, Gujarat, Maharashtra and Mysore one third of the cost of works is added as establishment charges, to arrive at the total cost of the scheme for working out the subsidy. The cost of staff thus comes to 25 per cent of the total cost of the scheme. The subsidy thus allowed for soil conservation is not benefiting the cultivator by this arrangement, but is appropriated for staff cost only. In effect, therefore, farmer does not get any benefit of subsidy. Generally in other agricultural development programmes that carry subsidy, the cost of staff is not added to the scheme. This is only peculiar to the soil conservation schemes. The system of subsidy in soil conservation has already come in criticism with farmers as has been pointed out by the survey carried out by Planning Commission (Programme Evaluation Organisation). The present system of subsidy does not enjoin on the farmers to maintain the structures and measures, nor is farmer required to

carry out the supporting follow-up programme even to the minimum, that does not involve any additional financial implication, and those that are necessary for the measures to be useful. That has rendered many soil conservation practices less useful and in some cases even completely ineffective.

Pattern of Subsidy for Soil Conservation in Other Countries (particularly in U.S.A.)

11.4. U.S.A. is considered as the pioneer country in soil conservation, where this programme has made tremendous strides. In spite of the fact that soil conservation programme is very much advanced in U.S.A., all practices that do not form regular field operations, are subsidised to the extent of 50-100 per cent. Subsidy is allowed not only for practices which are permanent or semi-permanent in nature, but even for those practices which are repeated every year, e.g., strip cropping and cover cropping, etc. Subsidy is worked out on the basis of actual cost of the works. Technical assistance rendered by soil conservation service is free, and therefore, is not charged to the cost of the works. Grant of subsidy, however, is subject to the condition that the measures would be applied according to the standards and specifications laid down by the Soil Conservation Service. For the guidance of field workers and the farmers, the details of all practices that carry subsidy are described in the Department's Hand Book for each State, giving the technical specifications required to be followed for the practices, to be effective. Before subsidy is allowed, all practices and measures adopted are checked with specifications to ensure that they conform to minimum standards of effectiveness and maximum found economically practicable. Grant of subsidy enjoins on the farmer, that, he shall maintain and use these measures as long as he owns the land on which the measures are carried out. There are distinct advantages in this system for promoting the purpose of soil conservation.

Suggested Pattern of Subsidy :

11.5. The objective of the grant of subsidy should be two fold :

- (i) as an incentive to the State to take up soil conservation programme to adequate scale ; and
- (ii) as an incentive to the cultivators.

11.6. The guiding principle for grant of subsidy to the cultivators should be the following :—

(i) Subsidy should be based on actual cost of works. The scale of subsidy should be higher for the measures that are more expensive than the ones which are less expensive.

(ii) The other consideration should be, whether it is to the benefit of an individual cultivator or for the benefit of the community. Thus some of the masonry or grassed structures for water disposal system which are for the benefit of a unit watershed or sub-watershed, ought to carry higher rate of subsidy than similar structures small in size, when constructed on individual holdings for the benefit of an individual farmer.

(iii) Cost of staff should not be charged to the scheme cost, for working out subsidy due to the cultivator.

(iv) The grant of subsidy should enjoin one the farmer or the community, the responsibility for maintenance and proper use of various practices and measures.

(v) The grant of subsidy should also compel the cultivators that they shall ensure a minimum follow-up, that will make the practice effective and useful.

11.7. Following scale of subsidy is suggested :—

(i) Central subsidy of 50 per cent may be allowed to State Governments on the staff employed on soil conservation ;

(ii) For all works carried out in Government land the subsidy may be 50 per cent from the Centre.

(iii) On the work in the cultivator's field, the pattern of subsidy to the cultivator ought to be related to the cost of works as follows :—

(a) For cost upto Rs. 100 per acre	25 per cent.
(b) For cost from Rs. 101 to Rs. 200 per acre	33 1/3 per cent.
(c) For cost from Rs. 201 to Rs. 500 per acre	50 per cent.

(d) Normally works costing more than Rs. 500/- per acre may not be encouraged. However, when such works are necessary in public interest, the subsidy may be limited upto the maximum allowed for the cost of Rs. 500/- per acre.

(e) For structural works that are carried out in the field of an individual farmer but are to benefit the whole watershed or the community, the subsidy may be 100 per cent.

(f) For change in, land use, subsidy may be 50 per cent of the cost of establishment of the changed land use. Besides, the farmer should be allowed rent for the land at twice the land assessment value till the new land use is fully established to give return.

(g) The subsidy in all cases must enjoin on the farmer the adoption of management programme necessary for use, maintenance and protection of various measures and structures. Such structures shall need to be specified for each type of work.

(h) The above pattern of subsidy will be equally applicable for State as well as Centrally sponsored schemes. However, as in the previous Plans, the financial allocation for all Centrally sponsored schemes will be over and above the State Plan allocation.

(i) The grant of subsidy shall be allowed only if it is certified by the soil conservation maintenance staff that minimum follow-up programme has been adopted by the farmer for three years. If not, no credit may be allowed for subsidy and the entire cost of works be recovered as loan.

(j) Subsidy for survey, research, demonstration and training programme may be 50 per cent. from the Centre to the States.

REQUIREMENT OF PERSONNEL (TECHNICAL AND NON-TECHNICAL FOR SOIL CONSERVATION PROGRAMME IN THE FOURTH FIVE YEAR PLAN

Technical Personnel :

12.1. With the present tempo of soil conservation programme, it is envisaged that the technical potential (trained personnel) that is likely to be built up by the end of the Third plan, will be sufficient to undertake field programmes in a comprehensive way, over an area of about 2.7 million acres annually. Of the total potential, the potential equivalent to 2.3 million acres annually is likely to be utilised for the programme "Soil and Water Conservation on Watershed Basis", potential equivalent to about 0.2 million acres annually for "Stabilisation of Ravines and Protection of Table Lands", and the remaining potential equivalent to 0.2 million acres annually for "Soil and Water Conservation in the Watersheds of River Valley Projects". In the Fourth Plan, additional built up of technical potential for various programmes as envisaged, will be necessary equivalent to 0.85 million acres annually for "Soil Conservation on Watershed basis", 0.15 million acres for "Soil Conservation in the Watersheds of River Valley Projects". In addition to this, technical potential will be necessary for undertaking the field programmes relating to Pilot Demonstration Projects on Watershed basis, Reclamation of Saline and Alkali and Water logged lands; and Irrigation, Water management and Field drainage.

12.2. Apart from the requirement of technical personnel for execution of the field programmes, personnel will be required at the **State and the Central** levels with specialisation in different scientific disciplines, to direct, guide and supervise field programmes and also to undertake training and research in various aspects of soil and water conservation.

12.3. The total requirement of trained personnel is estimated to be about 1550 senior technical staff (Officers), 8300 junior technical personnel (Assistants) and about 24,000 field level technicians (Sub-assistants). Out of the total requirement, the personnel needed for execution of field programmes is estimated to be about 1200 Officers, 7400 Assistants and 23,000 Sub-assistants for whom adequate facilities for training in soil and water conservation, including water use, pasture development and soil survey have to be developed. Other personnel will be needed largely for research, training and as specialist staff in various disciplines. The requirements for field execution are over about 3, 4 and 2.5 times those estimated for the Third Plan for Officers, Assistants and Sub-assistants respectively. The technical staff at senior and junior levels, required at the State and the Central levels, for overall direction, guidance, supervision and conduct of research and training will be, largely, personnel with good academic specialisation in different scientific disciplines. Many

of these would also need facilities for training under foreign aid programme, for further specialisation in their respective fields, with special reference to principles and practices of soil and water conservation.

Non-technical Personnel :

12.4. The requirement of non-technical personnel is estimated to be about 5,600 ministerial and about 10,000 Class IV.

12.5. Apart from the requirement of technical and non-technical personnel as indicated above, soil conservation is immensely a labour intensive programme. It will create tremendous opportunities of employment potential of unskilled labour.

CHAPTER 13

REQUIREMENT OF KEY MATERIALS, INSTRUMENTS AND EQUIPMENT

Key Materials :

13.1. For implementation of soil conservation programme it is reckoned that certain key materials will be required in substantial amounts. The estimated requirements are as follows :—

Cement	50,000 tons.
Iron and Steel	5,000 tons.
Barbed wire fence	50,000 tons.
Petrol	37,500 Kilolitres.
Diesel oil	8,400 Kilolitres.
Lubricating oil of all grades	2,200 Kilolitres.
Grease	250 tonnes.

13.2. A large number of instruments and other equipment is expected to be required for implementation of soil conservation programme. The estimated requirement is as follows :—

Jeeps and vehicles	1,500 Nos.
Tractors	160 Nos.
Self-recording raingauges	500 Nos.
Stage level recorders	500 Nos.
Dumpy levels	15,000 Nos.
Ebony levels	1,200 Nos.
Planimeters	500 Nos.
Pentographs	500 Nos.
Ghat tracers	300 Nos.
Calculating machines	25 Nos.
Meteorological instruments (complete units)	20 Nos.

In addition to the above, there will be requirement of laboratory equipment for research and training, equipment for survey, cartography, aerial photos and engineering and drawing equipment.

CHAPTER 14

PROJECTIONS FOR THE FIFTH PLAN

14.1. The soil conservation programme proposed for the Fourth Plan envisages building up of technical potential equivalent to taking up the additional field programmes of all types together every year to the tune of about 1.49 million acres. In addition, the potential for soil survey is envisaged to be built up to take up an additional area of about 1 million acres annually. At this rate, the technical potential (trained personnel) that would likely become available at the end of the Fourth Plan, for the programmes to be taken up in the first year of the Fifth Plan would enable, to undertake soil conservation programmes in the Fifth Plan as follows:—

- (a) All field programmes about 38.0 million acres.
- (b) Soil Survey about 65.0 million acres.

In addition, the potential will also be available for undertaking programmes like research, demonstration and training.

14.2. In the Fifth Plan it is envisaged to continue the rate of building up the technical potential as in the Fourth Plan. About 25 per cent of the potential so developed may be utilised to stabilise the potential of the Fourth Plan, to cover the gaps due to retirement and such other contingencies. Of the remaining potential (i.e. equivalent to 1.12 million acres annually) that will become available, it is intended to give a little higher emphasis than the Fourth Five Year Plan, to the programmes relating to water use and management, reclamation of saline and alkali soils and soil conservation in the watershed of the river valley projects. The potential for soil survey, however, will be developed at the rate of 2 million acres annually, as against one million acres in the Fourth Five Year Plan. With the potential that will likely be developed on the basis of the above considerations, it would be possible to cover a total area of 50.0 million acres of various field programmes and to undertake soil survey on an area of about 85 million acres as follows:—

Particulars of the programme	Appropriation of the additional technical potential in the Fifth Plan for various programmes (Million acres annually)	Area likely to be covered with the potential available at the end of the Fourth Plan (Million acres)	Area likely to be covered with the additional potential of the Fifth Plan (Million acres)	Total area likely to be covered in the Fifth Plan (Million acres)
1	2	3	4	5
(a) Soil conservation on the watershed basis	0.5	28.5	5.0	33.5
(b) Soil conservation in the watersheds of the river valley projects.	0.2	4.0	2.0	6.0

	1	2	3	4	5
(c) Stabilisation of ravines and protection of tablelands.		0.07	1.7	0.7	2.4
(d) Reclamation of saline and alkali lands .		0.15	0.3	1.5	1.8
(e) Irrigation, field		0.20	4.375	2.0	6.375
(f) Drainage and land forming.					
(f) Soil and Land Use Survey		2.0	65.0	20.0	85.0

NOTE—(i) Figures in column 3 are arrived at by multiplying the potential available at the end of the Fourth Plan for respective programmes by five for five years)

(ii) Figure in column 4 is arrived at by multiplying the figure in column 2 by ten. Figure in col. 2 is the additional technical potential that is proposed to be built up annually in the Fifth Plan. Total additional potential available for the Fifth Plan would be equivalent to 10 units for the first four years of the Fifth Plan. Potential developed in the fifth year of the Plan would be available for the next Plan only (*i.e.*) Sixth Plan. Hence the figure in col. 2 is multiplied by 10.

CHAPTER 15

SUMMARY OF PROPOSALS FOR SOIL CONSERVATION IN THE
FOURTH FIVE YEAR PLAN

S. No.	Particulars of the programme	Proposed target for the Fourth Plan area (in million acres)	Financial implication (Rs. in million)	Requirement of technical personnel		
				Officers	Assistants	Sub-assistants
1	2	3	4	5	6	7
(i)	Soil and water conservation on watershed basis.	20.00	1825.00	435	4350	16700
(ii)	Soil and Land Use Survey—					
	(a) All India Soil and land use survey.	20.00	2.50	..	..	..
	(b) State organisation . . .	35.00	38.50	102	219	290
(iii)	Soil and water conservation in watersheds of river valley projects.	2.50	510.00	112	749	2573
(iv)	Pilot demonstration projects on watershed basis.	50 projects covering 0.1 million acres.	4.00	25	60	92
(v)	Stabilisation of ravines and protection of table lands.	1.00	144.00	4	52	208
(vi)	Reclamation of saline, alkali and water logged lands.	0.15	41.00	47	89	227
(vii)	Irrigation water management and field drainage—					
	(a) Present water logged areas . . .	0.4	155.00	471	1993	3282
	(b) Areas to come under new irrigation command.	1.5				
(viii)	Setting up and strengthening of soil conservation and soil survey organisation—					
	State organisation	Provided under respective State programmes.	3.90	161	286	85
	Central organisations					
(ix)	Training in soil and water conservation.	..	25.00	50	115	106
(x)	Soil and water conservation research—					
	State research schemes		20.00	64	130	130
	Central research schemes		20.00			
(xi)	Central Arid Zone Research Institute.		7.70	81	175	47
	Miscellaneous		3.40	..	..	..
	TOTAL		2800.00	1542 or 1550	8218 or 8300	23734 or 24000

CHAPTER 16

**SUMMARY OF ADVANCE WORK FOR FOURTH FIVE YEAR PLAN
THAT WOULD BE NECESSARY IN THE REMAINING PERIOD OF
THE THIRD PLAN**

Sl. No.	Name of programme	Nature of advance work in the Third Plan	Likely financial implication (Rs. in million)
1	2	3	4
(i)	Soil and water conservation on watershed basis.	Building up soil survey organisation and surveying about 4.0 million acres in the remaining period of the Third Plan.	5.50
(ii)	Soil and land use survey .	(a) As above. (b) Aerial photo interpretation will need to be developed.	Finances would be available from Plan allocation.
(iii)	Soil and water conservation in watersheds of river valley projects for the protection of reservoirs and flood control.	(a) Making arrangements for training of specialists in scientific disciplines of geology, hydrology and economics in relations to watershed protection programme. This is for setting up 3-4 regional watershed planning units. (b) Strengthening of State organisation by adding design and construction engineers. (c) Starting 2-3 watershed protection pilot projects in the watershed of major river valley projects. (d) Instrumentation and setting up of recording and gauging sites, proposed in the Third Plan Programme will need to be completed. (e) Facilities would need to be developed for manufacture of gauging instruments internally in the country.	0.80
(iv)	Pilot demonstration project on watershed basin.	..	..
(v)	Stabilisation of ravines and protection of table lands.	Aerial and ground survey to demarcate table and marginal lands.	Financial requirement will be met from the existing provisions for the survey of ravine lands.

1	2	3	4
(vi)	Reclamation of saline, alkali and water-logged lands.	To establish 2-3 pilot projects each covering about 300-400 acres particularly in the States of Uttar Pradesh, Gujarat and Punjab.	0.60
(vii)	Irrigation water management and field drainage.	..	..
(viii)	Strengthening of soil conservation and soil survey organisations.	(a) Steps would need to be initiated for building up and strengthening organisations in the States and at the Centre. (b) Field parties for consolidation of holding will need to be strengthened by adding Soil Conservation Supervisors to each party.	0.23
(ix)	Training in soil and water conservation.	Build up training facilities	1.00
(x)	Soil and water conservation research.	One research centre on salinity problems and two watershed units.	0.10
(xi)	Central Arid Zone Research Institute.	Proposals are under consideration.	..
TOTAL			8.23 million

ANNEXURE I (a)

*Table Showing Trend of Yield Per Acre for Foodgrains from 1900-01 to 1939-40**

	(Lbs. per acre)							
	1900-1901 to 1904-1905	1905-1906 to 1909-1910	1911-12, to 1914-15	1915-16 to 1919-20	1920-21 to 1924-25	1925-26 to 1929-30	1930-31 to 1934-35	1935-36 to 1939-40
Area under food crop in million acres	181.3	188.6	195.1	197.0	197.2	195.6	202.8	202.7
Production in million	58.5	57.6	61.9	63.0	59.3	57.1	58.9	57.2
Calculated yield per acre	736	696	723	729	686	666	662	643

*Source.—Tenth International Conference of Agricultural Economists at Mysore, India, August 24 to September, 1958 by Shri J. P. Bhattacharjee.

