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REPORT OF THE WORKING GROUP
ON
LAND RECLAMATION AND DEVELOPMENT
FOR
FORMULATION OF THE SEVENTH FIVE YEAR PLAN
(1985-90)

MINISTRY OF AGRICULTURE
Department of Agriculture and Cooperation
Soil and Water Conservation Division
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FOREWORD

The Planning Commission constituted a Working Group on Land Reclamation and Development for formulation of the Seventh Five Year Plan under my Chairmanship with Shri A. C. Garg, Jt. Commissioner (Projects) as Member-Secretary.

The Working Group was re-constituted as per instructions of the Committee on Direction under the Chairmanship of Secretary (A&C) on 28th August, 1984. The re-constituted Working Group with Shri K. S. Puri, Joint Secretary (Soil Cons.) & Land Resources Commissioner as the Member-Secretary, was directed to prepare a fulfledged report which can be placed before the Committee on Direction within a month. The report of the Working Group has been completed within 20 days. I, therefore, record my sincere appreciation for the personal attention and efforts made by Shri K S Puri, I also acknowledge with thanks the contributions made by Shri D. C. Das Joint Commissioner (Soil Conservation), Dr. S. L. Seth, Director (Dry Farming) and Dr. Suraj Bhan, Dy Commissioner (SC-I&C). I am happy to record my appreciation of the untiring efforts made by S/Shri K. K. Sharma, Sr. P. A., J. N. Banati, P.A., J. L. Keswani, Sr. Computor and T. Roy, U. D. C., all of the Soil and Water Conservation Division, for preparing the master copy and making out copies of the report.

New Delhi,

September 18, 1984.

(K. C. S. ACHARYA)
Additional Secretary

CONTENTS

CHAPTER 1
INTRODUCTION

1.1 The Planning Commission, vide their office memorandum No. M-12043/3/83-Agri. dated 26th October, 1983 constituted a Working Group on Land Reclamation and Development for formulation of the Seventh Five Year Plan under the chairmanship of Dr. K.C S. Acharya, Additional Secretary in the Department of Agriculture & Cooperation with Shri A.C. Garg, Joint Commissioner (Projects), Department of Agriculture & Cooperation as the member-secretary The composition of the Working Group is given in Appendix-I. Subsequently, vide their Office Memorandum of even number dated 30th November, 1983, the Planning Commission included Joint Secretary (Plan Finance), Ministry of Finance and Joint Secretary (SC) and Land Resources Commissioner, Department of Agriculture and Cooperation as members of the Working Group On a suggestion from the Ministry of Home Affairs, it was decided to include Shri R.K. Saiyed, Additional Secretary in the Ministry of Home Affairs as a member of the Working Group vide Ministry of Agriculture No. 14-13/83-STS (O-ES) dated 7th August, 1984.

1.2 The terms of reference of the Working Group as contained in the Planning Commission's O M No 12043/3/83-Agri dated 26th October, 1983 are :

(i) To review critically the progress achieved so far in land reclamation and development under the Central/Centrally sponsored and State Sector programmes ;

(ii) To identify the constraints and problems faced in the implementation of various programmes aimed at land reclamation and development and to suggest measures—legislative, administrative, institutional and others, for overcoming the same with a view to accelerating the pace of progress in the coming years.

(iii) To formulate suitable proposals for the Seventh Five Year Plan including strategies and targets for land development and reclamation, with special reference to flood prone areas, saline/alkali lands, coastal areas, with a view to increasing agricultural production and productivity.

1.3 In view of the extensive terms of reference of the Working Group, a few officers/experts were co-opted as its members to have an in-depth study of the multi-facet problems on land reclamation and development. The list of the co-opted members is at Appendix-II.

1.4 A meeting of a Select Group from the Working Group on Land Reclamation & Development was held on 1st February, 1984 under the chairmanship of Agriculture Commissioner. The Select Group after detailed discussions decided the different chapters to be

incorporated in the Working Group report and the officers were identified for preparing the draft chapters so that the draft working paper is compiled and put up for consideration of the main Working Group at the earliest. The proceedings of the Select Group are given at Appendix-III. The Select Group noted that the scope for the Working Group on Land Reclamation & Development was overlapping with another Working Group on Forestry & Soil Conservation particularly dealing with soil and water conservation aspects which covered important spheres like soil erosion, ravine reclamation etc. After detailed discussion, the Select Group decided that the Working Group on Land Reclamation & Development may concentrate on activities concerned with bringing additional area of land with production potential but not at present under cultivation to productive use which may include saline and alkali soils, waterlogged and shrubs infested areas, etc.

1.5 In accordance with the conclusions of the Select Group on Land Reclamation & Development for formulation of the Seventh Five Year Plan meeting held on 1st February, 1984, following 5 papers given in Appendix IV to VIII were forwarded to Shri A.C. Garg, the Member-Secretary of the Working Group :

(*i*) Note on Land Reclamation and Development of Dr. I.P. Abrol, Director, Central Soil Salinity Research Institute, Karnal.

(*ii*) Note on Land Reclamation & Development for formulation of the Seventh Five Year Plan by Shri K. S. Puri, Joint Secretary and Land Resources Commissioner.

(*iii*) Working paper on Land Reclamation & Development by Shri N N. Goswami, Head of Chemistry Division, IARI, New Delhi.

(*iv*) Paper on Wasteland Reclamation, Soil Conservation and Land Development work in Bihar by Shri S.K. Srivastava, Agriculture Production Commissioner, Government of Bihar.