ANNEXURE I (b)

*Table Showing the Yield per acre of various Foodgrain Crops from 1940-41 to 1959-60**

Years	(Lbs. per acre)								
	Rice	Wheat	Jowar	Maize	Bajra	Barley	Ragi	Small millets	Gram
1940—41	758	641	454	736	351	774	725	432	539
1945—46	754	602	389	698	348	728	676	411	491
1950—51	692	557	328	369	272	700	616	379	465
1955—56	727	656	387	661	273	747	628	366	507
1959—60	787	652	430	731	278	706	676	350	541

*Source.—Long term projection of demands for and supply of selected agricultural commodities by National Council of Applied Economic Research.

ANNEXURE II & III

Progress of Soil Conservation in the Second Five Year Plan

Sl. No.	Name of State	II Physical Achievement Area in 000 acres			III Utilisation of funds (Rs. in lakhs.)			
		Plan Target	Agri. land	Afforestation & Pasture Dev.	Plan Allocation	Utilisation of funds	Percentage utilisation	
1	2	3	4	5	6	7	8	
<i>State Schemes</i>								
1.	Andhra Pradesh		71.50	15.70	121.0	87.2	72.2	
2.	Assam . . .		0.60	4.40	8.1	7.0	86.4	
3.	Bihar . . .		78.70	67.00	201.9	134.8	66.7	
4.	D.V.C. . . .		10.50	4.30	79.5	71.40	89.8	
5.	Maharashtra . . .		1308.30	10.80	526.2	901.2	171.2	
6.	Gujarat . . .		369.40	37.20				
7.	Kerala		11.50	..	25.5	19.5	76.4	
8.	Madhya Pradesh		51.10	21.10	245.0	115.6	47.1	
9.	Madras		131.30	76.40	155.5	142.3	91.4	
10.	Mysore		274.00	46.80	209.4	162.10	77.4	
11.	Orissa		59.50	19.90	47.8	50.0	104.6	
12.	Punjab		9.50	46.50	64.0	51.2	80.0	
13.	Rajasthan . . .		13.00	10.90+ 44½ miles	56.3	44.4	78.0	
14.	Uttar Pradesh		76.40	10.30	143.6	127.9	89.0	
15.	West Bengal . .		5.80	0.50	84.5	69.6	82.3	
16.	Jammu & Kashmir.		..	54.90	36.1	38.5	106.6	
17.	Himachal Pradesh		0.6	10.80	17.1	10.6	61.9	
18.	Delhi		N	4.30	2.9	2.5	86.2	
19.	Manipur		2.40	..	1.2	0.1	8.3	
20.	Tripura		N	0.40	0.9	0.9	100.0	
21.	Andaman . . . .		..	..	0.6	0.5	83.3
22.	Pondicherry . .		..	..	0.4	..	..
23.	Naga Hills . . .		..	..	0.4	0.5	125.0
TOTAL		Agri. land Aff. & Past Dev.	2000.0 1000.0	2473.1	442.2+ 44½ miles	2027.9	2037.8	100.5%

1	2	3	4	5	6	7	8
<i>Centrally Sponsored Schemes</i>							
(i)	Dry farming Demonstrations	40 Nos.	18 Nos.	42.0		11.4	27.1
(ii)	Soil Cons. Pilot Demons. in Bhakra Nangal.	6 Nos.	6 Nos.	20.0		9.5 Punjab 10.0 Himachal Pradesh	} 97.5
<i>Central Schemes</i>							
(i)	Soil & Land Use Survey	12500.0	13,900.0	41.0		41.8	102.0
(ii)	Research Centres including CAZRI Jodhpur.	} 9	9	140.00		114.8	72.0
(iii)	Pasture Development Scheme				28.0		18.1	64.8

*Utilisation of finances in respect of State Schemes is based on the actual expenditure for the first three years, revised outlay for the Fourth year and agreed outlay for the fifth year of the Plan.

N—Negligible (Delhi—15 acres, Tripura—40 acres).

ANNEXURE IV (a)

Progress of Centour Building and Terracing Programmes, in the Third Five Year Plan

(Area in lakh acres)

Sl. No.	Name of State	Revised Plan targets	Actual achievement for 1961-63	Anticipated achievement for 1963-64*	Anticipated achievement for first three years 1961-64	Proposed targets for 1964-65	Balance of Plan targets 1965-66 (Col. 3-6-7)
1	2	3	4	5	6	7	8
1.	Andhra Pradesh	4.00	0.58	0.39 (March 1964)	0.97 (24.36%)	0.73	2.30
2.	Assam	0.29	..	0.01 (March 1964)	0.01 (3.7%)	N	0.27
3.	Bihar	4.05	0.71	0.46	1.17 (28.86%)	1.06	1.82
4.	Gujarat	11.72	2.65	2.00	4.65 (39.0%)	2.92	4.15
5.	Jammu & Kashmir	..	..	..	..	..	..
6.	Kerala	0.76	0.03	0.06	0.09 (10.65%)	0.06	0.61
7.	Maharashtra	52.50	12.92	8.27	21.19 (40.36%)	12.97	18.34
8.	Madhya Pradesh	14.45	2.31	3.66 (March 1964)	5.97 (41.33%)	4.44	4.04
9.	Madras	4.30	1.11	0.52	1.63 (38.0%)	0.85	1.82
10.	Mysore	6.50	0.65	0.27 (March 1964)	0.92 (14.02%)	1.43	4.15
11.	Orissa	3.00	0.58	0.35	0.93 (31.00%)	0.50	1.57
12.	Punjab	1.25	0.01	0.19 (March 1964)	0.20 (16.07%)	0.40	0.65
13.	Rajasthan	1.78	0.43	0.31	0.74 (41.77%)	0.50	0.54
14.	Uttar Pradesh	10.85	1.16	0.97 (March 1964)	2.13 (19.6%)	2.41	6.31
15.	West Bengal	1.14	..	0.18	0.18 (15.78%)	0.32	0.64
16.	Andaman & Nicobar Islands	0.03	N	0.01	0.01 (16.67%)	0.01	0.01
17.	Himachal Pradesh	0.18	0.01	0.02	0.03 (16.87%)	0.03	0.12
TOTAL		116.80	23.15	17.67	40.82 (34.95%)	28.63	47.35

*Figures are based on actual progress wherever reports are received upto March, and the targets for other cases for the year.

N.—Negligible.

ANNEXURE IV (b)

Progress under Dry Farming

(Area in lakh acres)

1. Andhra Pradesh	*28.00	1.00	9.00	10.00 (35.7%)	9.00	9.00
2. Bihar	0.10	N	N	N	0.02	0.08
3. Gujarat	12.00	1.10	0.90	2.00 (16.7%)	3.00	7.00
4. Maharashtra	31.60	N	5.00	5.00 (15.8%)	7.99	18.61
5. Madhya Pradesh	90.00	5.20	24.90	30.10 (33.4%)	20.00	35.90
6. Madras	4.00	N	N	N	2.00	2.00
7. Mysore	1.25	0.60	0.10	0.70 (56.0%)	0.95	..
8. Orissa	5.00	0.20	1.00	1.20 (24.0%)	2.00	1.80
9. Rajasthan	20.00	0.31	5.42	5.73 (28.7%)	6.20	8.07
10. Uttar Pradesh	51.00	21.50	7.00	28.50 (56.0%)	11.27	11.23
11. Punjab	3.20	..	0.10	0.10 (3.1%)	1.20	1.90
12. West Bengal	1.00	..	..	..	N.A.	1.00
13. Himachal Pradesh	0.25	N	N	N	0.006	0.244
14. Delhi	0.02	N	N	N	0.004	0.016
TOTAL	247.42	29.91	53.42	83.33 (33.7%)	63.640	100.850

*Targets are based on the information received from the States.

ANNEXURE V

Progress of Afforestation, Pasture Development, Reclamation of Saline and Alkali Soils and Ravines.

(Area in 000 acres)

Sl. No.	Name of the State	Afforestation & Pasture Development			Reclamation of Saline and Alkali Soils			Reclamation of Ravine lands		
		Plan targets	Actual achievement 1961-63	Anticipated achievement for 1963-64	Plan targets	Actual achievement 1961-63	Anticipated achievement for 1963-64	Plan targets	Actual achievement 1961-63	Anticipated achievement for 1963-64
1	2	3	4	5	6	7	8	9	10	11
1.	Andhra Pradesh .	19.6	6.60	4.70	..	..	..	..	..	..
2.	Assam .	107.0	0.63	1.31	..	..	..	..	..	..
3.	Bihar .	64.0	22.50	12.00	..	..	..	..	..	..
4.	Gujarat .	..	..	..	45.00	N.A.	N.A.	12.00	0.70	2.30
5.	Jammu & Kashmir	76.0	23.00	12.90	..	..	..	5.00	0.20	..
6.	Kerala .	..	..	..	..	..	..	..	..	..
7.	Maharashtra .	..	..	..	37.60	N.A.	17.00*	..	..	..
8.	Madhya Pradesh .	13.50	3.29	0.70	0.40	Not started	2.00	2.00	1.40	0.40
9.	Madras .	57.00	18.60	3.44	1.00	Not started	..	..	..	..
10.	Mysore .	65.00	23.00	25.00	38.00	Not started	..	..	..	..
		+ 500 miles	+ 107 miles	+ 89 miles						
		L.H.	L.H.	L.H.						
11.	Orissa .	4.00	2.80	0.10	8.00	Not started	..	..	..	..
12.	Punjab .	9.00	3.40	1.40	50.00	19.00	18.00	..	..	..
		+ 250 miles	+ 55 miles	+ 22 miles						
		Chos, 800 miles	Chos, 331 miles	Chos, 126 miles						
		W.B.	W.B.	W.B.						
13.	Rajasthan .	13.00	2.00	2.85	10.00	1.65	0.50	6.00	1.80	1.35
		+100 miles	+34 miles	+34 miles						
		S.B.	S.B.	S.B.						
14.	Uttar Pradesh .	50.00	12.60	7.90	10.00	1.60	1.62	10.00	..	..
		+50 miles								
		R.S.								

ANNEXURE V

Progress of Afforestation, Pasture Development, Reclamation of Saline and Alkali Soils and Ravines.—contd.

1	2	3	4	5	6	7	8	9	10	11
15. West Bengal . . .		100.00	53.70	N.A.	..	..	..	..	..	..
16. Andaman & Nicobar		..	..	..	0.70	..	..	..	..	..
17. Delhi		4.00	0.90	0.40	4.00	..	0.80	..	..	..
18. Himachal Pradesh		43.00	24.90	15.10	..	..	..	..	..	..
19. Manipur . . . . .		..	..	..	..	..	..	..	..	..
20. Pondicherry . . . .		..	..	..	..	..	..	..	..	..
21. Tripura		2.00	1.20	0.90	..	..	..	..	..	..
22. Nagaland . . . . .		..	..	..	..	..	..	..	..	..
23. N.E.F.A. . . . .		..	..	..	..	..	..	..	..	..
	TOTAL	626.00	199.12	89.95	204.70	22.25	37.92	35.00	4.10	4.05
		+ 1700 miles	+ 527 miles	+ 271 miles						

*Includes achievement for 1961-62 and 1962-63

L.H.—Live hedges.

W.B.—Wind Breaks.

S.B.—Shelter belts.

R.S.—Road side plantation.

ANNEXURE VI

Soil Conservation Research Stations in the States

Sl. No.	Name of State	Particulars	Remarks
1	2	3	4
1.	Andhra Pradesh	One at Sahib Nagar for forestry	Work in progress, details not available.
2.	Assam	Station and two Sub-Stations for work on Shifting Cultivation.	Not started.
3.	Bihar	Two Research Stations one at Araria and another at Kan.	Work in progress. Details of work not known.
4.	Gujarat	One Research Station	Not started.
5.	Jammu & Kashmir	No Scheme.	
6.	Kerala	Ditto.	
7.	Maharashtra	No Scheme under Soil Conservation allocation.	
8.	Madras	No scheme.	
9.	Mysore	Three schemes	Work in progress. Nature of work undertaken not known.
10.	Madhya Pradesh	Two Centres, one at Phanda & another at Powerkhara. In addition, one more at Raipur is about to be started and one more is contemplated at Gwalior.	
11.	Orissa	One station at Lamptaput	Work at progress. Details of work not known.
12.	Punjab	Two Stations one for forestry and another for Pasture Development.	
13.	Rajasthan	No scheme.	
14.	Uttar Pradesh	One at Rehmankhara	Good work being carried out and progress reports are being received regularly.
15.	West Bengal	No scheme.	
16.	Himachal Pradesh	Ditto.	
17.	N.E.F.A.	One Centre for research in Shifting cultivation.	Not started.
18.	Manipur	Ditto.	Do.
19.	Tripura	Ditto.	Do.

ANNEXURE VII

Utilisation of finances in Third Plan in respect of State Plan Schemes.

(Rs. in lakhs)

Sl. No.	Name of State	Plan provision	Actual expenditure 1961-63	Anticipated expenditure 1963-64	Total	Percentage of Col. 3.
1.	2	3	4	5	6	7
1.	Andhra Pradesh	163.00	30.00	28.85	58.85	36.1
2.	Assam	50.00	2.60	3.00	5.60	11.2
3.	Bihar	415.04	127.40	69.30	190.70	46.0
4.	Gujarat	825.51	146.15	149.45	295.60	35.8
5.	Jammu & Kashmir	100.00	23.57	15.00	38.57	38.6
6.	Kerala	120.00	11.70	12.00	23.70	19.8
7.	Maharashtra	1973.25	646.71	515.70	1162.41	58.9
8.	Madhya Pradesh	349.10	97.12	82.00	179.12	51.3
9.	Madras	250.00	90.87	44.70	133.57	54.2
10.	Mysore	300.00	77.07	73.84	150.91	50.3
11.	Orissa	76.00	21.83	33.70	55.53	73.1
12.	Punjab	189.00	42.64	32.56	75.20	39.8
13.	Uttar Pradesh	398.99	62.70	88.56	149.26	37.4
14.	Rajasthan	140.00	25.62	17.00	42.62	30.4
15.	West Bengal	470.91	47.00	41.71	88.71	18.8
16.	Nagaland	2.99	0.09	0.68	0.77	25.7
17.	Himachal Pradesh	198.00	53.05	36.45	89.50	45.2
18.	Delhi	8.30	1.11	0.45	1.56	18.8
19.	Andaman Islands	9.98	1.05	0.98	2.03	20.3
20.	N. E. F. A.	4.00	0.54	0.30	0.84	21.0
21.	Tripura	17.00	4.95	4.50	9.45	55.6
22.	Manipur	0.50	..	..	..	—
23.	Pondicherry	12.00	0.69	0.15	0.84	7.0
24.	Goa	51.85	6.91	12.30	19.21	37.0
TOTAL		6125.42	1521.37	1255.18	2776.55	45.3

ANNEXURE VIII

Progress of Centrally Sponsored Scheme of Dry Farming Demonstration Projects (Third Plan)

Sl. No.	Name of State	No. of Projects allotted	No. of Projects taken up to 1963-64	Achievement up to 1963-64 (Acres)	Plan Provision Rs. lakhs	Amount sanctioned upto 1963-64 Rs. lakhs
1	2	3	4	5	6	7
1.	Andhra Pradesh	4	4	4,066	..	1.95
2.	Bihar	3	1	427	..	0.55
3.	Madhya Pradesh	4	4	2,042	..	0.95
4.	Punjab	9	9	13,033	..	6.48
5.	Maharashtra	3	3	1,087	..	1.37
6.	Uttar Pradesh	5	5	4,427	..	1.43
7.	Gujarat	1	1	1,000	..	0.27
8.	Madras	4	4	8,892	..	1.98
9.	Mysore	5	5	3,562	..	2.28
10.	West Bengal	1	1	903	..	0.56
11.	Rajasthan	4	4	N.A.	..	0.29
12.	Delhi	1	1	273	..	..
13.	D. V. C.	1	1	824	..	0.72
TOTAL		45	43	40,536	28.00	18.83

ANNEXURE IX

*Progress of Soil Conservation in the Watershed of River Valley Projects
(Third Plan) (Centrally Sponsored Programme)*

(Area in thousand acres)

S. No.	Name of the State	Name of the Project	Plan Targets	Achievement 1961-63	Anticipated achievement 1963-64	Total anticipated achievement 1961-64
1	2	3	4	5	6	7
1	Andhra Pradesh	Machkund	Agri. land	19.16	10.16	12.83
			Forest land	5.31	0.30	1.62
					March '64	
2	Orissa	Machkund	Agri. land	22.70	1.72	4.40
			Forest land		4.26	12.13
			Pasture Dev.		..	0.63
2	Orissa	Hirakud	Agri. land		23.47	29.87
			Forest land	54.62	3.01	8.71
			Pasture Dev.		0.54	1.59
3	Madhya Pradesh	Hirakud	Agri. land		7.06	34.47
			Forest land	144.14	7.06	9.82
			Pasture Dev.		..	3.82
					March '64	
3	Madhya Pradesh	Chambal	Agri. land		6.66	16.76
			Forest land	53.38	1.31	3.09
			Pasture Dev.		..	1.01
					March '64	
6	Rajasthan	Chambal	Agri. land	12.25	..	7.00
			Forest land	2.50	0.15	0.55
			Pasture Dev.	27.00	5.90	10.40

1	2	3	4	5	6	7	
5	Punjab	Bhakra Nangal	Agri. land Forest land Pasture Dev.	7.70 21.33 17.92	3.61 9.04 7.17	1.64 4.67 3.71 March '64	5.25 13.71 10.88
6	Himachal Pradesh	Bhakra Nangal	Agri. land Forest land Pasture Dev.	4.50 36.36 3.70	1.01 21.78 2.95	1.00 7.13 2.08 March '64	2.01 28.91 5.03
7	Bihar & West Bengal	D.V.C.	Agri. land Forest land Engineering Survey	72.00 70.00 30.00 2465.90 R.S. 72.90D.S.	14.83 27.32 13.00 289.92R.S. 53.76D.S.	7.59 4.00 7.00 640.00R.S. 64.00D.S.	22.42 31.28 20.00 929.92R.S. 117.76D.S.
8	Bihar	Mayurakshi	Agri. land Forest land Anti-erosion works Pasture Dev.	9.00 19.00 2.00	1.61 2.56 0.39	2.00 5.50 0.50	3.61 8.06 0.89
9	West Bengal	Kangsabati	Agri. land Forest land Pasture Dev.	5.50	..	..	..
10	Mysore	Tungabhadra	Agri. land Forest land Survey	22.50 10.00 ..	.. .. ..	4.86 1.50 11.00	4.86 1.50 11.00
11	Madras	Kundah	Agri. land Forest land Pasture Dev.	4.80 9.30 0.40	1.02 2.32 0.07	1.30 2.35 0.06	2.32 4.67 0.06
12	Gujarat	Dhantiwada	Agri. land Forest land Survey	7.65 3.50 320.00	.. .. 23.00	1.30 0.75 133.74 March '64	1.30 0.75 156.74

13	Uttar Pradesh	Ram Ganga	Agri. land	1.00	0.02	0.08	0.10
			Forest land	11.90	1.66	5.54	7.20
			Survey	200.00	16.50	40.00	56.50
						March '64	
14	Jammu & Kashmir	Pohru	Agri. land	16.50	4.60	4.88	9.48
			Forest land				
			Pasture Dev.	5.50	..	..	..
15.	Maharashtra	Ghod	TOTAL	729.46	182.56	160.43	342.99
			Agri. land	2465.90R.S.	289.92R.S.	640.00R.S.	929.92R.S.
			Forest land				
			Pasture Dev.	592.90D.S.	93.26D.S.	248.26D.S.	342.00D.S.
Survey							

R.S.—Reconnaissance Survey.

D.S.—Detailed Survey.

ANNEXURE X

Utilisation of Finances in respect of Soil Conservation Schemes in Catchment of River Valley Projects.

(Centrally Sponsored)

(Rs. in Lakhs)

Sl. No.	Name of State	Name of Project	Plan allocation	Actual 1961-62	Expenditure 1962-63	Anticipated expenditure 1963-1964	Recommended outlay 1964-65
1	2	3	4	5	6	7	8
1.	Andhra Pradesh	Machkund	66.00	7.94	15.39	15.74	16.85
2.	Orissa	Machkund	33.00	7.87	18.56	38.47	47.00
		Hirakud	50.00				
3.	Madhya Pradesh	Hirakud	150.00	1.39	19.93	40.92	30.00
		Chambal	50.00	0.30			
4.	Rajasthan	Chambal	25.00	0.94	4.76	8.58	10.00
5.	Punjab	Bhakra Nangal	152.00	9.10	25.14	32.56	39.95
6.	Himachal Pradesh	Bhakra Nangal	128.00	11.93	31.81	38.64	57.95
7.	Bihar and West Bengal.	D. V. C.	250.00	32.83	39.75	50.00	51.64
8.	Bihar	Mayurakshi Kosi	25.00	0.49	3.67	4.68	8.00
			25.00	..	..	..	..
9.	West Bengal	Kangsabati	10.00	..	..	1.00	7.75
10.	Mysore	Tungabhadra	25.00	..	0.46	7.56	8.00
11.	Madras	Kundah	25.00	0.08	8.11	10.55	11.50
12.	Gujarat	Dhantiwada	10.00	..	0.13	0.13	4.08
13.	Uttar Pradesh	Ram Ganga	50.00	1.49	4.37	10.90	16.00
14.	Jammu and Kashmir	Pohru	25.00	1.05	4.81	6.50	8.30
15.	Maharashtra	Ghod	10.00	..	..	..	4.00
TOTAL			1109.00	85.41	176.89	266.23	337.02
				7.7%	16.0%	24.0%	80.4%

ANNEXURE XI

Progress of Soil Survey under all India Soil and Land Use Survey Scheme during Third Five Year Plan (upto 1963-64).

Catchment Areas				Non-catchment Areas			(Area in 000 acres)		
Sl. No.	Name of Catchment	Detailed	Reconnai- sance	Total	Sl. No.	Name of State	Detailed	Recon- naisance	Total
1	Bhakra Nangal	120.75	12.75*	133.50	1	Maharashtra . . . . .	..	250.00	250.00
2	Tungabhadra	67.84	731.50	799.34	2	Mysore	35.28	924.36	959.64
3	Chambal	309.97	56.00	365.97	3	Andhra Pradesh	79.64	713.56	793.20
4	Machkund	3.58	305.69*	309.27	4	Madras	16.00	980.70	996.70
5	Hirakund	1438.48	121.69	1560.17	5	Kerala	9.00	720.75	729.75
6	Kunda	8.70	..	8.70	6	Rajasthan	3.80	..	3.80
					7	Punjab	0.31	..	0.31
					8	Uttar Pradesh	5.66	..	5.66
					9	Orissa	39.57	..	39.57
					10	Tripura	0.15	394.32	394.47
					11	Nepal (Chatra)	0.64	5.12	5.76
					12	Delhi	18.42	75.24	93.66
						TOTAL	208.47	4064.05	4272.52
						Total catchment areas			3176.95
						Total Non-catchment areas			4272.52
						GRAND TOTAL			7449.47

*Detailed reconnaissance.

ANNEXURE XII

Present Organisation in States for Soil Conservation

Sl. No.	Name of State	State Level	Divisional Level	Sub-Division] or District Level	Norm per field Unit per year in Acres.
1	2	3	4	5	6
1	Andhra Pradesh	1. Director of Agriculture	Divisional Engineers (Soil Conservation).	1. <i>Officers</i> Assistant Agricultural Engineers (Soil Conservation). 2. <i>Assistants</i> (i) Agricultural Engineering supervisors. (ii) Soil Conservation Assistants. 3. <i>Sub-Assistants</i> Sub-Assistants, Chainmen, Staff-men.	5000 acres for Sub-Division comprising of 1 Officer 5 Assistants 15 Sub-Assistants
	Agriculture Department	2. Superintending Engineer. 3. Assistant Agricultural Engineer (Soil Conservation).			
	Forest Department	Chief Conservator of Forests	Conservator of Forests	1. <i>Officers</i> Divisional Forest Officers. 2. <i>Assistants</i> Range Officers,	A. <i>Areas in Plains</i> I. Formation . 2,000 II. Maintenance " 6,000 B. <i>Agency Areas</i> I. Formation . 1,000

2 Assam Director of Soil Conservation.

3 Bihar 1. Director of Soil Conservation.
2. Deputy Director of Soil Conservation.

3. *Sub-assistants*. II. Maintenance
Foresters 3,000.
For a Unit consisting of
1 Officer,
5 Range Officers
20 Foresters

1. *Officers*
Divisional Officers

2. *Assistants* Not available.
(i) Soil Conservation Rangers
(ii) Soil Conservation Demonstrators (Senior Grade).

3. *Sub-assistants*.
(i) Deputy Rangers.
(ii) Surveyors.
(iii) Soil Conservation Demonstrators (Junior grade).
(iv) Foresters.
(v) Soil Conservation Guards.
(vi) Plantation Malis.

1. *Officers*
Assistant Directors of Soil Conservation (District level). 2,000 acres for one field party comprising of

2. *Assistants*
Soil Conservation Extension Supervisors. 1. Soil Conservation Extension Supervisor.

3. *Sub-assistants*. 2 Field Supervisors
(i) Field Supervisors 1 Amin and
(ii) Amins 2 Chainmen.
(iii) Chainmen.

1	2	3	4	5	6
4 Gujarat Agriculture Department.	Joint Director of Agriculture	Divisional Soil Conservation Officer.	1. <i>Officer</i> Sub-Divisional Soil Conservation Officers. 2. <i>Assistant</i> Agriculture Supervisors. 3. <i>Sub-Assistants.</i> Agricultural Assistants.	8000 acres per Sub-division comprising of 1 Officer 5 Agriculture Supervisors 25 Agriculture Assistants.	
Forest Department	Chief Conservator of Forests.	1. Conservator of Forests Kotar Afforestation & Reclamation. 2. Technical Assistant (Civil Engineering). 3. Technical Assistant (Agriculture). 4. Divisional Soil Conservation Officer.	1. Divisional Forest Officers (Afforestation) 2. Divisional Forest Officers (Reclamation). 3. District Inspector of Land Records. 4. Sub-Divisional Soil Conservation Officers.	Afforestation : 400 acres per year for a field party comprising of 1. Forest Range Officer. 2 Foresters and 4 to 5 Beat Guards.	
5 Jammu & Kashmir Forest Department	Chief Conservator of Forests.	Conservator of Forests.	1. <i>Officers.</i> Divisional Soil Conservation Officers. 2. <i>Assistants.</i> Forest Rangers (Asstts.) 3. <i>Sub-Assistants.</i> Foresters.	1,500 acres will be covered by each Division.	
6 Maharashtra Agriculture Department.	Joint Director of Agriculture	Divisional Soil Conservation Officers.	1. <i>Officers</i> Sub-Divisional Soil Conservation Officers.	A. Bunding Sub-Division comprising of	

			2. <i>Assistants.</i> Agricultural Supervisors.	1 Sub Divisional Officer. 5 Agrl. Supervisors. 25 Agricultural-Assistants.
			3. <i>Sub-Assistants</i> Agricultural Assistants.	12,500 acres B. <i>Terracing</i> 1. <i>Sub-Divisions</i> 1,250.
7	<i>Madhya Pradesh</i> Agriculture Department.	Joint Director of Agriculture (Land Development).	Divisional Soil Conservation Officers.	1. <i>Officers</i> Sub-Divisional Soil Con- servation Officers. 2. <i>Assistants.</i> Soil Conservation Assis- tants. 3. <i>Sub-Assistants.</i> Soil Conservation Sub- Assistants.
	Forest Department	Chief Conservator of Forests	Deputy Conservator of Fo- rests (3 Divisions).	1,000 acres per year per Division.
8	<i>Madras</i> Agriculture Department.	Joint Director of Agriculture (Engineering).	Divisional Engineers.	1. <i>Officers</i> Assistant Agricultural En- gineers. 2. <i>Assistants.</i> Soil Conservation Assis- tants ; or Agricultural Engineering Supervisors.
		2. Agricultural Engineers Madras.		7,500 acres in plains and 750 acres in hills for exe- cution Sub-division com- prising of 1 Officer 5 Assistants 10 Sub-Assistants; 10 Field Assistants.
			3. <i>Sub-Assistants.</i> (i) Soil Conservation Sub- assistants. (ii) Field Assistants.	

1	2	3	4	5	6
	Forest Department		There is no special organisation in the Forest Department for dealing with soil conservation programmes exclusively. The works are executed by the Departmental staff under the Guidance of Divisional Forest Officer, Conservator of Forests and Chief Conservator of Forests.		2,000 acres of plantation per year per Forest Division comprising of 1. Divisional Forest Officer. 4. Range Officers.
9	Mysore Agriculture Department	1. Director of Agri. 2. Assistant Soil Conservation Officer.	Divisional Conservation Officers (Class I)	1. Officers Sub-Divisional Soil Conservation Officers. 2. Assistants. Agricultural Demonstrator.	6,000 acres per Sub-Division comprising of 1 Officer 5 Agrl. Demonstrators. 25 Agri. Assistants. 3. Sub-Assistants Agricultural Assistants.
10	Orissa Agriculture Department	1. Director of Agriculture. 2. Joint Director Soil Conservation. 3. Research Officers 4. Assistant Soil Conservation Officer (Survey).	Divisional Soil Conservation Officers Class I (There are 4 Divisions).	1. Officers. Asstt. Soil Conservation Officers Class II. 2. Assistants. Soil Conservation Assistants. 3. Sub-Assistants. Surveyors.	5,500 acres per year for 1 Sub-Division consisting of 1. Sub-divisional Officer 5. Assistants and 25 Surveyors.
11	Punjab Agriculture Department	1. Adviser Soil Conservation. 2. Joint Director.	Divisional Soil Conservation Officers.	1. Officers Assistant Soil Conservation Officers. 2. Assistants. Agricultural Inspectors/Overseers.	Not yet fixed, target for each Sub-Division will be fixed as soon as the Soil Conservation Act is passed.

3. *Sub-Assistants*
Agricultural Sub-Inspectors/Surveyors.

Forest Department . . . Soil Conservation works are dealt with by forest staff at all levels throughout the State in Forest land.

12 *Rajasthan*

Agriculture Department . . . Soil Conservation Officer .

A. *Training.* . . . 500 to 750 acres for a field party consisting of
Officer-in-Charge.

B. *Demonstration.* . . . 1 Soil Conservation Assistant and 2 to 3 Fieldmen.
Assistant Soil Conservation Officers.

C. *Extension.*

1. *Officers.*

(i) Soil Conservation Engineers.

(ii) Assistant Soil Conservation Officers.

2. *Assistants.*

Soil Conservation Assistants.

3. *Sub-assistants.*

(i) Overseers.

(ii) Fieldmen.

(iii) Surveyors.

(iv) Chainmen.

(v) Tracers.

Forest Department . . . Chief Conservator of Forests Conservator of Forests .

1. *District.*

Divisional Forest Officers.

2. *Range.*

Range Forest Officers.

3. *Sections.*

Foresters assisted by Guards.

1	2	3	4	5	6
13 <i>Uttar Pradesh</i>	Agricultural Department .	<ol style="list-style-type: none"> 1. Joint Director. 2. Deputy Director Soil Conservation Research (One). 3. Deputy Director of Soil Conservation (Extension). 4. Executive Engineers. 5. Technical Officers, Forestry, Agrostology, Agronomy. 6. Assistant Engineers. 		<ol style="list-style-type: none"> 1. <i>District Level</i> District Soil Conservation Officers. 2. <i>Block Levels.</i> The Block Development Officer is designated as Assistant Soil Conservation Officer. He is assisted by 1 Soil Conservation Inspector and upto 10 Assistant Soil Conservation Inspectors. 	175 acres per each Assistant Soil Conservation Inspector (based on actuals).
14 <i>West Bengal.</i>	Agriculture Department .	At present, there is no set up in the State. There is only one soil conservation scheme now in operation in the Midnapore District and the work is being executed by one Engineering Overseer, 2 Engineering Sub-Overseers, 2 Agriculture Overseers and one Surveyor under the guidance of the District Agricultural Officer, Midnapore.			
	Forest Department .	At present, there is no separate organisation in the Forest Department for soil Conservation works. The Forest Department executes soil conservation schemes along with other forestry operations through the Divisional Forest Officer and his set up, like Rangers etc.			
15 <i>Himachal Pradesh.</i>	Deputy Director of Agriculture.	Divisional Soil Conservation Officers.	<ol style="list-style-type: none"> 1. <i>Officers</i> Sub-Divisional Soil Conservation Officers. 2. <i>Assistants</i> Agricultural Inspector. 	600 acres per sub-Divisional Unit comprising of 1. Asstt. Soil Conservation Officer. 4 Agricultural Inspectors. 4 Surveyors and 12 Sub-Inspectors.	

Forest Department . . .	Chief Conservator of Forests.	Conservator of Forests.
16 Delhi	The soil conservation work is being looked after by the Soil Conservation Unit of the Development Department. There is also a Soil Conservation Officer who is also the State Forest Officer.	
17 Tripura.	Agriculture Department . . .	1. Director of Agriculture
		Does not arise.

3. *Sub-Asssts.*
 - (i) Surveyors.
 - (ii) Sub-Inspectors.

- | | |
|---|---|
| 1. <i>Officers.</i>
Divisional Forest Officers. | <i>Average for Division</i>
Afforestation 831 acres. |
| 2. <i>Asstts.</i>
(i) Range Officers.
(ii) Block Officers (Foresters).
(iii) Guards. | 2. Pasture Development 160 acres.
3. River Fringe Plantation 13 acres. |
| 1. <i>Officers.</i>
Soil Conservation Officer. | Not available. |
| 2. <i>Assistants.</i>
(i) Rangers.
(ii) Soil Conservation Assistants. | |
| 3. <i>Sub-Assistants.</i>
(i) Deputy Rangers.
(ii) Foresters. | |
| 1. <i>Officers.</i>
(i) Land Utilisation Development Officer (Reclamation).
(ii) Land Utilisation Development Officer (Soil Survey).
(iii) Land Utilisation Development Officer (General). | Not available. |
| 2. <i>Assistants.</i>
(i) Agricultural Extension Officer.
(ii) Supervisors.
(ii) Special Officer. | |

ANNEXURE XIII

Present position with regard to Soil Conservation Legislation, State Soil Conservation Board and District Soil Conservation Committees

Sl. No.	Name of State	Enactment	State Soil Conservation Board	District Committee.
1	2	3	4	5
1	Andhra Pradesh	At present Madras Land Improvement Act 1949 and Hyderabad Land Improvement Act 1953 are in force. The integration of the Madras and Hyderabad Land Improvement Act based on the Medel Bill is under the consideration of the State Govt.	Yes. Has been constituted.	No. There is a provision in the proposed Act for the formation of District Land Improvement Board.
2	Assam	No. Legislative measures on soil conservation in respect of four Sixth Schedule districts are under the consideration of the District Councils. In respect of the plains districts necessary powers have been given to the State Government under the Assam Acquisition of Land for Flood Control and Prevention of Erosion Act, 1955.	No.	No.
3	Bihar	A draft Soil Conservation Bill has been processed by the State Government and is awaiting introduction in the State Legislature.	No. Will be formed after the enactment of the legislation. However there is a State Land Use Board.	Nil. Will be formed after the enactment of the legislation.
4	Gujarat	Yes. The Bombay Land Improvement Schemes Act 1942,	No. It is not considered absolutely essential to form the Board at the present juncture,	Yes. Land Improvement Boards have been constituted.