(*v*) Note on Land Reclamation & Development for formulation of Seventh Five Year Plan by Shri N. Gopalakrishnan, Principal Secretary & Agriculture Production Commissioner, Government of Andhra Pradesh.

1.6 The Select Group of the Working Group on Land Reclamation and Development had decided in its meeting on 1st February, 1984 that the draft working paper based on the papers received from the members should be compiled and put up for consideration of the main Working Group at the earliest. In a meeting of the Committee on Direction under the chairmanship of Secretary in the Department of Agriculture & Cooperation held on 28th August, 1984, it was decided that Joint Secretary (SC) & Land Resources Commissioner would act as the Member-Secretary in place of Shri A.C. Garg, Joint Commissioner (Projects). The Working Group was directed to prepare a full-fledged report which can be placed before the Committee on Direction within a month. It was also decided that the Working Group on Land Reclamation & Development should inter alia cover the following in their report :

(*i*) Reclamation and utilisation of fallow lands and culturable waste lands.

(*ii*) Land suffering from water-logging, salinity, alkalinity, acidity and coastal sands.

(*iii*) Reclamation, stabilisation and development of ravinous lands.

CHAPTER 2

BACKGROUND OF LAND RECLAMATION AND DEVELOPMENT

2 1 Land surface constitutes 329 million ha. in India. Of this only about 46 per cent is under cultivation. This area is shrinking both in quality and quantity. In quantity, cultivated land area is shrinking due to the encroachment of roads, railways, human habitations, mining and industries. In quality, the cultivated land area is shrinking due to the ever increasing degradation brought about by erosion, desertification, water logging, salinity, alkali soils and toxic effects of agricultural chemicals and industrial effluents. It is estimated that the population of India will increase from 684 million in 1981 to one billion by 2000 AD. Food requirement will increase by 60 to 70 per cent. Thus, against an estimated foodgrain production of 150.6 million tonnes in 1983 84, the requirement is expected to be between 185 and 188 million tonnes by the end of Seventh Five Year Plan (1989-90) and 240 million tonnes by 2000 AD.

2.2 Forests in India are already under severe pressure of growing population. An area of 75 million ha is reported to be under forests much of which is sparsely forested. Only 22 per cent of the area is under forests compared to the recommended 33 per cent. Fuelwood is becoming scarce. Against the current fuelwood requirement of 133 million tonnes the fuelwood production in 1983 84 has been only 39 million tonnes. Cattle and buffalo population and sheep and goat population will also increase by 2000 AD thus increasing the threat to the already over-grazed lands of the country. When the basic requirements of the country's population are at stake, our interest in the appropriate use of available land, which is the productive base, is natural. It is estimated that about 80 million ha. out of a total of 140.27 million ha. of the cultivated lands of India suffer from varying degrees of soil erosion. About 6000 million tonnes of soils alongwith major plant nutrients (NPK) between 5.37 and 8.4 million tonnes are washed away to the seas annually. The corresponding loss in crop production varies from 30 to 50 million tonnes annually.

2.3 The demand for land and primary products from land are continually on the rise in view of India's growing population and the country's limited land resources. A strategy to meet the rising demand for land based products is to aim for higher productivity per unit area of production. Though opportunities for horizontal expansion are limited, valuable contribution to the country's overall production could be obtained through reclamation of fallow and culturable waste lands and lands gone out of cultivation due to one form of degradation or another. Problem areas of the latter category comprise lands affected by water-logging, salinity, alkalinity, ravines, riverine, coastal saline and sandy lands, laterite soils and other categories of land gone out of cultivation due to one reason or the other. Modern technology suitable for

reclamation and appropriate in each case provides great scope for improving categories of land indicated above. In view of the country's scarce land resources and need for additional production, land reclamation and development of the nature given above are vitally important.

2.4 Average productivity of arable land is low because of lower productivity of rainfed areas. These areas provide 42 per cent of the country's foodgrains, bulk of pulses, oilseeds and industrial raw materials Some of the policy considerations which can lead to efficient land and water utilisation and increased crop production in rainfed/dryland areas are :

(*i*) High priority to land development supported by a research programme.

(*ii*) Adoption of measures on an integrated watershed management basis.

(*iii*) Subsidising cost of land development and recovery of only development charges on unit area basis.

(*iv*) Inclusion of water harvesting structures including farm ponds, dug wells, etc.

(*v*) Farmers' responsibility in maintenance of soil conservation works.

2.5 Farmers should be fully involved, encouraged and assisted on a massive scale in bringing about consolidation of holdings, utilisation of created assets and developing their lands on scientific lines. Innovative approaches such as participation of Panchayats and voluntary organisations should also be considered in such efforts.

2.6 The per capita availability of land has been rapidly going down from one Census year to the other. While in 1901, there were available 1.37 ha of land per head of population in our country, the growing population reduced this figure to 0.89 ha in 1951 and 0.50 ha. in 1981. The above per capita figures relate to the total land surface of the country. Since a considerable part of the total land surface is under mountains, hills, forests, etc , all the land cannot be available for agricultural purposes. On considering the cultivable land—which includes even culturable waste and fallow land—and which alone is capable of growing food and fodder, we find that our country had about 0.48 ha. per capita of cultivable land in 1950-51. By 1981, only 0.20 ha. of cultivable land per capita was available. By 2000 AD, with a population of one billion hardly 0.14 ha. of cultivable land per capita will be available. As the population grows, the per capita availability of cultivable land, the reclamation and land development programme notwithstanding will go on declining while the food requirements of the country as a whole will go on increasing over the years. This declining trend of man-land ratio cannot be viewed with complacency because it has serious implications for our food supply problem.