5	Jammu & Kashmir	Yes Land Preservation and Improvement Act is in force.	Yes	The formation of District Soil Conservation Committees is under consideration of Govt.
6	Kerala	The Kerala Land Development Bill 1963, which has been passed by the State Legislature is awaiting the assent of the President.	No But there is a Land Development Board with 5 members which controls the Soil Conservation Programme.	No But there are District Development Council which discuss the subject of soil conservation.
7	Maharashtra	Yes Bombay Land Improvement Schemes Act of 1942.	No It is not considered necessary to have State Soil Conservation Board.	Yes District Land Improvement Boards have been constituted for every District.
8	Madhya Pradesh	Yes Madhya Pradesh Land Improvement Act (1957) in force from 15-11-1958.	Yes Functioning from 10-10-1958	Yes District Land Improvement Committees have been formed in all districts.
9	Madras	Yes The Madras Land Improvement Schemes Act 1959 is in force from 1-4-1962.	Yes The Madras Land Improvement Board has already been set up.	No The formation of District Committees is under the active consideration of the Government.
10	Mysore	Yes The rules under the Mysore Land Improvement Act 1961 have come into effect from 1st September 1962 throughout the State.	Yes This was formed prior to reorganisation of States. The State Govt. has been requested to reorganise the Board for the reorganised State.	The District Committees are functioning in the districts of Bijanur Belgaum and Dharwar. District Committees will be formed in all the districts.
11	Orissa	No The draft Soil Conservation Bill which was introduced in the State Legislature during the March 1964 session has been referred to a Select Committee.	Yes Has been established on 4-8-1962	No Not yet formed. However there is a District Development Committee which discusses the subject of soil conservation.

1	2	3	4	5
12	Punjab . . .	Yes The Punjab Land Improvement Schemes Act, 1963.	Yes Set up in 1959	No The District Soil Conservation Committees will be formed as soon as the Soil Conservation Act is enacted.
13	Rajasthan . . .	No The Soil Conservation Bill which was introduced in the State Legislature in the last Budget Session has been referred to a Select Committee.	Yes A State Soil Conservation Board has been set up.	No At present there are no District Soil Conservation Committees. These will be formally constituted after the proposed legislation was enacted.
14	Uttar Pradesh . . .	Yes Uttar Pradesh Soil Conservation Bill, 1963.	Yes A high Power Soil Conservation Board has been set up in 1957.	Yes District Soil Conservation Committees have been set up in those districts where soil conservation work has been taken up.
15	West Bengal . . .	Nil The matter is under the consideration of the State Soil Conservation Board.	Yes Has been set up on 3-8-62	The State Govt. do not think it worthwhile to establish the District Soil Conservation Committee at this moment.
16	Delhi . . .	No It has been decided not to have any soil conservation legislation for the Union Territory as there is not much agricultural land.	..	..
17	Himachal Pradesh . . .	The Himachal Pradesh Land Development Act 1954 (Act XII of 1954) is in force since 1955.	An Inter-State Soil Conservation Board has been constituted. (This is for soil conservation works in the catchments of river valley project-Bakhra).	No Sub-Committees are being formed at district level.

18	Tripura	The bill is under preparation by the State Govt.	Yes Land Utilisation and Soil Conservation Board set up in 1959.	No Tripura is a single district territory.
19	Andaman & Nicobar Administration.	The Andaman & Nicobar Islands Land Development Schemes Regulation 1963.	No Provision for the formation of Andaman & Nicobar Islands Land Improvement Board exists in the draft/regulation.	No Provision for the formation of "District Land Improvement Committee" exists in the draft regulation.
20	N.E.F.A.	Nil	Nil	Nil
21	Pondicherry	The Madras Land Improvement Act 1959 is being extended to this territory.		
22	Manipur	The Madhya Pradesh Soil Conservation Act 1957 has been extended to this territory.		
23	Nagaland	Nil		
24	Goa, Diu & Daman . .	Nil		

ANNEXURE XIV

Table showing the likely build up of Technical Resources (Trained personnel) in the Third Plan.

(Area in lakh acres)

Sl. No.	Name of State	Total personnel likely to be available at the end of third plan or the beginning of Fourth Plan.	Composition of sub-div. unit	No. of sub-div. field units likely to be in position in the beginning of 4th Plan	Norm for bunding per sub-div. per year.	Area likely to be covered annually by sub-div. units as in Col. No. 5	Total area likely to be covered in five years per sub-Div. units as in col. No. 5	
1	2	3	4	5	6	7	8	
1.	Mysore . . .	Officers	44	..				
		Assistants	228	5	39	6,000	2.34	11.70
		Sub-Assts.	965	25				
2.	Andhra Pradesh	Officers	20	1				
		Assistants	120	5	20	5,000	1.00	5.00
		Sub-Assts.	360	15				
3.	Madras . . .	Officers	25	1				
		Assistants	125	5	22	6,000	1.32	6.60
		Sub-Assts.	227	10				
4.	Uttar Pradesh	Officers	49	1				
		Assts.	192	10	22	15,000	3.30	16.50
		Sub-Assts.	1114	50				
5.	Maharashtra .	Officers	195	1				
		Assistants	1014	5	184	12,500	23.00	115.00
		Sub-Assts.	4606	25				
6.	Punjab . . .	Officers	8	1				
		Assistants	40	3	12	3,000	0.36	1.80
		Sub-Assts.	125	10				
7.	Rajasthan .	Officers	17	1				
		Assistants	49	3	15	3,000	0.45	2.21
		Sub-Assts.	138	9				
8.	Orissa . . .	Officers	47	1				
		Assistants	153	4	20	4,000	0.80	4.00
		Sub-Assts.	394	20				
9.	Kerala . . .	Officers	9	N.A.				
		Assistants	12		12	300	0.036	0.18
		Sub-Assts.	16					
10.	Gujarat . . .	Officers	55	1				
		Assts.	250	5	48	8,000	3.84	19.20
		Sub-Assts.	1250	25				

1	2	3	4	5	6	7	8
11.	Himachal Pradesh.	Officers	14	1			
		Asstts.	25	3	8	600	0.024
		Sub-Assts.	75	9			0.12
12.	Jammu & Kashmir.						
13.	Madhya Pradesh.	Officers	88	1			
		Assistants	353	5	68	6,000	4.08
		Sub-Assts.	1353	20			20.40
14.	Bihar	Officers	23				
		Assistants	210		N.A.	N.A.	N.A.
		Sub-Assts.	N.A.				N.A.
15.	West Bengal	N.A.	N.A.		N.A.	N.A.	N.A.
16.	Assam	N.A.	N.A.		N.A.	N.A.	N.A.
	TOTAL	Officers	594				
		Assistants	2771		470		40.55
		Sub-Assts.	10586				202.75

ANNEXURE XV

Scheme of All India Soil and Land Use Survey

PROPOSAL FOR

THE CONTINUANCE OF THE SCHEME AND EXPANSION OF ACTIVITIES DURING THE FOURTH FIVE YEAR PLAN, 1966-71.

Introduction :

Scientific survey and classification of the soils of the country is needed for a proper understanding of the kind of soils, their potentialities and limitations for effective exploitation and rational land use. It has, therefore, been recognised that an appraisal of the soil resources of India is a pre-requisite for the development of agriculture on sound scientific lines and therefore soil surveys have become an integral part of an effective agricultural programme.

2. The broad objectives of soil survey are both basic and applied. The basic aspect of soil survey is based on soil research and helps in building up a thorough knowledge and understanding of the soils, in determining the various important characteristics for classifying them into units and to map them with appropriate legend, and terminology. The objective of soil survey is to study and map the soils of the village lands, irrigated areas; the catchment areas and the like, to enable the preparation of land use plans for the following purposes :—

- (i) Developing the land under cultivation.
- (ii) Bringing new lands under cultivation.
- (iii) Drawing up plans for lands brought under irrigation or reclaimed from water-logging, salinity hazards etc.
- (iv) Better utilisation of the lands for urban and rural development programme such as making of bricks, tiles, drains, roads etc.
- (v) Better watershed management.

The programme of All India Soil Survey also envisages the formulation of a national policy and procedure for all phases of a national survey and cartography and for the development of national standards including soil survey operations, interpretation, soil classification, correlation and soil survey investigation.

Background Information

3. The data on Indian soils including soil fertility and soil and Land Use Surveys upto the year 1960 were collected under the Scheme for "Collection and collation of Soil Survey Data in India" and is under publication with the I. C. A. R. in the form of a book entitled "Soils of India". There are Survey Organisations in operation in (I) several States like the States of Uttar Pradesh, West Bengal, Bihar, Mysore, and Andhra Pradesh (II) Organisations like the Damodar Valley Corporation and Central Water and Power Commission and (III) under the schemes financed by the Central Soil Conservation Board, I.C.A.R. and other commodity committees. At present generally in the States, the state Agricultural Chemists are looking after this work.

4. This work was expanded and under the Second Five Year Plan (since 1955) an All India Soil Survey Scheme was initiated at the Indian

Agricultural Research Institute, for carrying out reconnaissance soil surveys by establishing regional laboratories in four major soil groups occurring in India: (i) Alluvial Soil (Delhi) (ii) Black soils (Poona now at Nagpur), (iii) Red Soils (Bangalore) and (iv) Laterite Soils (Calcutta). Later on, the Central Soil Conservation Board formulated a scheme of Soil and Land Use Planning Organisation for purposes of Soil and Land Use Surveys in the catchment areas of six major river valley projects namely (i) Machkund, (ii) Hirakud, (iii) Chambal, (iv) Bhakra-Nangal, (v) Kosi and (vi) Damodar totalling to about 78,000 sq. miles. It was deemed fit in the interests of coordination and economy and to avoid duplication, that there should be only one Central Organisation to undertake and formulate the techniques and policy of various types of soil surveys needed. These two schemes were, therefore, integrated with effect from 1st March 1958 as the integrated Scheme for All India Soil and Land Use Survey and placed under the administrative control of the Director, Indian Agricultural Research Institute. This work is being carried out under the supervision of the Chief Soil Survey Officer through the four regional centres located at Delhi, Nagpur, Calcutta and Bangalore; each under the charge of Soil Correlator. The scheme also includes a Cartographic Laboratory at the Indian Agricultural Research Institute for processing and printing soil maps. The general programme of soil and land use survey in the country was reviewed by soil scientists in India in consultation with Dr. C. E. Kellog, Assistant Chief Soil Conservation Service of the U.S.D.A. who visited India early in 1958.

Programme and Progress of the Work

5. The plan of the work consists in carrying out generally, standard detailed soil survey in the scale 16"—1 mile or 8"—1 mile, in the catchment areas of the River Valley Projects, and in some cases in commanded areas under the canals and cultivated areas.

6. During the Second Five Year Plan, out of a target of 125 lakh acres, 120 lakh acres were covered by detailed and reconnaissance surveys of which 20.5 lakh acres fell in the catchment areas of Hirakud, Machkund, Bhakra-Nangal and Chambal and 99.5 lakh acres in the State of Madras, Mysore, Andhra Pradesh, Kerala, Maharashtra, Madhya Pradesh, Orissa, West Bengal, Tripura, Delhi, Punjab and Uttar Pradesh.

7. During the Third Five Year Plan period, in the first two and half years, a total of 67 lakh acres by detailed and reconnaissance survey have been completed. Of this area, 24 lakh acres fall in the catchment areas of Hirakud, Machkund, Bhakra-Nangal and Chambal and about 43 lakhs acres in the States of Madras, Mysore, Andhra Pradesh, Kerala, Maharashtra, Orissa, Tripura, Punjab and Uttar Pradesh. In the remaining part of the Third Plan, it is expected that another 70 lakh acres would be covered by both detailed and reconnaissance surveys in both catchment and non-catchment areas.

8. The Planning Commission have indicated that as Detailed Survey in the River Valley Catchments, where work is now in progress, has outstripped execution of soil conservation measures, survey work should be taken up in other River Valley catchments. The Central Water and Power Commission have fixed the following 8 catchments as requiring priority attention (i) Pohru, (ii) Ramganga, (iii) Mayurakshi, (iv) Kangsabati, (v) Dantiwada, (vi) Kundah and (vii) Tungabhadra. Since the present staff of the All India Soil and Land Use Survey Organisation is inadequate to handle this extensive areas, proposals have been placed before the Ministry for the sanction of 20 additional field parties among the four regional centres. The target of achievement of these additional parties is estimated at 8 lakh acres of detailed survey per year. At this rate, to cover the area of these additional catchments alone would require 20 years to complete. Besides the above catchments there are other catchments, whose protection will assume importance with the passage of time and as other River Valley Projects are taken up. To mention a few among these are the projects on (i) Narmada, (ii) Sone, (iii) Tapti, (iv) Krishna and (v) Godavari. Soil Survey work of these areas alone would require the continuance of the field work by the existing and the proposed field parties for periods covering several Five Year Plans.

9. Besides the field soil work envisaged during the Second and Third Five Year Plans, the technique of mapping and reproduction of soil maps has come to be critically examined in the light of developments in the U.S.A. and other countries with the use of air photographs for soil survey.

10. To keep pace with these developing requirements, an Air Photo Interpretation Unit has been added to the All India Soil and Land Use Scheme commencing from the third year of the present plan period. This unit is in its infancy, and requires to be developed and enlarged to meet the increasing developments of this new technique. Also air photography of a number of catchments covering an extent of over 70,000 square miles are being undertaken by the Surveyor General and these photographs are being put to use. Hence the Air Photo Interpretation Unit would require to be strengthened, continued and expanded during the Fourth Plan period.

11. The technical staff at present working at headquarters and controlling the work of the various centres are a minimum and are practically in the scale that were envisaged in 1958 during the Second Plan period. With the increasing volume, tempo and variety of work, the stress placed on this staff has increased and it will be necessary to enlarge the staff if the various items of technical matter relating to soil classification, reporting map publication etc., are to be effectively attended to. It is, therefore, considered necessary to provide for a few additional posts to enable this work to be effectively attended.

Budgetary Implications.

12. Proposals are incorporated here for the continuance of scheme of the Third Plan with its expanded activities and accordingly the existing Third Plan Budget (including the committed expenditure carried over from the Second Plan), are proposed for continuance.

13. In addition certain provision is now made for inclusion in the Fourth Plan as New Item to provide for the following:—

- (1) Replacement of old vehicles, which have served for nearly 10 years, by new vehicles, and providing additional ones to facilitate allotment of at least one vehicle for each field party.
- (2) Provision for the construction of laboratory buildings for the Regional Centres at Nagpur and Calcutta and equipping them.
- (3) Provision for additional technical staff at headquarters to cope up with the increased work and additional responsibility.

Budget for Fourth Plan (1966-71)

	Rs. in lakhs.
1. Existing Third Plan Scheme (committed expenditure)	77.00
2. Provision in Third Plan for expansion of work, Air Photo Interpretation Unit etc. (committed expenditure)	25.00
3. Provision for expansion of field work, replacements, capital expenditure, etc. as explained above	25.00
(Details for item 3)	
i. Buildings (Soil Correlation laboratory at Calcutta and Nagpur)	10.00
ii. Equipment for above laboratories	2.00
iii. Provision for 32 jeeps and trailers for replacements and additions to four centres.	5.00
iv. Provision for Specialist Officers and equipment at headquarters	8.00
GRAND TOTAL	127.00

14. Targets and Achievements.

Item	Unit	Achievements from inception upto end of Third Plan (estimated)	Targets for fourth plan period (in lakhs acres)				
			1966-67	67-68	68-69	69-70	70-71
(a) Catchment area.	Standard Soil Survey	290 lakhs acres.	30	30	30	30	30
(b) Non-catchment area.			10	10	10	10	10

The above table shows that at an annual pace of 40 lakhs acres surveyed, an additional 200 lakh acres would be covered during the Fourth Plan.

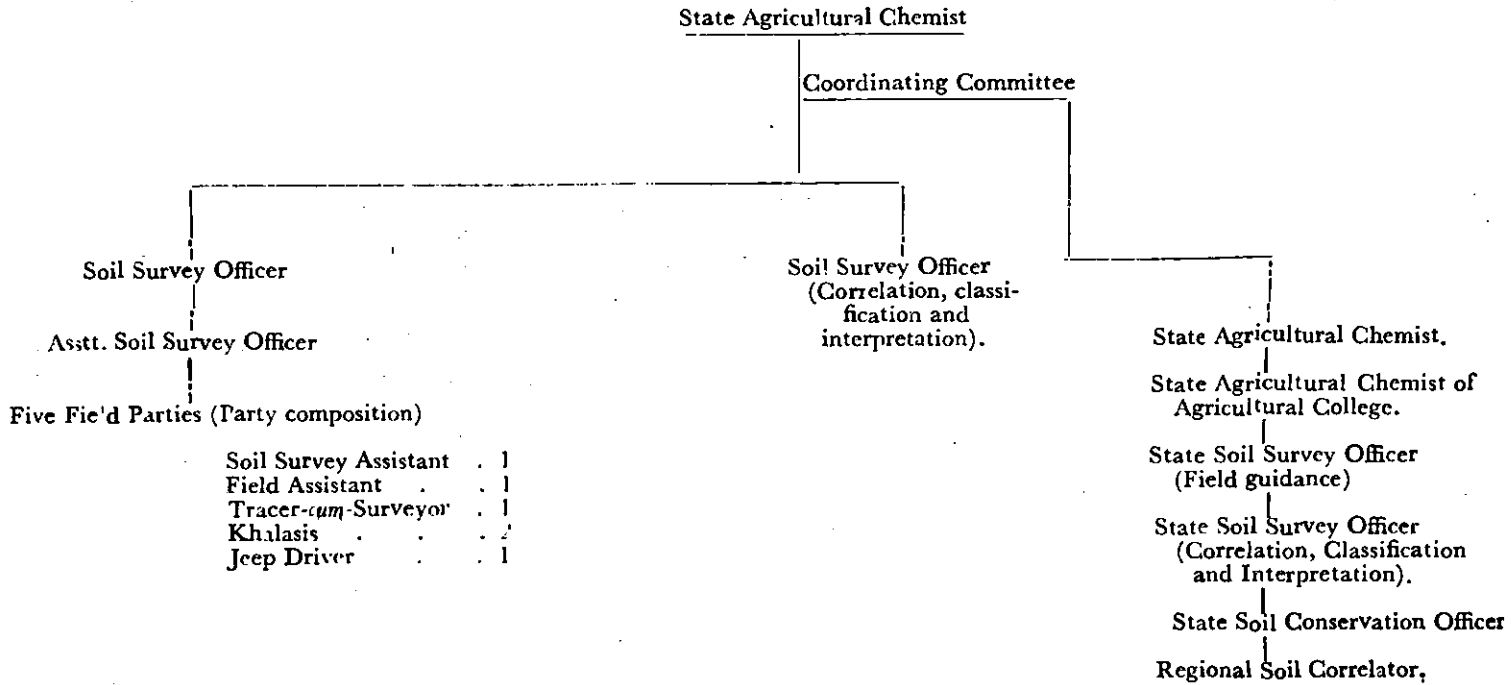
ANNEXURE XVI

Suggested Organisation for Soil Survey

(Schematic Chart attached)

- (i) The overall responsibility for soil survey in the State may be vested in the Agricultural Chemist who may already be doing some soil survey work and may have laboratory facilities for the work.
- (ii) The Agricultural Chemist may be assisted by two Senior Technical Officers, one for soil survey and the other for classification, correlation and interpretation work.
- (iii) Execution of field work may be organised through field parties. One field party comprising of one Soil Survey Assistant, one Field Assistant, one Tracer-cum-Surveyor and two Khalasis should be able to cover about 40,000 acres of standard soil survey annually. For every 5 such field parties it would be necessary to have an Assistant Soil Survey Officer (a Class II Officer) for supervision and inspection. It would also be necessary to provide a jeep and a trailer to each field party for quick mobility and transport from place to place, without which the work may be very much handicapped.
- (iv) For cartographic work, one Assistant would be required to manage the work of about 5-10 field parties.
- (v) Adequate laboratory facilities would also be needed for carrying out the analytical work. Experience so far has shown, that, for the work load of about 10 field parties, it is necessary to have one Research Assistant, two Senior Scientific Assistants, two Junior Scientific Assistants and two Laboratory Attendants.
- (vi) Besides the technical personnel as suggested above, it would also be necessary to provide adequate non-technical ministerial staff and other office help.
- (vii) An organisational chart for the proposed State Soil Survey Organisation is given.

SCHEMATIC CHART OF SUGGESTED STATE SOIL SURVEY ORGANISATION



ANNEXURE XVII

Suggested Organisation for Soil and Water Conservation Programme

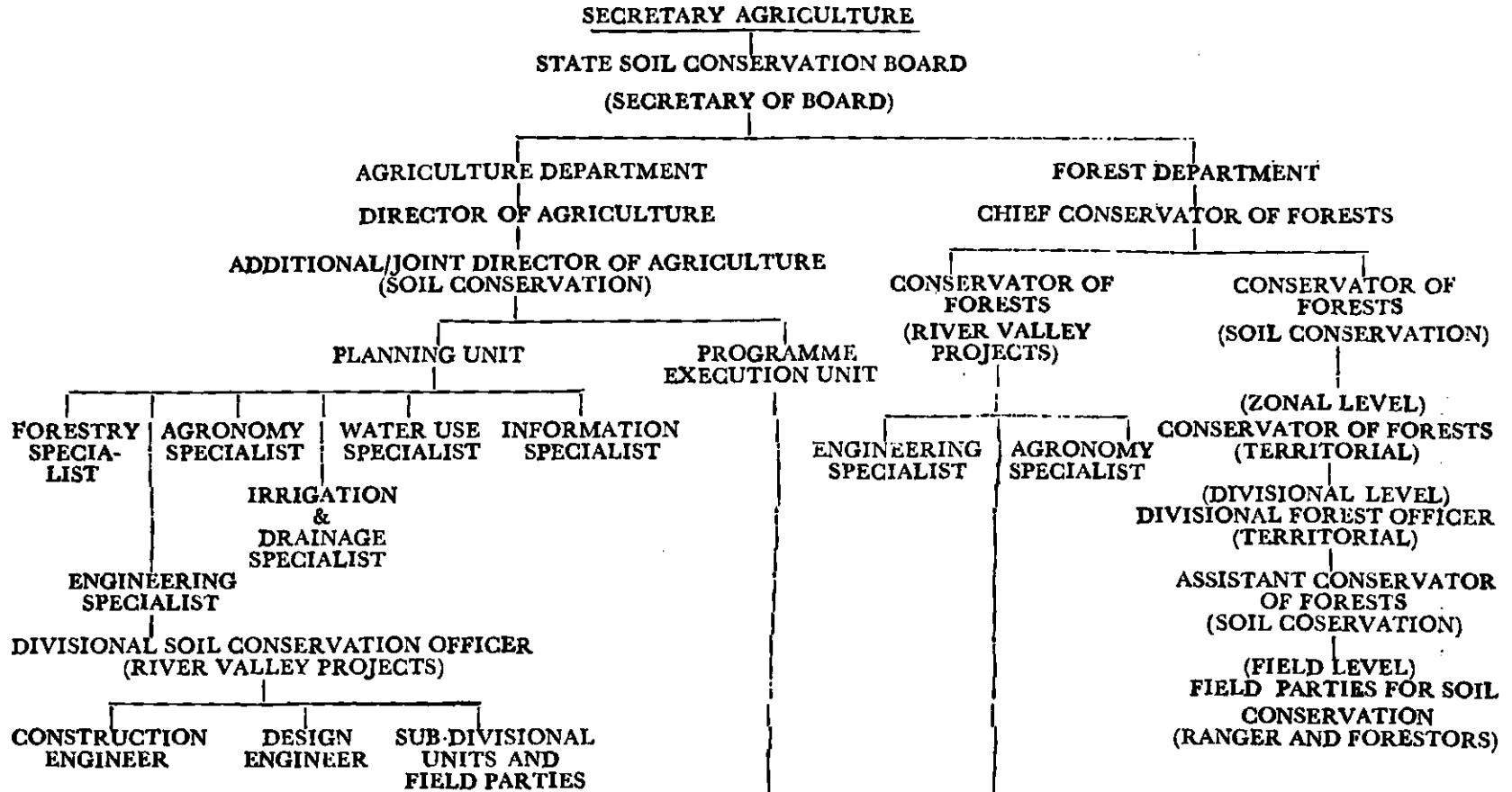
(Schematic Chart attached)

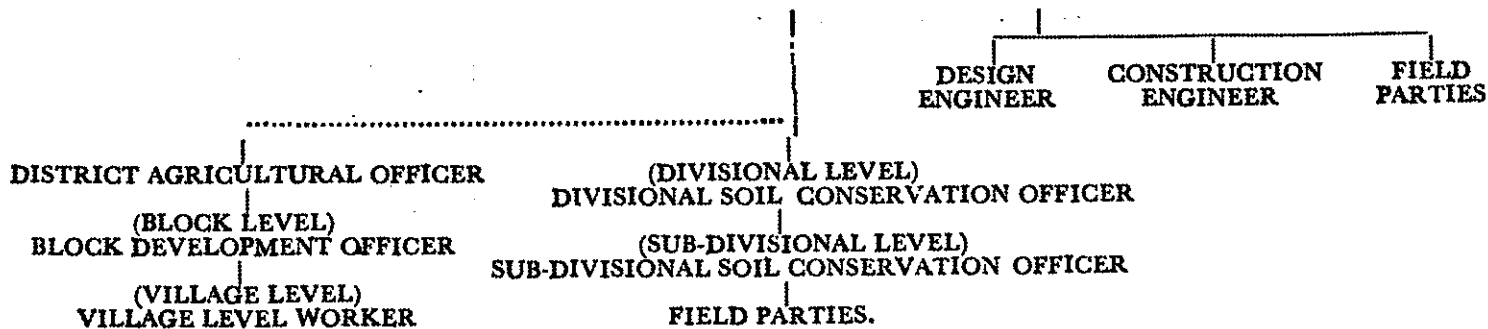
To undertake soil conservation programme in a comprehensive way, it will be necessary to strengthen the States' present organisation, to provide adequate and competent guidance in planning, application and field evaluation of various aspects of soil and water use and management programme, undertake structural works in the watershed of river valley projects, and other erosion control measures, and also ensure effective inter-departmental coordination on watershed basis. The type of organisation considered essential in the States for Soil Conservation is indicated below:—

- (i) To ensure coordination amongst various departments and to take policy decisions at State level and consider and fix due priorities and responsibilities for various departments, it is essential that every State should have a State Soil Conservation Board with a full-time Secretary. The constitution and functions of these Boards are indicated in Chapter III of the Model Soil Conservation Bill circulated to the State Government.
- (ii) The next essential step is to provide suitable technical set up at the State level for adequate guidance in effective planning and implementation of the programmes, laid down by the State Soil Conservation Boards and to carry out field evaluation of programmes, to assess technical sufficiency and adequacy of various practices and measures. The responsibilities for overall coordinated planning of soil conservation should be given to one single authority, preferably the Department of Agriculture. At the State level, there should be an officer of the rank of Additional or Joint Director of Agriculture-in-charge of soil conservation programme. He should be assisted by a group of specialists in the fields of agronomy, forestry, engineering irrigation and drainage and water use. Specialist staff will also be needed in the field of information to bring out educational material, e.g., pamphlets, posters, films and film strips in adequate number for mass awakening on soil conservation problems. While this agency will undertake coordinated planning in the watershed through its field organisation in close cooperation with other departments concerned with the programme, the actual field work will be carried out by different departments concerned, according to the accepted and approved plan, in an integrated way, to cover each unit watershed or sub-watershed at a time.
- (iii) For execution of field work in the agricultural land, the work should be organised in sub-divisions. One sub-division comprising of a sub-Divisional Soil Conservation Officer, about 5 soil conservation assistants and 25 sub-assistants are considered adequate for managing about 7500 acres annually. For maintenance and to ensure the follow up programme of use and management of soil and water, it will be necessary to have one sub-assistant for every 3000 to 4000 acres and for every 4 sub-assistants, one soil conservation assistant. Four execution sub-divisional units can be organised in one division under the charge of Divisional Soil Conservation Officer.
- (iv) For programmes relating to terracing, field drainage, conservation irrigation, land levelling, the composition and content of sub-divisional and divisional units will require to be suitably modified to provide for personnel properly trained in various aspects of the work, e.g. agronomy, soils and engineering.

- (v) The extension agencies have important role to play in so far as the programme relating to use and management of soil and water is concerned. To ensure effective coordination and efficient role of these agencies, it is essential that when the comprehensive schemes for soil conservation are prepared and approved, a copy thereof is sent to the District Agricultural Officer, who will take up the areas indicated in the scheme for agricultural land as the fixed targets for the follow up programmes through the extension agencies at the block and village levels.
- (vi) In so far as the Forest Department is concerned, at the State level, it is essential to have a Conservator of Forests under Chief Conservator solely incharge of soil conservation programme in the forest lands of the State. For work at the field level, there may be an Assistant Conservator of Forests, assisted with adequate field parties solely for soil conservation programme in each territorial forest division, under a Divisional Forest Officer. A field unit consisting of 5 rangers and 20 foresters with some guards may manage about 5000 acres annually. Wherever necessary, separate forest divisions may be opened for soil conservation programmes.
- (vii) For work in the watersheds of river valley projects, it is essential that the overall responsibility for execution is vested under one officer, who may be from soil conservation unit of either the Agriculture or the Forest department. When the work is vested with Forest department, it will be necessary to have specialists one each in agronomy and engineering to exercise proper technical supervision and checks on standards and specifications for various practices under engineering and agronomy programmes. However, when the responsibility for these programmes is vested with soil conservation unit of Agriculture department, the sub-divisional and divisional units, as suggested above, will be adequate. Overall control and guidance will be provided by the Additional or Joint Director of Soil Conservation and his specialist staff. For undertaking constructional works for sediment detention and food control in each watershed, it will be essential to have construction and design engineers or one engineer for both purposes, on the field staff, in each State depending on the extent of the problem.
- (viii) Soil Conservation legislation will be necessary for undertaking work on watershed basis. Some of the States already have some legislation. In many other, either the existing legislations are to be amended or new legislations enacted. Early action in this behalf would also be necessary. It would also be necessary to ensure that provisions of the Act are properly applied for treatment of complete watershed or sub-watershed, as a unit.
- (ix) A schematic Chart for the suggested organisation is given.
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SUGGESTED ORGANISATION FOR SOIL CONSERVATION IN STATES





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- Notes.—1. THE SET UP FOR WATERSHEDS OF RIVER VALLEY PROJECTS, IN THE FOREST DEPARTMENT WILL BE APPLICABLE IF THE RESPONSIBILITY FOR WORK IN RIVER VALLEY AREAS IS VESTED WITH FOREST DEPARTMENT.
2. THE DOTTED LINE SHOWS THE CO-ORDINATING ARRANGEMENT OF SOIL CONSERVATION DIVISION WITH EXTENSION AGENCIES.

ANNEXURE XVIII

Review of Important Recommendations and Suggestions made by various Expert Committees, Conferences, Seminars, Foreign Experts and Surveys

Particulars	Recommendations	Reference
1. Organisation	(i) The administrative machinery for soil conservation in the States needs to be strengthened at different levels.	Study of Soil Conservation Programme for agricultural land. (P.E.O.—Planning Commission) 1962.
	(ii) Apart from strengthening of the administrative structure its functioning needs to be improved and strengthened in a number of ways.	Ditto.
	(iii) The responsibility for soil conservation should be given to one single authority—preferably the Department of Agriculture, where an officer of the rank of Joint Director should be placed in overall charge of the programme in each State. He should be assisted by specialists in forestry, engineering, drainage, soil survey and should be backed by a high power committee.	Ditto.
	(iv) In States where one single senior State Officer of the rank of Joint Secretary has not yet been made responsible for soil conservation programme, arrangements should be ensured for proper coordination among various soil conservation programmes and agencies involved.	Joint Conference of State Ministers of Agriculture and Community Development & Panchayati Raj, August, 1963.
	(v) The policy making and executive agencies in the States are to be strengthened. For strengthening the policy making side, it is necessary that the State Governments that have not so far set up any Soil Conservation Board should take early steps to constitute such body. In a few States, where some State level Board is functioning, the functions of this body do not include policy formation and administrative coordination. These bodies need to be reconstituted so that they may be effective in, and capable of, taking decisions on matters of policy and providing expert guidance and coordination.	Study of Soil Conservation Programme for agricultural land. (P.E.O.—Planning Commission) 1962.
	(vi) Soil Conservation Boards have one top ranking officer responsible for the entire programme of the Centre in soil conservation and soil survey. Director of Soil Survey be responsible directly to this top ranking officer.	Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Assistant Chief of Soil Conservation, U.S.A. 1958.