2 7 The production projections for the year 2000 AD indicate that the country would need another 10 million ha as net sown area 40 million ha for production and fuelwood forestry and 10 million for fodder. The horizontal expansion is available only through reclamation, development and utilisation of the fallows other than current fallows, cultivable waste lands and degraded land such as ravines, alkali and saline soils, etc.

2.8 Farm production depends largely on fitting soil management practices to the soil properties as accurately as possible. It is the right combination of a number of practices that get optimum results. Researchers try various combinations of fertilisers, tillage methods, water management and conservation measures. Combinations that produce the greatest yields

at the least cost on soils at experiment stations can be expected to give reasonably good results elsewhere. Some severely eroded soils respond readily to soil treatments such as fertiliser, lime etc. but other lands respond very poorly. A soil survey can help to decide whether added treatment to reclaim soils is likely to succeed. Soil surveys show the location of soils in the country and describe the soil property. Soil surveys provide information about how much susceptible each soil is to erosion and land degradation.

2.9 Land reclamation and develpoment works need a multi disciplinary organisation, machinery and equipment and institutional arrangements such as Land Development Corporations. It would be necessary to strengthen the existing organisational and institutional arrangements suitably and coordinate their activities within the overall strategy of the land use policy. The State Land Use Boards could look into these activities.

REVIEW

2.10 The Government has been concerned with the problem of managing land and developing it to meet the requirements of food, fibre, fuelwood and fodder from the early 19th Century. Reclamation of degraded lands and the area subject to injudicious utilisation received attention of the Government from the early days. Research programmes were taken up to deal with the problems of rainfed farming areas and prevent soil erosion in the hilly regions. The management and utilisation of available cultivable land with a viable technology later came to be known as the Bombay Dry Farming Technology. Pioneering works were carried out in controlling and stabilising torrents in the foothills of Punjab. A few princely States, particularly in Madhya Pradesh, Gujarat, Uttar Pradesh and Rajasthan took up programmes for stabilising and reclaiming gullied and ravinous areas through afforestation and land development measure.

2.11 Since Independence, the area under irrigation in the country has increased considerably. At the time of partition, the Indian irrigation system commanded some 23 million ha. This rose to 57.60 million ha currently and is expected to reach 113 million ha. during the next 20-30 years. Though major strides have been made in creating irrigation potential in the country there is considerable under-utilisation of the potential created. The poor management and injudicious use of irrigation water has also brought in its wake problems of water logging and salinity in the irrigated areas.

2.12 Some specific cases of land degradation threatening the country's supplies of food, fodder, fuel and industrial raw materials are :

(i) Soil erosion
(ii) Accumulation of salts and alkali
(iii) Fertilisers (when applied in excess)
(iv) Irrigation water (when applied in excess).

With the establishment of Central Soil Conservation Board in the First Five Year Plan, following programmes were taken up for land reclamation and development :

(i) Identification of the extent of problem areas
(ii) Survey and categorisation

(iii) Research and training
(iv) Pilot schemes
(v) Setting up Land Development Corporations.

EXTENT OF PROBLEM AREAS

2.13 The problem areas which call for specific measures for land reclamation and development fall into two majors categories :—

(i) Areas which are degraded ;
(ii) Areas which are under-utilised or injudiciously utilised.

DEGRADED AREAS :

2.14 **Ravinous and Gullied Areas** : Extensive areas are degraded through gullies and ravines. Gullies are generally due to the over-land flow and present in the plateau regions of East and South as well as along the foothills of the Shivaliks and the Himalayas. The ravines on the other hand are generally due to interaction of overland flow and also due to the ingress of river water into the lands. Ravines are mostly found in the States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat along the rivers of Jamuna, Chambal, Mahi, Sabarmati and their tributaries and account for 2.76 million ha. The problem of gullies and ravines are prevalent in 12 States over an area of 3.97 million ha. and threaten roughly another 4 to 6 million ha. of table land which include some of the major productive command areas. The problems are prevalent in the elevations ranging from 200 to 1300 m.

2.15 **Water-logged Areas.** The National Commission on Agriculture indicated that about 6 million ha. is water-logged area which is further divided into two categories, namely, 3.3 million ha. of water logged area due to surface flooding and 2.6 million ha. due to high water-table.

2.16 **Alkali Soils.** Owing to injudicious use of irrigation water coupled with surface and soil conditions, extensive areas have become alkaline and thus unproductive. An estimated 2.5 million ha. is subject to this problem of alkalinity and bulk of it is in three States *viz.* Uttar Pradesh, Punjab and Haryana.

2.17 **Saline Soils.** The problem of salinity, unlike that of alkalinity, is present in inland as well as coastal areas. An estimate, which puts alkaline and saline soils at 7 million ha., indicates that area affected by salinity is 4.5 million ha This includes one million ha. in arid and semi aid areas of Rajasthan and Gujarat and 1.4 million ha. in arid and semi-arid regions of black cotton soils. However, problem of salinity is more pronounced in the coastal areas. India has a coast-line of about 6000 km. The problem of salinity in coastal areas is of various kinds and intermixed with the problem of sandy soils and sand-dunes The analysis of National Commission on Agriculture (NCA) and National Committee on the Development of Backward Areas (NCDBA) have revealed that this dual problem is causing serious damage to agriculture and lot of fertile land is becoming unproductive in the States of West Bengal, Tamil Nadu, Orissa, Maharashtra, Kerala,

Karnataka, Gujarat and Andhra Pradesh. There is, however, difference in the total estimate between that of NCA and NCDBA. The former (NCA) recorded an estimated 50 to 80 thousand sq. km as the problem area while the latter (NCDBA) put in at 30 to 40 thousand sq. km. Taking the total stock of the problem area and that of the identified inland saline areas, it appears that about 5.5 million ha. is subject to salinity and coastal sand problems. NCDBA further divided the problems into six categories besides the inland salinity problem in arid and semi-arid regions.

2.18 **Riverine Land (Chos/torrents).** Heavy sediment load carried by rivers from the hills cause mandering and serious bank erosion. Depending upon the course of the rivers and the speed of flow, the sediments deposit in large quantities and result in shifting of courses as well as temporary inundation of vast stretch of land. Such riverine lands are called by different regional names, such as, Khadar, Diara, Char, Rao and Chos There is no precise data of the areas under this category of problem in the country. However, a rough estimate available indicated that about 2·73 million ha. is subject to this type of erosion.

2 19 **Lateritic Soils.** An estimated area of 12 million ha. has been identified as lateritic one in the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Orissa, Bihar and West Bengal. The areas are characterised by highly leached soils, poor fertility, low water retentivity and high rate of phosphatic fixation. These areas overlap with gullied areas and also those subject to the problem of acidity.

2.20 **Land infested with Shrubs and Bushes.** This is not a recognised category of land use statistics, and therefore, no reliable data on the extent of area under this category is available. The areas are part of wastelands. The information that could be obtained by the National Commission on Agriculture from 4 States of Karnataka, Kerala, Madhya Pradesh and Mizoram indicate that about 10.39 lakh ha. is subject to the problem of shrubs and bushes.

2.21 **Stony and Gravelly soils.** Rolling topography and plateaus, which have been subject to heavy grazing or indiscriminate felling of trees, are found strewn with stones and gravels. Soils in such land are generally acidic and severely eroded.

UNDER-UTILISED AND INJUDICIOUSLY UTILISED AREAS

2.22 **Culturable Wastelands.** The lands which are cultivated once but not cultivated for 5 years or more in succession are defined as culturable wastelands. These lands may be either fallow or covered with shrubs or bushy jungle which are not put to any specific use. These lands are either assessed or unassessed or can be found in isolated blocks or within cultivated holdings. Land use statistics indicate that such lands have reduced from 22.9 million ha. in 1950-51 to 16.73 million ha. in 1980-81.

2.23 **Fallows other than current fallows.** These are the lands which are cultivated but are temporarily out of cultivation for a period of not less than a year and not more than 5 years. The reasons for keeping lands fallow may be poverty, inadequate supply of water, malarial climate, silting of canals and rivers, unremunerative nature of farming etc. The land use statistics indicate that this type of land has declined from 17.4 million ha. in 1950-51 to

9.82 million ha in 1980-81. The productivity of such lands is poor. In any programme for land utilisation and land management in the country, fallows orher than current fallows deserve equal, if not more attention than the cultivated land.

SURVEY AND CATEGORISATION

2.24 The Government of India have taken steps to collect data about culturable wastelands and fallows other than current fallows through the Directorate of Economics & Statistics. Annual statistics for the States and the country as a whole are available upto 1980-81. In 1959, the Government of India constituted the "Wastelands, Survey Reclamation Committee" to locate lands classified as "Other uncultivated lands excluding fallow land" and "fallows other than current fallows". A Centrally sponsored scheme was implemented during the Third Five Year Plan to locate and identify culturable wastelands in blocks less than 100 ha. in 15 States. The State Land Use Board, Kerala also carried out a diagnostic survey of the fallow lands other than current fallows.

2.25 The "Reh Commission" investigated into causes of deterioration of lands through irrigation and occurrence of the problem of salinity and alkalinity in Uttar Pradesh. The "Royal Commission on Agriculture", "Usar Reclamation Committee" of the erstwhile United Provinces also reviewed the severity and extent of the problem of alkali soils The Natural Resources Division of the Planning Commission conducted a study of the wastelands including saline, alkaline lands and studied the reclamation measures. The National Commission on Agriculture made the latest review of the available information and indicated that a total area of 7 million ha. of alkali and saline soils.

2.26 A Special Committee of the Central Board of Irrigation defined water-logging in terms of crop performance and depth of water table. The Central Ground Water Board and Command Area Development Authorities have been obtaining data on water-logged areas due to water-table rise and surface pl nning. Government of India reviewed the status of data on the water-logged areas and directed All India Soil & Land Use Survey Organisation to collate and consolidate all available information from various sources to arrive at the total extent of water logged areas due to surface flooding.

2 27 A Centrally sponsored scheme was launched during 1961-62 to survey and categorise ravinous areas in depth categories. Similarly, another survey was carried out to determine the distribution of ravinous areas under different ownership categories in 4 States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat.

RESEARCH AND TRAINING

2.28 The problem of alkaline soils was scientifically studied at the close of the 19th century and efforts to find out a viable technology was carried out at the Agricultural College, Kanpur. However, even though applicability of amendment, green manure with irrigation was tested and found feasible for reclamation of such lands, a viable package of practices was offered by the Central Soil Salinity Research Institute, Karnal. This Institute also carried out programmes to impart training and exchange of experiences with officers working in different organisations and dealing with different problems.