P.E.O.—Programme Evaluation Organisation,

II. Programme Planning and Execution

- (vii) A single agency should be given the responsibility for coordination and improvement of natural and artificial water ways and improvement of natural drainage ways should be given a high priority. Report on India's Food Crisis and Steps to meet it, by Ford Foundation Team—1959.
- (viii) A Soil and Water Conservation Officer should be assigned at the block level to work on conservation education. He could report administratively to the Block Development Officer but technically to the District Conservation Officer serving his area. Report by Mr. D. A. Williams, Chief of Soil Conservation Service U.S.A., regarding Soil and Water Conservation Programmes and Organisation in India—1960.
- (i) Working concept of soil conservation be broadened to include all the combinations of soil and water management practices that are needed to achieve sustained production of crops, grasses and trees from the specific kinds of soil at the highest practical level. In every place where soil conservation is fully effective, a proper combination of four elements has been achieved, soil, water, plants and people. Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Assistant Chief Soil Conservation U.S.A.—1958.
- (ii) The present effort in most of the States is taking a single practice approach. While these efforts, in most cases, are a step in the right direction, I do not believe the objectives of a soil and water conservation programme can be fully achieved in that way. For example, great reliance is being placed on bunds as a means of checking erosion and increasing the amount of water that penetrates the soil for future crop production. Bunds alone will not accomplish these objectives. But bunds, where needed on sloping land, combined with contour framing, properly prepared grassed waterways for safe disposal of run off, improved cultural practices such as good crop rotations, lister or basin lister planting, improved manurial practices and better seed, will combine to greatly increase crop yields and reduce erosion. The Development of soil and water conservation in India (Six months Report) by Mr. A. M. Hedge Leader of TCM Conservation Team—June 1957.
- (iii) There is an ever present danger in blanket or generalised programme recommendations being extended to physical situations for which they are not suited. There is no alternative to sound technical approach to the solution of problems involving soil and water. Each practice has its appropriate place in combination with other treatments on a selected basis properly related to the particular soil, water, plant, and human situations involved. It is highly important that the facts about soil and water be obtained and documented. Report by Mr. D. A. Williams, Chief of Soil Conservation Service U.S.A. regarding Soil & Water Conservation Programme and Organisation in India—1960.

Particulars	Recommendations	Reference
II. Programme Planning and Execution—(contd.)	(iv) No grants for soil conservation be approved by the Soil Conservation Board until a standard soil survey of appropriate scale and detail has been made or is included in the plan for completion, prior to the actual conservation planning.	Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief of Soil Conservation—1958.
	(v) Soil conservation work be carefully integrated with soil testing, extension work, and other services to cultivators so that the cultivators have the great benefit of the interaction among improved water control, fertilizers, improved seed etc. It is the combination of all that gives the big improvement.	Ditto.
	(vi) The "follow on" practices so essential to the full benefits of conservation were not, in any area observed, receiving the attention necessary. Nevertheless it is essential that conservation workers follow through with cultivators to achieve the application of needed practices and become conservation farmers.	Report by Mr. D. A. Williams, Chief of Soil Conservation Service U.S.A. regarding Soil & Water Conservation Programmes and Organisation in India—1960.
	(vii) It is my feeling that too much emphasis is being placed on bunds as a means of holding the rainfall on the land. Not enough emphasis is given to ways of increasing the amount of water the soil can absorb between bunds.	The Development of Soil and Water Conservation in India, by Mr. A. M. Hedge, Leader of TCM Conservation Team—1957.
	(viii) The use of boundary bunds, fertilizers and soil conserving or building practices should not be indiscriminate. Greater results can be achieved from such measures when properly related to the soil needs, but wastage of funds and human efforts will occur if they are not properly used. There is no "magic wand" applicable to all soils and conditions. Thus a technical foundation is essential to the solution of such problems.	Report by Mr. D. A. Williams Chief of Soil Conservation Service U.S.A., regarding Soil and Water Conservation Programmes & Organisation in India—1960.
	(ix) Arrangements can be made cooperatively with States for continuous follow through of soil conservation planning in order to be more sure that works of improvement are maintained and that cultivators are given all possible assistance for further improvement.	Soil Conservation & Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief of Soil Conservation U.S.A.—1958.
	(x) The methods and practices to be adopted for soil conservation purposes should be fully established and supported by research results before they are either demonstrated or extended. There is a great need for expanding research programme.	Study of Soil Conservation Programme for agricultural land (P.E.O.—Planning Commission)—1962.

- (xi) The conflict of view about certain works designated as soil conservation measures viz., Medhbands and watbandi may be resolved so that blocks can be given scientific guidance in respect of such guidance by the departmental staff. Study of Soil Conservation Programme for agricultural land. (P.E.O.—Planning Commission)—1962.
- (xii) Increased efforts should be made on accurate contour bunding with first priority on better soils (1) that can be shifted from rough pasture to crop land, (2) that can be shifted from kharif crop alone to both kharif and rabi crops or (3) that can produce much higher yields. Report on Food Crisis in India and steps to meet it by Ford Foundation Team—1959.
- (xiii) Maximum efforts should be taken to ensure that soil conservation programmes were executed efficiently and arrangements made for maintaining the works to adopt follow on practices. Conference of State Ministers in charge of Soil Conservation Bhubneshwar—1960.
- (xiv) Centre should arrange to inspect all soil conservation work done by the centre or under grants of funds to the States in order (1) to see that the work done conforms to reasonable standards (2) that the most improved methods based on adequate soil surveys are followed. Soil Conservation & Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief of Soil Conservation USA—1958.
- (xv) The protection of catchment areas of costly water reservoirs is a must if such works are to be safeguarded for the people. Rather than debate the various estimates of length of life of such reservoirs, it should be recognised that their value will continue to grow with the pressure of population and the essential steps be taken to correct the problem. It would appear that the steep slopes of the Himalayas cannot continue in cultivation if this siltation problem is to be solved. Some scheme should be devised and implemented which would convert the cultivated use of the steep lands to forests. This will probably involve some magnitude of public ownership or control of the land. Hill cultivators with little hope or opportunity of success should be relocated to reclaimed lands or provided employment opportunities outside of agriculture. Likewise, nomadic and other excessive grazing cannot continue if the catchment areas are to be given essential protection. Report by Mr. D. A. Williams, Chief of Soil Conservation Service U. S. A. regarding Soil and Water Conservation Programmes and Organisation in India—1960.
- (xvi) In order to avoid national waste it is essential that before new river valley project is taken up in future, careful estimates are made of soil conservation measures. Necessary estimates of the financial provision for these measures should form an essential part of the project. Firm assurance about financial provisions should be given before a project is taken. With regard to existing river valley projects, whose catchments lie in more than one State, it is necessary to establish River Boards immediately. Conference of State Ministers in charge of Soil Conservation, Bhubaneshwar—1960.

Particulars	Recommendations	Reference
II. Programme Planning and Execution—(concl'd.)	(xvii) The protection of constructed terraces, bunds, drainage channels, and vegetative treatments from excessive livestock grazing and trampling is a must if the soil and water resources are to be conserved and improved.	Report by Mr. D. A. Williams, Chief of Soil Conservation Service U. S. A., regarding Soil and Water Conservation Programmes and Organisation in India—1960.
	(xviii) Suitable allotments for soil and water conservation works, including forest planting and protection from over-grazing should be made within all plans for works of public improvement, such as water storage reservoirs and the improvement in the catchment area should be timed, to begin, as soon as firm decisions of the project are finalised and soil surveys can be made.	Report on Food Crisis in India and steps to meet it by Ford Foundation Team—1959.
	(xix) The cooperation of State highway officials be sought for better control of water. Inadequately located and constructed ditches and culverts have resulted in enormous new gullies in highly erosive soils.	Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief of Soil Conservation U. S. A.
	(xx) Joint conference among agriculturists and highway engineers should be held in order to find ways to develop mutually satisfactory methods for joint planning for handling of waterways, to be most helpful to soil stability and agricultural production.	Report on Food Crisis in India and steps to meet it by Ford Foundation Team—1959.
	(xxi) There are very great opportunities for the reclamation of alkali and saline soils. This programme must be approached on a technically sound basis. To attempt to reclaim such lands in areas of low rainfall and little, if any, irrigation water will be costly and in most cases disappointing.	Report by Mr. D. A. Williams, Chief of Soil Conservation Service U. S. A., regarding Soil and Water Conservation Programme and Organisation in India—1960.
	(xxii) It is extremely important that drainage plans visualise the necessity of link or lateral drains, permitting cultivators to dispose of excess water from their fields at a rate and to a depth consistent with soils and crops. Because drainage is to primarily serve an agricultural purpose, the planning of it should be participated in by agricultural experts. It is suggested that a top expert or experts in agricultural drainage be sought as a consultant for several months on this problem.	Ditto

- (xxiii) Importance must be given to the control of grazing by closures etc. and villagers should not be permitted to take cattle into closed area but be allowed to cut the grass free of cost. Seventh meeting of Central Soil Conservation Board—1963.
- (xxiv) The research and demonstration work on grasses in the arid zone clearly shows that such lands can be vastly improved in productivity and the soils stabilised from wind erosion. However, such improvement necessitates the boldest of administrative action in the restriction of grazing use until, recovery occurs and the management of grazing use thereafter consistent with desired vegetative types and their sustained vitality. Technical experts can do little in this area to apply their knowledge till the necessary administrative actions are taken. Report by Dr. D. A. Williams, Chief of Soil Conservation Service U. S. A., regarding Soil & Water Conservation Programmes and Organisation in India—1960.
- (xxv) In the case of ravines it would seem more logical and practical to detain or divert the over-burden water from such areas, exclude all grazing, and reforest the critical areas. In some cases temporary sediment catchment basins may be desirable until vegetation growth is attained. Ditto
- (xxvi) Public financial investments in land use adjustments and in conservation practices with long term public benefits appears essential to the accomplishment of the essential soil and water conservation programme. Ditto
- (xxvii) The Soil Conservation Board should work out reasonable ways to guarantee cultivators against loss from the adoption of radically changed systems of soil and water management that promise substantial increase in food production and income. Report on Food Crisis in India and steps to meet it by Ford Foundation Team—1959.
- (xxviii) Additional subsidy be given to the sharing of costs and risks with the cultivators who are adopting difficult soil conservation measures such as large terraces, diversions etc. Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief of Soil Conservation U. S. A.—1958.
- (xxix) Conservation treatment tends to result in lowering of the yield of crops in most areas during the first one or two years. Under such circumstances cultivators need some positive inducement. Such inducement may be given in the shape of subsidised supply of fertilizers, good seeds, etc. Study of Soil Conservation Programme for agricultural land. (P. E. O.—Planning Commission)—1962.

Particulars	Recommendations	Reference
II. Programme Planning and Execution—(contd.)	(xxx) Public assistance through loans or subsidies should be given for constructing or repairing tanks only where the designs provide for (i) as deep tanks as are practicable (considering the problem of sealing them against breakage by the use of special earth materials or chemical sealers) in order to conserve soil and reduce evaporation, (ii) grass silt traps on the margin, and (iii) proper bunds, diversions, spillways and catches to control erosion in the catchment area so that they may continue for a reasonable life span.	Report on Food Crisis in India and steps to meet it by Ford Foundation Team—1959.
	(xxxix) The community development blocks and people's institutions have an important role to play in carrying the programme to the desired extent. The role of the blocks in the extension of soil conservation practices has not been given sufficient thought yet in the majority of the States. The role of block agency in different aspects and stages of the programme needs to be spelled out clearly at this stage.	Study of Soil Conservation Programme for agricultural land. (P. E. O.—Planning Commission)—1962.
	(xxxix) Proper coordination, if not integration, of two agencies, i. e. soil conservation staff and the block staff is urgently needed. The blocks can play a useful role in preparing the people to accept conservation farming treatment so that they may voluntarily come forward with their consent.	Ditto
	(xxxix) A priority of kinds of work in programme planning, research and execution should be established to guide all conservation activities.	Soil Conservation in India—Observation and suggestions by R. L. Ven Treba—1955.
	(xxxix) The soil conservation programme needs to be more fully integrated also in respect of its different administrative components <i>viz.</i> research, training, demonstration and extensions.	Study of Soil Conservation Programme for agricultural land (P. E. O.—Planning Commission)—1962.
III. Training and Education.	(i) The kind of conservation programme needed in India will require extensive and continuing training. This training should start by including in the syllabus of agricultural colleges special course in soil and water conservation. The Chief Director of Soil Conservation and the Joint Director should work closely with the agricultural colleges to this end. When technicians well trained in the technology of soil and water conservation come out of the agricultural colleges, the syllabus of the training centres operated by the Board can be greatly modified. I do not believe the training given by colleges can ever supplement the need for	The Development of Soil and Water Conservation in India by Mr. A. M. Hedge Leader of TCM Conservation Team—1957.

soil conservation training centres. But when technicians become available who have received good academic training in the technology of soil conservation, it will remain for the Board to provide training largely in the techniques and practical application of the technology. Thus the period of training offered by the Board can be reduced and more technicians can be accommodated.

- (ii) Appropriate steps should be taken by the Centre to work with agricultural and engineering colleges in order to help them develop satisfactory curricula for the potential soil scientists and conservation engineers so urgently needed in India.
- (iii) There should be complete educational course at some Institute where we could take raw people and turn them into specialists.
- (iv) But academic training must be supplemented by practical on-the-job training under the supervision of experienced technicians. Pilot projects offer splendid opportunities for such on-the-job training.
- (v) Use pilot demonstration projects for training field personnel.
- (vi) If extension education is to be strengthened, demonstrations have to be pursued to the result so that the cultivators can be shown the effect of the treatment on productivity and net returns.
- (vii) The training facilities for the sub-assistants may be expanded by the State Governments.

Reports on India's Food Crisis and steps to meet it by Ford Foundation Team—1959.

Informal Conference of the State Ministers of Agriculture—August, 1962.

The Development of Soil and Water Conservation in India by Mr. A. M. Hedge, Leader of TCM Conservation Team—1957.

Soil Conservation in India—Observation and Suggestion by R. L. Ven Treba—1955.

Study of Soil Conservation Programme for agricultural land. (P.E.O.—Planning Commission)—1962.

Ditto.

Soil Conservation and Soil Survey in India by Dr. C. E. Kellogg, Asstt. Chief Soil Conservation, U. S. A.—1958.

- (i) Specific arrangement be made among Indian Council of Agricultural Research, the Soil Conservation Board and other agencies for periodic field appraisals of the additional research in all phases of agriculture to make soil conservation work as efficient as possible and the formal reports including specific research needs be fully considered in giving priority to research projects and grants.
- (ii) Over emphasis upon plot run-off and other research should be avoided as compared with that on watershed and field scale work. Participation by appropriate State agencies in the research of the Central Government should be had to further assure the acceptance and use of the results.

Report by Mr. D. A. Williams, Chief of Soil Conservation Service USA regarding Soil and Water Conservation Programme and Organisation in India—1960.

IV. Research

Particulars	Recommendations	Reference
IV. Research—(contd.)	<p>(iii) The problems of compaction, inadequate aeration and undesirable moisture relationships for the growth of plants are widespread in India. There are also evidences that high soil temperature and factors associated with it seriously retard the growth during the portion of the year. All the physical factors affect the crop growth, very materially. In many irrigated areas of the world it has been found that as soon as fertilisers use becomes widespread, further increases in production are brought about by manipulation and control of physical factors. The progress in solving the problems of soil physics as they affect the production in India can be brought about most economically and rapidly by applying basic and fundamental research that has already been done and is being done by more advanced agricultural countries to the problems of India.</p>	Soil Physics Problems in India—Sterling Taylor, Consultant in Soil Physics—1955.
	For this following is essentials.—	
	<p>(a) to employ at each State and Central laboratory a Soil Physicist equal in rank to the soil Chemist and have the necessary assistance ;</p> <p>(b) each research station employing Soil Physicist should provide basic soil physics laboratory facilities including simple shop for repairing research equipment and fabricating simple items of research equipment ; and</p> <p>(c) provide good laboratory facilities for a research organisation.</p> <p>(iv) Research and demonstration should be expanded on the reclamation of saline and alkali soils and increased efforts should be made to reclaim present areas affected by salinity and alkalinity.</p> <p>(v) The Centre should develop an adequate research programme for testing likely possibilities for improving and supplementing the existing systems of shifting cultivation.</p> <p>(vi) In the light of the growing body of evidence, the Board of Agriculture of the Indian Council of Agricultural Research should give this problem of grazing control a top priority for appropriate study and recommendations, working in full cooperation with leading experts in soil and water</p>	Report on India's Food Crisis and steps to meet it by Ford Foundation Team—1959.
		Ditto.
		Ditto.

conservation, range management, farm management and legal matters relating to rural lands. (This kind of coordinated study should result in preparing and promulgating a widespread and intensive educational programme among cultivators and herdsmen and drafting of model legislation for controlled grazing including the licensing of grazing on all public lands under management systems that permit adequate protection of plants, soils and water supplies.

- (vii) Two central research stations be established to conduct basic research on national and regional soil and water conservation problems, one in an irrigated and one in a non-irrigated area and the funds be made available for close collaboration with State Agricultural Departments, Agricultural Colleges and other appropriate institutions.