2.29 The problem of ravines had received attention of the Central Soil Conservation Board during the First Five Year Plan. As a result, the Government of India had set up three Soil Conservation Research, Training & Demonstration Centres at Kota (Rajasthan) for Chambal ravines, Agra (U.P.) for Jamuna ravines and Vasad (Gujarat) for Mahi ravines. These centres have carried out integrated experiments for protecting table lands, reclaiming, developing and stabilising ravines through a combination of biological and engineering measures. These Centres have also imparted training to the personnel who are engaged in tackling the ravinous areas.

2.30 The Indian Council of Agricultural Research sanctioned a coordinated research project for improvement of Diara lands during Sixth Five Year Plan with an outlay of Rs. 49.01 lakhs for a period of 5 years. The project covers the improvement of Ganga Diara in Bihar State and in the Saryu and Brahmaputra Diara lands in Uttar Pradesh and Assam States. The experiments in agronomy, plant breeding, plant protection and soil conservation engineering are being conducted both under rainfed and irrigation conditions to generate problem oriented information.

PILOT SCHEMES

2.31 During the Third Five Year Plan and Annual Plan period (1966-69), a Centrally sponsored scheme was launched to re-settle landless families on reclaimed wastelands in 14 States. Similarly, a pilot project was implemented in the 4 States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat in accordance with the National policy for Ravine Reclamation and, which had been endorsed by the findings of the research stations, for testing the technical feasibility of the same. The programme has been transferred to the State Sector during 1979-80. A Pilot Project of Amendments of Alkali and Acid soils in Compact Areas was implemented in the three States of Uttar Pradesh, Punjab and Haryana during the Fifth Plan for reclamation of alkali soils. In 1979-80, this scheme was transferred to the State Sector.

LAND DEVELOPMENT CORPORATIONS

2.32 The States of Haryana, Punjab, Madhya Pradesh, Gujarat, Uttar Pradesh, Rajasthan and some other States have established Land Development Corporations with a view to facilitate flow of institutional finance in connection with reclamation of alkali and ravine lands and development of command areas. The Gujarat State Land Development Corporation has been entrusted with the task of carrying out of soil and water conservation works in the State.

CHAPTER 3

PROPOSALS FOR THE SEVENTH FIVE YEAR PLAN

3.1 **Approach and Strategy** : With the pressure of population and declining man—land ratio, there is always an effort to reclaim and utilise culturable wastelands and degraded lands of various kinds for cultivation. For each type of wasteland and degraded land, there has to be a proper programme for reclamation which will gradually build up the soil and bring land to productive use. To enable this, there has to be a systematic survey of the different categories of wastelands and degraded land. The surveys should not be limited to identification and location of such areas but also extend to diagnosis of major maladies and prescription of feasible remedies to restore the same. For this purpose, support from conventional soil and land use surveys, water resource information, land surveys, revenue details particularly ownership pattern should be obtained from various sources and collated to arrive at a feasible programme. Wherever necessary, such surveys should be carried out to establish the actual cost and feasible means to reclaim such lands. Land reclamation problems will vary from area to area depending on the agro-climatic conditions. Therefore, the agricultural universities and Indian Council of Agricultural Research should provide scientific guidance and support in all problems that may arise on regional basis as the programmes develop. Land reclamation will require the help of agricultural machinery and exploitation of the reclaimed areas will need substantial services and input supplies. In the various States, Land Development Corporations, Agro-Industries Corporations and departmental custom hire services have been organised to implement land reclamation and development programmes. Where such corporations or custom hire services do not exist, the concerned States should organise them. Land reclamation should form a part of area development. The State Land Use Board should prepare a perspective State programme keeping in view the national priorities and socio-economic needs, the competing demand for land and the need for growth with social justice. Such perspective programmes should take into account the available financial resources with the States and through the financial institutions. In undertaking investments for reclamation, social costs and benefits should be kept in view and not merely financial costs and benefits. Land reclamation programmes for development and restoration of ravines, water logged areas, land with saline and alkaline soil, river beds, chos, etc. substantially depend on irrigation and good drainage system.

3.2 The problem areas are extensive and their reclamation would need appropriate time horizon and enormous financial resources. Therefore, we will have to set priorities. The possibilities for immediate reclamation exist in the following problematic areas :

	Category	*Area in million ha.*
(*i*)	Ravines and gullies	4.0
(*ii*)	Culturable wastelands	16.73 (1980-81)
(*iii*)	Fallows other than current fallows	9 82 (1980-81)
(*iv*)	Alkaline soils	2.5
(*v*)	Saline soils including coastal sandy areas.	5 5

During the Seventh Plan period an area of 15.04 lakh ha. is proposed to be reclaimed and developed with an outlay of Rs. 987.21 crores. Schemewise details are given in Statement at pages 34-35.

3 3 **Manpower Planning** : The Seventh Plan programme envisages a quantum jump in reclamation and land development programmes. Organisational capabilities both at the Centre and the States will, therefore, have to be reviewed and strengthened to meet the demand of new programmes. The reorganisation should also be provided with adequate number of machinery and equipment with appropriate facilities for maintenance and servicing the same. Various types of training courses and orientation camps will have to be organised for different levels for personnel of implementing agencies as well as farmers. Demonstration in farmers' fields and inter-regional visit of farmers will be needed to exchange experience and adoption of improved practices. Workshops and seminars would have to be organised for transfer of technology and feedback.

3.4 **Development and stabilisation of Ravinous Areas :**

3.4.1 Ravines and gullies are estimated to have degraded an area of 39.75 lakh ha. in about 12 States throughout the country. These are found along the Shivaliks, the foot-hills of the Himalayas, in Eastern India, plateaus in the East and South and most spectacularly along the rivers of Chambal, Yamuna, Mahi and Sabarmati. About 27.65 lakh ha. of such areas are located in four States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat. In addition to this another 4 to 6 million ha. of productive table lands, mostly part of command areas, are being threatened by the steady encroachment of ravines and gullies.

3.4.2 Under the Centrally sponsored scheme launched during 1961-62, an area of 8.3 lakh ha. was surveyed and categorised in terms of depth variations. Similarly, the distribution of ravinous areas in 4 States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat were found as follows :

(*a*) Owned by individuals —48% (mostly table lands and shallow ravines)

(*b*) Owned by Government —29% (mostly wastelands and medium and deep ravines).

(*c*) Owned by Panchayats/Villages —23% (mostly gazing lands)

In these surveys aerial photos, cadastral maps, toposheets and revenue records have been consulted.

3.4.3 In 1967, a national policy was formulated for developing and reclamation of ravines on the following lines :—

(*a*) Treating table lands to control run-off and prevent erosion :

(*b*) Preventing encroachment of ravines into table lands ;

(c) Reclaiming shallow and broad ravines for agriculture/horticulture with irrigation ; and

(d) Stabilising medium and deep ravines for purpose of fuel and fodder reserves through afforestation supplemented by conservation structures.

3.4.4 Simultaneously, research efforts were initiated at the three Centres set up by the Government of India representing three different ravine systems, such as at Agra (Uttar Pradesh) for Yamuna ; at Kota (Rajasthan) for Chambal ; and Vasad (Gujarat) for Mahi system. These centres are now under the control of ICAR

3.4.5 The Ministry of Home Affairs had set up an Inter Ministerial Working Group with an officer of the Ministry of Agriculture as the Member-Secretary. The Working Group brought out its report in 1972 giving an action programme for the States of Uttar Pradesh, Madhya Pradesh and Rajasthan in line with the results of the Research Centres and the National Policy.

3.4.6 **Central Sector Pilot Projects.** To demonstrate the feasibility of carrying out integrated ravine development works in compliance to the national policy as well as available research results, a Central Scheme of Pilot Project for Ravine Reclamation was launched during the Fourth Plan. It was continued till 1978 79 under the name of Pilot Project for Protection of Table lands and Stabilisation of Ravinous Areas in Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh. Area treated along rivers of Chambal, Yamuna, Mahi and others was 3667 hectares at a cost of Rs. 649.22 lakhs.

3.4.7 **Programme for the Dacoity-prone States.** The Committee of Secretaries had reviewed the problem in the context of dacoity in the three States, namely, Madhya Pradesh, Rajasthan and Uttar Pradesh. The Committe of Secretaries had set up a Working Group under the chairmanship of Planning Secretary which, in turn, accorded the highest priority to the construction of roads and reclamation and development of ravine areas including afforestation as a part of overall strategy. The Working Group has contemplated to launch a massive programme in these three States.

3.4.8 The technology is available for developing ravinous areas in an integrated manner on the basis of their watersheds in accordance with the national policy and the experiences gained in implementing the Central Sector pilot projects. In formulating the scheme, the ownership pattern should be considered along with depth categories. For this, States would have to be assisted to carry out survey and categorisation works expeditiously.

3.4.9 A programme for treating 1.65 lakh ha. (Uttar Pradesh 60,000 ha. Madhya Pradesh 50,000 ha. and Rajasthan 55,000 ha.) in an integrated manner and on the basis of ravine watersheds is proposed to be taken up at an estimated cost of Rs. 82.50 crores as per the report of Technical Group of Department of Agriculture and Cooperation set up at the instance of Planning Commission. The components will involve afforestation and erosion control, slope stabilisation structures, water disposal system, reclamation and development of lands as well as providing irrigation from surface or ground water sources. The average unit cost for treating one hectare with varying combination of practices may be about Rs. 5000.

3.4.10 **Programme for Gujarat.** It has been mentioned earlier that the 4 States, namely, Gujarat, Madhya Pradesh, Rajasthan and Uttar Pradesh account for the major portion of ravine lands. Therefore, the research efforts as well as development efforts were made in all the four States during the Fourth and Fifth Plan periods The experience of Gujarat in implementing the integrated programme has been quite encouraging Besides, Gujarat represents certain specific problems such as migratory grazing and keeping idle the productive alluvial soil along the rivers of Mahi and Sabarmati. The results of the earlier efforts have amply demonstrated the capability of these lands in terms of agricultural crops, fodder and horticultural or forest plantations. An area of 30,000 ha. in the same integrated manner is proposed to be treated in the State of Gujarat at an investment of Rs. 15 crores. (The total outlay for this scheme would be :)

3.4.11 The National Commission on Agriculture have also recommended for expeditious treatment of these lands. It would, therefore, be desirable to extend similar assistance to Gujarat for implementing this programme which requires heavy investment. For this new scheme in the Seventh Five Year Plan, the States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat would have to strengthen the existing organisation in terms of multi-disciplinary expertise, equipment, machinery, etc. The Central Government also would have to create a new unit under a Joint Commissioner for planning, supervising and monitoring the programme. The expenditure on the administrative set up should not be allowed to exceed 33⅓ per cent of the funds. ( )

Plan period	*Outlay in Rs crores*	
Sixth Plan	Uttar Pradesh, Madhya Pradesh Rajasthan	Gujarat
	Nil	Nil
Seventh Plan	Rs. 82.50	Rs. 15.00
	Total : Rs. 97.50 crores	

3.5 Survey, Categorisation and Restoration of Culturable Wastelands and fallows other than current fallows

3.5.1 The Government has recognised the necessity to survey, categorise and utilise the wastelands. There are many causes of the origin of wastelands and their distribution. Conservation and development of wastelands require very close cooperation of a number of line departments and active participation of the local community for judicious exploitation as well as for permitting adequate re-generation. The "Waste Land Survey and Reclamation Committee" constituted in 1959 carried out survey in 12 States and identified nearly 6.4 lakh ha. in blocks of 100 ha. and more.