V. Demonstration

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| <p>(i) In order that the demonstrations may achieve the objective of convincing the cultivators of the usefulness of the conservation treatments, conservation farming practices have to be introduced on the lands and their results demonstrated. For this purpose, necessary training should be given to extension officers and the village level workers. Block Development Officers should be given special training in soil conservation treatments and practices.</p> | <p>Study of Soil Conservation Programme for agricultural land (P.E.O.—Planning Commission)—1962.</p> |
| <p>(ii) On all projects there should be a continuing informational and educational programme designed to teach cultivators how to get the maximum production from their conservation work and how to maintain all measures in effective working condition.</p> | <p>The Development of Soil and Water Conservation in India—Mr. A.M.Hedge, Leader of TCM Conservation Team—1957.</p> |
| <p>(iii) Pilot demonstration projects will serve as excellent sources for field observations and for conducting informal research to establish guides for technical standards and criteria.</p> | <p>Soil Conservation in India—Observations and Suggestions by R.L.Ven Treba—1955.</p> |
| <p>(iv) All projects should be covered by a soil survey in sufficient detail to provide a guide in planning the use and treatment of land according to its capability. In terms of priority the soil survey should be the first activity undertaken.</p> | <p>The Development of Soil and Water Conservation in India—Mr. A. M. Hedge, Leader of TCM Conservation Team—1957.</p> |
| <p>(v) Because of the magnitude of providing adequate feed for India's livestock population consideration should be given to establishing a few grazing demonstration projects.</p> | <p>Ditto.</p> |

Particulars	Recommendations	Reference
V. Demonstration—(contd.)	(vi) Demonstrations of the great value of guarding vegetation including grasses, shrubs and trees and of the other associated practices should be increased as rapidly as facilities permit along with plant selections, seed multiplication, and re-seeding of the desirable species of grasses, shrubs and trees so that as many cultivators and herdsmen as possible can see the results.	Report on India's Food Crisis and steps to meet it by Ford Foundation Team—1959.
VI. People's Participation	<p>(i) The soil conservation work should be carried on cooperatively with other village programme and that villagers are given full understanding of the work and of their responsibility in it.</p> <p>(ii) There is need also for strengthening the public relations side activity of the soil conservation set up, more so at the village and block levels.</p> <p>(iii) Cultivators should be encouraged to build bunds, terraces etc. using their own bullock power and local equipment.</p> <p>(iv) The association of the people with the soil conservation may ensure the conservation of treated areas.</p> <p>(v) Every effort should be made to develop local leadership and responsibility for soil and water conservation within the villages and larger units of local Government.</p> <p>(vi) It is for consideration for the State Government that how under the Panchayati Raj set up, the soil conservation extension staff may be linked in some form or the other with the block set up.</p> <p>(vii) The Panchayats may be actively associated with the execution of soil conservation programme right from the planning stage as they can help in convincing the people, securing their consent and inducing them to undertake the work themselves on their land and speedily recovering the loans</p>	<p>Soil Conservation and Soil Survey in India by Dr. C.E. Kellogg, Asstt. Chief Soil Conservation USA—1958.</p> <p>Study of Soil Conservation Programme for agricultural land (P.E.O.—Planning Commission)—1962.</p> <p>Soil Conservation in India—Observations and Suggestions by R.L. Ven Treba—1955.</p> <p>Study of Soil Conservation Programme for agricultural land (P.E.O.—Planning Commission)—1962.</p> <p>Soil Conservation and Soil Survey in India by Dr. C.E. Kellogg Asstt. Chief Soil Conservation USA—1958.</p> <p>Study of Soil Conservation Programme for agricultural land (P.E.O.—Planning Commission)—1962.</p> <p>Study of Soil Conservation Programme for agricultural land. (P.E.O.—Planning Commission)—1962.</p>

(viii) Soil conservation being a highly technical programme covering watersheds which are not coterminous with blocks and of a non-recurring character, its implementation should be the responsibility of the technical staff appointed for the purpose. The block staff should give all assistance to them who should, in turn, enlist the cooperation of the Panchayati Raj bodies for mobilising the manpower required for the purpose and carry on educative propaganda among farmers and others covered under the working plan.

Joint Conference of State Ministers of Agriculture and Community Development and Panchayati Raj—August, 1963.

VII. Legislation

(i) Legislation should be adopted to provide that a bunding or terracing scheme be undertaken in a village or larger unit, only where a clear majority have voted for it with full understanding of the works to be done. The work should be done on all lands required to make the scheme successful and charged as part of the taxes against the land, if necessary. The Government should maintain the bunds for two years after which the responsibility for maintenance should be given to the village. In order to protect the welfare of the majority, the Government should inspect the bunds thereafter and make necessary repairs if bunds are not maintained, charging the cost as part of the taxes against the land.

Report on India's Food Crisis and steps to meet it by Ford Foundation Team—1959.

(ii) Wherever legislative enactments had not yet been passed, this should be executed as soon as possible.

Conference of State Ministers in charge of Soil Conservation Bhubaneswar—Dec., 1960.

(iii) In the States where Soil Conservation Legislation has not yet been enacted, immediate steps should be taken to this end.

Study of Soil Conservation Programme for agricultural land (P. E. O.—Planning Commission)—1962.

(iv) In the States where soil Conservation Legislation has not yet been enacted, immediate steps should be taken to this effect.

Joint Conference of State Ministers of Agriculture and Community Development and Panchayati Raj—Aug., 1963.

VIII. Land Reforms

(i) The development of new land areas should be planned jointly with experts in soil and water conservation on the basis of adequate soil surveys, so that adequate lay-outs of holdings are ensured for efficient soil and water management and so that holdings have comparable potential for food production.

Report on India's Food Crisis and steps to meet it by Ford Foundation Team—1959.

Particulars	Recommendations	Reference
VIII. Land Reforms—(contd.)	<p>(ii) Future land clearing for settlement should not be approved without examination of the soil to be sure that any potential hazard of soil erosion, soil blowing or low yields can be controlled by the cultivators with such technical and financial assistance as can be given.</p> <p>(iii) Special effort and priority be given to the consolidation, or partial consolidation of holdings in the villages, especially where run-off and erosion control are significant problems.</p> <p>(iv) It is urged that conservation experts work very closely with officers dealing with consolidation of holdings, policies be adopted by the Centre and State Governments to facilitate conservation objectives.</p>	<p>Soil Conservation and Soil Survey in India by Dr. C.E. Kellogg, Asstt. Chief Soil Conservation, USA.</p> <p>Ditto.</p> <p>Report by Mr. D. A. Williams, Chief of Soil Conservation Service U. S. A., regarding Soil and Water Conservation Programme and Organisation in India—1960.</p>

Recommendations made at the Hill Development Seminar—April, 1963

Erosion Control

- (i) Considerable erosion occurs due to improper alignment of roads in hills and lack of effective stabilisation of road-sides. Soil conservation need, therefore, should be carefully considered in road construction. Before road plans are finalised, soil conservation technicians along with road constructing authorities should go over the entire road alignment and satisfy themselves that the soil conservation needs have been adequately met. Minimum standards for stabilisation of road-sides should be fixed for the region. Licenses for quarrying limestone and other minor minerals should be granted only on the advice of a Soil Conservationist.
- (ii) Soil conservation is the most important problem in the hills and it should be the concern of all agencies. It is, therefore, necessary that officials of the Departments of Revenue, Public Works, Forest, Agriculture and Community Development, etc. should have training in soil conservation which will enable them to deal with the problems. By this, they will also be able to create an awareness of the problem among the local population.

Land Development and Use

- (i) The fundamental problem of agricultural development in hill areas is that of sustained, efficient use of soil. To ensure this, the scope of soil and water conservation programmes should be enlarged from one of

erosion control as at present to complete treatment, management and land use adjustment. The new programme will then include items like erosion control, fertility built up, cropping system and crop rotation, water use, drainage, correction of soil reaction and improvement of the physical condition of soil, etc. All agricultural production programmes should be coordinated effectively with the soil and water management and conservation programme towards this end.

- (ii) Further allotments of land for cultivation and other uses in hill areas should be strictly based on land capability classification determined through standard soil surveys. This work should be done by the Soil Conservation Wing of the State Agriculture Department where such a wing does not exist, it should be created.
- (iii) When new lands are allotted to settlers in accordance with land capability the soil conservation measures they have to carry out for sustained efficient use of soils may be clearly laid down. These should be checked within a stipulated time and if not carried out, the allotment should not be confirmed on permanent or long term basis but should be cancelled.
- (iv) For new areas under cultivation changes in land use in conformity with soil conservation needs, should be brought about gradually. In new lands as also in the lands under plough, the future emphasis should be on development of horticultural and plantation crops as well as pastures and wood lands.

Forest and Pasture Development.

- (i) In many hill areas, the denudation of forests is so severe that slips and land slides occur and streams are choked with debris. Since forest management policies now vary from area to area they should be brought in line with the Central National Policy based on rational consideration of the hill areas. Recognition for the adoption of a sound policy of land use under forest management should be secured through education.
- (ii) The problem of grazing in many of the border regions of Himalayas has become serious by the loss of facilities in the alpine pastures of the Tibetan region. Pasture improvement and development through known practices, viz. fertilizer use, rotational grazing and introduction of good species of grasses and legumes from similar eco-climatic regions is, therefore, of paramount importance. Immediate attention should be paid to the development of these areas where improved indigenous and foreign breeds have been introduced for the upgrading of the local livestock.

Recommendations	Reference	
Particulars	Recommendations	Reference
Survey of Problems	<p>For a well-planned and sustained development of hilly areas, a sample survey may be carried out to highlight the nature and magnitude of various problems for both short-term and long-term development with due priorities. This may include :—</p> <ul style="list-style-type: none"> (a) Present land use and future needs; (b) Soil and water conservation problems ; (c) Survey of local grasses and legumes for grassland development; (d) Marketing and processing needs ; (e) Development of small, medium and big industries based on the indigenous raw materials. 	
Training and Education	<ul style="list-style-type: none"> (i) To create a future generation of enlightened farmers, teaching of scientific methods of farming and land use consistent with soil conservation needs, should be taken up in schools through vocational courses at secondary levels. Suitable modifications in the text books will be necessary for this purpose. (ii) Vocational training for farmers in scientific methods of management and use of land should be taken up. 	
Research	<p>There is urgent need for research on watershed management, shifting cultivation, pasture development and other agricultural sciences. The question of adequate research facility on watershed and shifting cultivation should be considered by the Central Soil Conservation Board urgently.</p>	
Enactment	<p>A comprehensive soil conservation bill should be enacted on the lines of the model soil conservation draft bill of the Government of India wherever it has not been enacted as yet.</p>	

ANNEXURE XIX

Minutes of the meeting held on the 29th and 30th September 1964 in Vigyan Bhavan, to discuss with the State Representatives, the soil conservation programme for the Fourth Five Year Plan

The meeting with the State representatives was held on 29th and 30th September, 1964 in Vigyan Bhavan under the Chairmanship of Shri A. D. Pandit, Special Secretary, Ministry of Food & Agriculture (Department of Agriculture).

2. In the opening remarks Chairman briefly referred to the scope and importance of soil conservation in agricultural development, necessity of soil survey as basis for scientific land use and management, need for building adequate soil survey and soil conservation organisations, training of personnel and operational research in soil conservation. Chairman also referred to the need for rationalising the pattern of assistance to farmers for soil conservation programme on the basis of economic benefits from various practices and measures.

3. The Chairman said that soil conservation should not be limited to contour bunding or afforestation only but it would include conservation and management of soil and water. Without an effective soil conservation programme there can be no stable agriculture. Application of external inputs e.g., fertilizers and seeds etc. will not yield full benefit in the absence of proper soil and water management. The Chairman emphasised that for sustained benefits from soil conservation, it was imperative that the programme should be planned carefully so that it was technically sound and economically profitable; as otherwise while the money will be spent there will be no corresponding benefits. Infructuous expenditure contributes to inflation. The emphasis, therefore, should be on effectiveness and efficiency of the programme and not only on achievement of mere physical targets. The important thing, therefore, was not the quantity but the quality of work executed.

4. The Chairman further stated that for sound and effective planning it would be necessary that prior to undertaking a programme, standard soil survey should be carried out to know the properties and characteristics of soil and diagonalise the nature and severity of various problems of conservation and management of soil and water. He then emphasised the need for building up adequate soil survey organisation in the States and undertaking soil survey cooperatively by the States and the Centre for the programmes to be taken up in the Fourth Plan.

5. Speaking about soil conservation organisation, the Chairman pointed out that lack of proper organisation has been the major bottleneck in undertaking soil conservation programme effectively. Planning and execution, he said, so far, was rather fragmented as it did not cover a watershed in a comprehensive way. He then emphasised the need for building appropriate soil conservation organisation that will undertake planning in a comprehensive way on watershed basis and ensure coordination among various departments. He stressed that besides the State level soil Conservation Boards or Committees in each State there should be a technical cell comprising of specialists in different scientific disciplines like agronomy, soil science, engineering, forestry, water use and information etc. which should preferably be attached to Agriculture Department. The technical cell should be responsible for coordinated planning and functional coordination among various departments. The Chairman said that soil conservation being an inter-disciplinary programme, it will not be possible for one officer of the rank of Director of Soil Conservation or Joint Director (Agriculture—Soil Conservation) to exercise proper checks for technical adequacy and soundness of field programmes and ensure inter-departmental coordination. Hence there was need to have a technical cell. The Chairman emphasised that the planning should be done on watershed basis in a comprehensive way by the technical

cell and the plans duly approved by different departments may be put up to the State Soil Conservation Board or Committee for final approval. The Board will assign due priorities and fix responsibilities on different departments to implement the plan simultaneously in proper sequence.

6. Chairman further emphasised the need for technical assessment of the plans and coordination of the programme by the Centre through regional organisation. He said that to ensure technical efficiency of any programme second technical scrutiny by the Centre was essential. He further said that coordination of soil conservation programme was necessary by the Centre so that experience gained in one State can be easily made available to other States for application under identical conditions. Coordination can only be secured through regional organisation. Giving an example of Indian Council of Agricultural Research, which is supposed to coordinate research all over the country. Chairman said that experience had shown that it was not possible to ensure coordination through Committees and so project coordinators had been appointed for special research projects, e.g., hybrid maize, research on pulses and soil fertility etc. Likewise in soil conservation coordination and technical assessment cannot be ensured through the present limited organisation at the Centre and there was need to have regional units for this purpose. Besides, these regional units will help in collection, compilation and interpretation of basic information about meteorology, hydrology, sedimentation and erosion etc. which is essential for planning coordinated watershed protection programmes and for which the States had no organisation. The regional units thus will serve as clearing house for all basic technical information necessary for planning soil and water conservation programmes effectively.

7. Chairman further stressed the need for adequate programmes for training and operational research to support sustained soil conservation programme. Speaking about the pattern of assistance, Chairman emphasised that the present system of financial assistance was based on *ad-hoc* considerations. It was not related to cost benefit ratios. He emphasised the need for greater economic studies to rationalise the financial assistance to the farmers. Following these opening remarks, discussions were held on individual items of agenda.

8 Item (I)—*Scope of Soil Conservation and Approach in the Fourth Plan*
Following recommendations were made:—

i. Soil Conservation should include conservation and management of soil and water. The programme should include measures necessary for erosion control (water and wind); conservation farming; programme for treatment and reclamation of ravines, reclamation of saline, alkali and water logged lands; field drainage; land levelling; conservation irrigation; and water spreading etc.

ii. The unit of planning and execution should be a catchment or a sub-catchment.

iii. Planning should be done by one department in a comprehensive way but the execution is to be done by the concerned department according to their field of specialisation in proper sequence and simultaneously to complete the watershed.

iv. It was recognised that in some cases because of certain social and political considerations it may be necessary to make local adjustments in execution of the programme to complete a watershed in stages but such adjustments could only be permitted so long as they do not affect the technical requirements of the programmes. Thus, for instance, in the hilly districts of Assam which are governed by autonomous committees and which are inhabited by tribal communities, it was stated that it may not be possible to take up a complete watershed for execution, unless, the area is temporarily acquired by the Government which is not possible. In such cases the major emphasis in the programme will be on small scale demonstrations as an educative programme and no large extension work would be done. But in the watersheds of river valley projects, for catchments close to reservoirs, no compromise can be made in watershed concept. A firm land policy will have to be adopted in such cases and even, if necessary, the land may have to be acquired and put under conservation treatment.

v. In the case of Panchayat lands falling within a catchment it was suggested that lands could be temporarily acquired under soil conservation enactment and treated according to land capability, as other Government lands. After rehabilitation, the lands could be passed on to Panchayats without imposing conditions except that the area will be managed according to conservation principles. The income from management of such lands should accrue to the Panchayats. If the Panchayats fail to manage the lands properly, the lands could be taken over by the Government permanently and managed under its control.

vi. Waste lands falling in the watersheds should also be treated according to the land capability.

vii. In the case of reclamation of ravines priority should be given to treatment and protection of table lands and stabilisation of marginal lands and gully heads. Reclamation of ravines should be confined only to shallow peripheral ravines. Deep ravines should be treated under forest and pastures. Reclamation of deep ravines for agricultural purpose at high cost of Rs. 1000-1200 per acre should not be taken up.

viii. In the case of watersheds of river valley projects, it was recommended that appropriate structural and vegetative measures should be taken to prevent sediment hazards from road side and bank cutting also.

9. Item (2)—*Soil Conservation Organisation.*

i. The pattern of organisation suggested by the Ministry was generally agreed to. Accordingly following should be the general organisational pattern for soil conservation in the States :—

(a) There should be State Soil Conservation Board or Committee which will be policy laying body. The Board will see that the responsibilities for work are defined for different departments and that the work is executed simultaneously in a sequence by the concerned departments.

(b) There shall be a technical cell at the State level comprising of the specialists in the fields of agronomy, soil science, engineering, forestry, water use and information etc. The cell should be under the agriculture department.