3.5.2 The Centrally Sponsored Scheme for Survey and Categorisation of wastelands in blocks of less than 100 ha. identified about 2.3 million ha. in 15 States. The experience was that the term 'culturable waste' or mere locating these lands would serve little purpose unless further surveys are carried out to collect necessary information about the problems and

potentialities for restoration to productive uses and to categorise such culturable wastelands in accordance with some identified parameters. The National Commission on Agriculture, therefore, recommended that categorisation of wastelands in the country in blocks less than 100 ha. should be completed through a Centrally sponsored scheme on a priority basis. It is, however, to be remembered that these lands have been under some sort of use to the villagers and their livestock population for one or other purpose.

3.5 3 The National Commission on Agriculture reports that about 4.66 million ha. were reclaimed by the States during 1950 51 to 1973 74 i.e beginning of the Fifth Plan. Through a Centrally sponsored scheme, 1.11 lakh families were settled in an area of 1.9 lakh ha. of such reclaimed land. The programme continued to be persued as a small part of some State Sector and Centrally sponsored schemes of soil conservation and land reclamation.

3.5.4 **Studies on lands lying idle.** The Government of India sponsored a study in 1977-78 by the Indian Agricultural Statistics Research Institute, ICAR, on the utilisation of idle or under-utilised lands under operational holdings. The objectives of the study were :—

(*i*) To ascertain causes for non-utilisation of cultivable but not cultivated land, and

(*ii*) To estimate the extent of wastelands for different causes and suggest suitable measures for their proper utilisation.

The study was carried out in Anantpur, Belgaum, Chittorgarh, Jabalpur, Jhansi and Ratnagiri with the help of agricultural universities located in or near the districts. In spite of special efforts made in conducting the study, lack of uniformity in data collection and its presentation remained. However, the study revealed that the causes for lands remaining idle are :—

(*i*) Unlevelled and rocky land
(*ii*) Lack of irrigation
(*iii*) Lack of resources
(*iv*) Land with low fertility and grazing land
(*v*) Alkaline and saline soils
(*vi*) Soil erosion, and
(*vii*) Weed infested land

The main remedial measures identified in the study are :—

(*i*) Land levelling, shaping and removal of rocks

(*ii*) Provision of irrigation facilities

(*iii*) Provision of resources and credit facilities so that the cultivators are in a position to obtain the crucial inputs

(*iv*) Improving the soil fertility by adequate and timely availability of fertilisers and other soil conditioners, etc.

The study recommended a time-bound programme of creating necessary infrastructure like setting up of cooperative societies, fertiliser sale depots, extension and advisory service and

availability of improved machinery and custom hire service. The study also recommended to undertake a survey of such idle lands in these and other districts, where these lands are sizable, to identify the various problems standing in the way of land reclamation to ensure formulation of time-bound action programme.

3.5.5 **Waste lands.** The background of earlier programmes and the recommendation of National Commission on Agriculture emphasises the urgent need to survey all culturable wastelands which are available in blocks less than 100 ha. Since locating such blocks alone would not be adequate for formulating any programme to develop/reclaim such lands for productive uses or other purposes it would be necessary to supplement the initial surveys by more detailed diagnostic survey for determining some identified parameters—relating to the causes of degradation, impediment to production and remedial measures to combat the same. These activities will have to be carried out extensively throughout the country. Appropriate methodology such as at State, District and Village level may have to be developed. The procedures for carrying out subsequent detailed surveys will also have to be evolved in consultation with various institutes and developmental departments. The initial year will be utilised in evolving this methodology and also identifying such lands in blocks less than 100 ha. From second year onwards selected blocks will be taken up for development and productive purposes.

3.5.6 **Fallow lands.** Fallows other than current fallows, more specifically the long fallows, are scattered in small patches. The causes of their non-utilisation is mainly social, economic and technical. Though some statistics are available, some of the States expressed the need to survey the same and find out problems and means to restore them to cultivation, tree plantation (forest or fruit), grass land etc. Therefore, as in the case of wastelands here also some diagnostic survey will be needed. Both these types of lands will be immediate source for horizontal expansion and also provide relief to existing forest and agricultural lands under heavy pressure.

3.5.7 **Productivity Year Programme** : In the Productivity Year 1982-83, a programme for restoration of fallow lands other than current fallows was launched in 8 States, namely, Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh. Each of these States has more than 5 lakh ha. of such land and together account for 8 million ha. out of a total of 9.62 million ha. for the country. During 1982-83, a target of 4 lakh ha. was fixed for these States. Against this target, an area of 3.83 lakh ha. was brought under productive land management practices throgh cultivation, raising of utility trees, development of orchards and grassland and afforestation with erosion control measures wherever necessary. Out of the total achievement, afforestation including agro-forestry and erosion control works were carried out on an areas of 2.17 lakh ha. while crop cultivation and horticultural activities were taken up in an area of 1.66 lakh ha. The States of Tamil Nadu, Uttar Pradesh, Bihar and Rajasthan exceeded their target.