(c) A coordinated working plan on the basis of catchment as a unit of working will be drawn up in a comprehensive way by the technical cell at the State level and finalised in joint consultation with other departments. The plan will be signed by the concerned departments and which when finally approved by the State Soil Conservation Board will be executed by the concerned departments according to their field of specialisation, simultaneously, in proper sequence.

(d) There should be separate staff for maintenance and follow up programme. This staff should preferably be attached to the Community Development block.

(e) The State of Bihar favoured a separate technical cell for planning not attached to any department and Kerala showed a preference for separate Directorate of Soil Conservation which is already in existence in the State.

(f) In Madhya Pradesh re-organisation of the department of Agriculture was being considered according to which it was envisaged to have one set of specialist staff for all agricultural development programmes. This was considered as retrograde step. Soil Conservation being a full-time job required full-time specialist staff. State representatives were advised to reconsider the decision in this respect.

(g) With regard to setting up of regional units by the Centre for technical assessment of soil conservation plans; and helping States in planning of soil conservation programmes in the watersheds of river valley projects the opinion was divided. The general feeling was that the Centre may have the regional units only for planning and assessment of Centrally sponsored programmes in the watersheds of river valley projects. In respect of State schemes the States of Kerala, Andhra Pradesh, Jammu & Kashmir and the Union Territories of Manipur, Tripura and Delhi favoured regional units, but the remaining States were opposed to the proposal of setting up regional units.

10. Item (III)—*Soil Survey—Scope and Organisation.*

Following recommendations were made :—

i. Prior to undertaking soil conservation programme soil survey should be carried out. This would include reconnaissance survey to delineate the problem area to be followed by standard soil survey of the problem areas to draw up technical plan of work.

ii. Soil survey carried out by different departments in the State for limited purposes e.g. slope survey for contour bunding, irrigation surveys by engineering departments in which soils are characterised for a few of the properties upto two feet depth only or survey of waste lands for resettlement should be coordinated under one organisation. There should be standard soil survey and the soils should be studied for their properties and problems on the basis of the characteristics of the entire soil profile. Often soil characteristics of layers below top 1-2 feet affect very considerably conservation and management needs of soil and water. Data available from standard soil survey could be utilised by various departments supplementing wherever necessary with additional information.

iii. Soil Survey organisation in the States may be built preferably under Soil Chemists and soil survey work should be functionally integrated with soil conservation programme.

iv. In the forest areas soil survey should be carried out only to characterise the soil properties and to indicate the erosion and sediment hazards under the existing conditions and not to classify the area into land use capability classes.

v. It was suggested that a letter may be issued from the Forest side of the Ministry to State Governments emphasising that merely because a forest land falls within Class I to IV, it does not follow that it should necessarily be put under agricultural crops. Consideration must always be given to National Forest policy and no forest lands should be converted to other uses in view of the gap between the recommended and actual percentage of forest land. No forest lands having protective forests on vulnerable areas like river banks should be allowed to be converted to other uses.

vi. In a point raised by Rajasthan about the clearing of the forest areas now falling under the command of some medium irrigation projects, it was suggested that such areas would generally be not very extensive compared to the remaining command area. It would not be desirable to deforest such areas, as forests will be needed by the farming communities in the remaining area as well for their fuel and timber needs.

vii. The State should build up their own soil survey organisation on the lines already indicated to them by this Ministry. Such of the States that do not have any soil survey organisation can be helped by the All-India Soil & Land Use Survey Organisation in a limited way for the next year or so, during which time, these States should build up their own organisations. Adequate facilities would be provided by the Centre for training of personnel to enable the States to build up their organisations.

viii. Soil survey carried out in the States should be closely integrated with soil survey carried out by the Centre. The functional integration between the Centre and the States will be secured through Soil Correlator centres and Coordination Committee suggested in this Ministry's letter.

ix. The Coordination Committee will have Officer-in-charge of State Soil Conservation as one of the members in addition to other members suggested in this Ministry's letter.

x. With regard to the requirement of foreign exchange for laboratory equipment for soil survey, it was suggested that the laboratory facilities at present available with the Agricultural Chemists, at agricultural colleges and the existing soil testing laboratories should be fully utilised before any further expansion of such laboratories is considered.

xi. Representatives of Kerala and Gujarat States expressed some difficulties in getting topo-sheets for use in soil survey work. It was agreed that the Central Government would take up the matter with the Defence Ministry to get the clearance for making topo-sheets available to the States for use in soil survey work.

11. Item (IV)—*Pattern of Assistance for Soil Conservation Programmes.*

The recommendations contained in the draft Fourth Five Year Plan (Interim Report of Working Group on Soil Conservation) were generally agreed to with the following modifications :—

(i) The scale of subsidy for soil conservation schemes was suggested to be as under :—

Upto Rs. 50 per acre	25% subsidy.
Rs. 51 to Rs. 100/- per acre	33½% subsidy.
Rs. 101 and above.	50% subsidy.

The higher limit for cost of works upto which subsidy would be allowed was recommended to be raised to Rs. 750/- per acre instead of Rs. 500/-.

(ii) The pattern of assistance on Govt. land (50% from the Centre) would also be applicable for community lands.

(iii) The States and the Soil Conservation Research Stations of the Central Government should carry out some economic research about the cost/benefit ratios of various practices under different conditions so that more rational basis could be formulated for pattern of assistance to farmers.

(iv) In the pattern of subsidy suggested, no distinction was made between tribal and non-tribal areas. However, the States suggested that special consideration should be given to tribal areas. It was agreed that this matter should be referred to the Ministry of Home Affairs.

(v) For working out subsidy for each farmer it was agreed that it should be done on the basis of average cost of works per acre for a unit catchment or sub-catchment.

(vi) On a point whether the cost of follow up programme should be included in the cost of soil conservation work or not, the opinion of the States was divided. Some of the States desired that the cost of follow-up programme, e.g., cost of seeds and fertilizers etc. should be included in the cost for soil conservation for first two years. Many other States felt that this would not be feasible as it would create complications in preparing recovery statements etc. It was, however, left open to the States whether to provide the funds for follow-up programme in the soil conservation work or not, but the amount spent for the follow-up programme will not carry any subsidy as the fertilizers etc. are already subsidised under different programmes, e.g. phosphate is subsidised 25% and for nitrogenous fertilizers, there is a move to reduce the cost by about 20%. The Chairman emphasised that the whole object of extension should be that if the prices of the external inputs are reasonable the farmers should be able to buy these at the prevalent prices, apply them, and yet make a profit. If he cannot do that, mere subsidy cannot sustain such a programme. The emphasis, therefore, should be largely on educative programme and not on continued subsidy.

(vii) Bihar and D.V.C. raised a point that on marginal lands it will be necessary to subsidise the programme of seeds and fertilizers to stabilise agriculture. It was suggested that, as far as possible, marginal lands should be put under permanent vegetative cover like forest and pastures and the people rehabilitated on other vocations and jobs. If necessary, such lands could even be acquired under the Land Acquisition Act.

(viii) In the subsidy, provision should also be made for acquisition of common land, required for common waterways or drainage channels.

12. Item (V)—*Soil Conservation in the Watersheds of river valley Projects.*

(i) All soil conservation programme in the watersheds of river valley projects should be Centrally sponsored.

(ii) It was recognised that in the watersheds of river valley projects, mining areas and quarries present a serious hazard of sedimentation. At present, no soil conservation measures were being adopted in these areas by the parties owning the rights—not even the Indian Mining Corporation. It

was agreed that the Centre would examine the present Mining Act to see if the adequate provision exists for ensuring soil conservation measures on such lands. If no provision exists in the Act, adequate provision would need to be made in the Mining Act or in the States Soil Conservation Act by suitable amendment.

(iii) It was agreed that the soil conservation measures in the watersheds of river valley projects should make adequate provision for prevention and control of erosion and sediment hazard from road side erosion, stream-bank cutting and bed scour.

(iv) To ensure adequate attention to soil conservation measures in road construction projects, it was suggested that an Executive Engineer trained in soil conservation should be attached to Superintending Engineer Circle so that the local Executive Engineers will give adequate attention to soil conservation programme in the road construction work.

(v) On the request of Andhra Pradesh, it was agreed, that the possibility of taking up a pilot project by Centre on watershed management for Machkund in Andhra Pradesh would be examined.

13. Item (VI)—*Research Demonstration and Training*

Following recommendations were made:—

(i) Training of officers will continue to be organised by the Central Government. For training of Assistants, States should progressively develop their own facilities individually or cooperatively with the neighbouring States.

(ii) To meet the requirement of the training of Assistants, for such of the States that cannot start their own training Centres individually or cooperatively with neighbouring States. Centre would continue to provide necessary facilities till such time that States are able to build their own facilities for training of Assistants.

(iii) For training of officers, it was agreed that besides Dehra-Dun possibility of developing Ootacamund as a training centre for Officers would also be examined.

(iv) A training centre for Assistants at Bilaspur was suggested to be started to meet the requirements of the Himalayan States of Himachal Pradesh, Punjab, Jammu and Kashmir etc.

(v) Training of personnel in water use should be intensified by the States.

(vi) Training in soil survey should be started at other Soil Correlator Centres, besides Nagpur. However, to develop adequate facilities, it was suggested that the States should indicate their firm phased requirements of personnel to be trained for the Fourth Plan.

(vii) For training in soil survey, graduates with B.Sc. (Agri.) may be sent. There need be no emphasis on trainees having M.Sc. degree.

(viii) Recommendation should be made to Education Ministry to include some lessons on soil conservation in the text books in primary and secondary courses in schools.

(ix) Recommendation should be made to include soil conservation as a subject to Civil Engineering. If this cannot be done, arrangements should be made for giving a few lectures on soil conservation to engineering students in colleges. The recommendation was suggested to be sent to the Ministry of Education.

(x) In Andhra Pradesh, difficulty was being experienced in recruiting personnel for soil conservation programme of the Forest Department, as the Finance Department of the State Government was not allowing filling up such posts by direct recruitment. Unlike other scientific fields, in the case of forestry, the candidates are recruited by the Government in the first instance and then sent for training on Government expenses to Forest College. Since Government was to make a permanent investment in the case of training of forest personnel, State Finance Department would allow appointments only against the permanent posts. Temporary posts are allowed to be filled by

promotion from rangers'. This, according to the Soil Conservation Organisation, was not a satisfactory arrangement, firstly because such promotions were limited only to 25-30% of the posts and secondly that the rangers were not qualified enough to imbibe soil conservation training at Dehra Dun and fill up responsible posts for soil conservation work. In other States, posts for soil conservation and other forest development activities are created in the first instance as temporary to be made permanent and the candidates are appointed by direct recruitment. Accordingly it was suggested that the procedure followed in other States should be followed by Andhra Pradesh also i.e. the appointments may be made on temporary basis to be made permanent in course of time.

(xi) The Joint Director of Soil Conservation, Orissa, desired if seats could be reserved for forestry training at Dehra Dun for nominees of Soil Conservation Organisation. It was suggested that the Chief Conservator of Forest of the State could include such candidates in his demand for training at Dehra Dun.

(xii) It was emphasised that the education and information programme for soil conservation, both in the States and at the Centre was very weak. While considerable educational material by way of pamphlets, posters, other literature, films and film strips etc. was being issued on general agriculture, hardly any literature was being put out on soil conservation. Both the States and the Centre should strengthen the information and education units. Adequate provision should be made in the Fourth Plan for information and education programme for soil conservation.

(xiii) The States should have facilities for offset press.

(xiv) Phased requirement of trained personnel should be firmly worked out by the States for the programmes to be taken up in the Fourth Plan.

(xv) Facilities for operational research should be strengthened in the States.

(xvi) It was felt that there was no need for any research on shifting cultivation as such. But research in certain aspects of soil and water management e.g., crop introduction, fertility building and erosion control etc. may be undertaken.

(xvii) It was suggested by the States that the programme of demonstrations (50 demonstrations) included in the draft proposals was inadequate. There should be one, or more demonstrations in each District.

14. Item (VII)—*Programme of different States.*

Following recommendations were made :—

(i) The Fourth Plan outlays should have definite relationship with the achievement in the Third Plan.

(ii) Programme for soil conservation in the watersheds of river valley projects should clearly indicate the priorities by watersheds.

(iii) In Jammu and Kashmir no soil conservation work was started by the Agriculture Department in the Third Plan. Adequate provision should be made for treatment of Agricultural land in an integrated way alongwith forest and pasture areas during the Fourth Plan.

(iv) In view of the fact that soil conservation would be undertaken in a comprehensive way and would include follow-up programme also, it was suggested that there should be no separate targets for dry farming.

(v) In non-bunded areas, the measures like dry farming should be undertaken through extension agencies as their normal function of extension of improved practices.

(vi) Provision for raising of forest plantations which are purely for commercial purpose or for meeting industrial demands or for regeneration of old reserves after felling, should not be made under soil conservation. Under soil conservation programme provision should be made when the afforestation works are for protection of the catchment areas and for control of erosion hazard.

(vii) Forestry programmes should also indicate the locations and extent of the programme taken up under soil conservation and forestry separately.

(viii) Provision for reclamation of ravines should be made in the States' programme and not as Centrally sponsored.

(ix) In a point raised about reclamation of saline and alkali lands in Punjab, it was brought out that the present reclamation operations did not provide for adequate leaching, drainage and application of amendments. The programme consisted largely of raising paddy with normal irrigation. It was felt that this method would not achieve permanent reclamation. For effective reclamation, it was emphasised that proper leaching and drainage, besides other amendments, based on detailed investigation of the nature and severity of the problem would be necessary. Adviser Soil Conservation, Punjab was requested to bring the above point to the notice of the Irrigation Department of the Punjab Government, as that Department was concerned with this particular programme.

(x) In the case of Rajasthan, for land levelling, double provision was made viz. for the purchase of bulldozers for levelling and also for the full cost of levelling. It was suggested that the plan should indicate the provision on the basis of cost of reclamation per acre. Certain proportion of the total cost should be apportioned for purchase of the equipment and that there should be no double provision.

(xi) It was recognised that it may be necessary to make some provision for buildings particularly where the work on soil conservation is carried out in far off places. However, it was suggested that the cost on account of buildings should bear a reasonable proportion of about 4-5% of the total cost of the works. The provision made in the case of Assam which was 14% was regarded as very high.

(xii) The provision on account of sea erosion should not be made under soil conservation.

(xiii) Some of the States had not made provision for land grading and land levelling, for utilisation of irrigation potential. It was suggested that adequate provision should be made for these programmes under soil conservation.

(xiv) With regard to the research programmes, it was felt that all research programme of the State Governments and the Centre should be co-ordinated.

(xv) In Madhya Pradesh, about 7 new stations were being proposed in the Fourth Plan. This was considered too big a number. In the case of shifting cultivation it was felt that there was no need for undertaking direct research in the problems of shifting cultivation, although, research could be carried on crop introduction and fertility building and erosion control and the like.

(xvi) In some States provision was made for three month's training of Assistants. This was considered inadequate. Proper training period for Assistants should be about 5-6 months.

(xvii) In many States organisation was being developed along the administrative jurisdiction of the State like Districts etc. In developing field organisation consideration should be given to the nature and severity of the problem and not to be administrative units. In the latter case the programme will be top heavy.

(xviii) In the case of Union Territories, it was suggested that some officer from the Centre should advise them in formulating their programmes.

(xix) The programmes of consolidation of holding and minor irrigation should be coordinated with soil conservation.

15. *Item (VIII)—Advance Work.*

It was recognised that the success of soil conservation programme in the Fourth Plan would depend very considerably on the steps taken as an advance work in the remaining period of the Third Plan. Following recommendations were made:—

Advance Work—Action to be taken by the States.

(i) The States should take early steps to build up the soil survey and soil conservation organisations and also carry out soil survey for the areas to be taken up for soil conservation in the first year of the Fourth Plan.

(ii) Steps should be taken to train adequate number of personnel in soil survey and soil conservation.

(iii) Arrangements should be made to develop facilities for training of Assistants by the States individually or cooperatively with neighbouring States.

(iv) Such of the States that do not have soil conservation legislation should take early steps to get the legislation through as early as possible. In the case of Delhi it was suggested that the Administration should consider the implementation of the Act as soil conservation was necessary even for urban areas.

(v) States should take early steps for installation of gauging posts in the watersheds of river valley projects.

Advance Work—action to be taken by the Centre.

(i) The Centre should take steps to build up soil conservation organisation.

(ii) Efforts should be made for manufacture of the automatic raingauges and stage level recorders for soil conservation works.

(iii) Facilities for training in soil survey and for officers in soil conservation should be expanded.

16. *General.*

(i) On the basis of the information furnished by the State Governments, the size of soil conservation programme for the Fourth Plan worked out to about 4 times in financial outlay and 3 times in physical targets. Relatively higher financial outlay than the physical targets was due to inclusion of substantial targets under programmes like reclamation of saline and alkali lands, soil conservation in the watersheds of river valley projects, land levelling and conservation irrigation which cost more than simple contour bunding programme.

(ii) In view of the fact that soil conservation programmes for the Fourth Plan prepared by many of the States required revision, it was suggested that the revised programmes should be prepared indicating the Centrally sponsored and State sponsored programmes separately with full details about the requirement and availability of trained personnel, and sent to the Ministry within the next 8-10 days.





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