3.5.8 In the light of encouraging performance during 1982-83, the programme had been extended in 1983-84 to 4 more States namely, Assam, Meghalaya, Orissa and West Bengal envisaging a total target of 4.30 lakh ha, for 12 States during 1983-84. On the basis of progress

reports received, the achievement was 3.64 lakh ha. The target for 1984-85 is 5.58 lakh ha. in 18 States including Gujarat.

3.5 9 A brief proforma was sent to the concerned States for reporting the physical progress and qualitative benefits through implementation of this programme. The information provided by the States of Assam, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradeshh reveal that a variety of benefits have accrued from the implementation of this programme as follows :

(*i*) In the State of Maharashtra, additional production from cultivation was 856 tonnes in two years while in Madhya Pradesh, additional production from cultivation was of the order of 28,000 tonnes.

(*ii*) In Madhya Pradesh, Uttar Pradesh and Karnataka a total of 1700 storage tanks were constructed/renovated during this period.

(*iii*) Assam reported that an area of 306 ha. could be reclaimed while 251 ha. could be provided with irrigation by way of improving/constructing distribution systems.

(*iv*) Additional employment was generated in all the States. Maharashtra, U.P. and Karnataka reported a total employment generation of 66.25 lakh mandays.

(*v*) Rajasthan reported that 27.51 lakh trees of various species such as *Dalbergia sisoo*, *Acacia nilotica*, *Zyzyphus Zuzuba*, Subabul, *Prosopis juliflora*, *Eucalyptus*, etc. were planted. An area of 15,747 ha. was brought under grass cover.

(*vi*) Tamil Nadu reported that horticultural trees like mango, cashew, lime and Tamarind were planted in 217 ha. and *Eucalyptus*, Subabul, silk cotton and *Causurina* were planted in 1098 ha. An area of 129 ha. was brought under napier grass, cenchrus and guinea grass.

3.5.10 There is no single State department for carrying out these works. It would, therefore, be necessary to utilise the State Soil Survey and Soil conservation organisations in addition to the Forests and Agriculture departments. These organisations may have to be strengthened in terms of appropriate expertise and also for providing some specific training for conducting necessary surveys and compiling the data obtained therefrom. The Central assistance will, therefore, be necessary to help the States to re-arrange and strengthen their organisational base to carry out these programmes and implement the same on priority basis as per the recommendations of the National Commission on Agriculture. The Central organisation would also need strengthening by creating a new unit under a Joint Commissioner for planning, supervising and monitoring the programme.

3.5.11 Judging from the present rate of expenditure for treating such lands, an average amount of Rs. 5000 will be needed per hectare for development and productive uses of such lands, while survey and categorisation and planning may demand additional fund. It is proposed that in addition to carrying out the survey over an area of 2 million ha., an area of 5 lakh ha. could

be kept as a target for development. A sum of Rs. 255 crores (Rs. 250 crores for restoration of fallows and cultivable wastelands and Rs. 5 crores for survey and categorisation) is proposed for both aspects of this programme. The pattern of assistance suggested will be 100 per cent Central grant in respect of survey and categorisation while 100 per cent assistance covering 50 per cent grant and 50 per cent loan advance to the States for developmental activities.

Sixth Plan Outlay	—	Nil
Seventh Plan Outlay	—	Rs. 255 crores

3.6 Protection and Development of Waterlogged Area for increasing productivity

3.6.1 The problem of silt and salt has been damaging the natural resources base of land and water throughout recorded history of mankind. Many prosperous countries and civilisations in the past were ruined by these problems. Problem of salt is again intimately related to waterlogging. The National Commission on Agriculture has estimated that about 6 million ha., spread over 17 States, is subject to waterlogging. Considering the major causes of waterlogging, these areas could be divided into two categories namely :

(i) Areas waterlogged due to surface flooding— about 3.4 million ha.

(ii) Areas waterlogged due to rise of water table— about 2.6 million ha.

An inter-ministerial meeting was held on 23rd December, 1983 under the chairmanship of Secretary (A&C) in the Ministry of Agriculture to review the problem of waterlogged areas in the country. The meeting observed that the Central Ground Water Board would continue to be responsible for collecting data and preparing the map of the waterlogged areas in the country due to rise of water table. There is need to strengthen the Central Ground Water Board and the counterparts in the States for collecting observations from larger number of stations to prepare reliable map of the areas subjected to waterlogging due to rise of water table. The Central Ground Water Board should set up additional 5000 hydrograph stations in the country during the Seventh Five Year Plan. The meeting also decided that All India Soil & Land Use Survey Organisation should be responsible for collecting data and preparing map depicting water logged areas due to surface flooding. All India Soil & Land Use Survey Organisation should undertake the work of super-imposing the maps made available by Central Ground Water Board to get the total picture of waterlogged areas in the country in one map. The All India Soil & Land Use Survey Organisation would need to be strengthened suitably for this task. Soil & Water Conservation Division in the Ministry of Agriculture should include these activities of All India Soil & Land Use Survey Organisation and strengthening of the Soil & Water Conservation Division to coordinate all activities relating to waterlogged areas and related problems in its Seventh Five Year Plan. All India Soil and Land Use Survey Organisation should use software including satellite imageries available through remote sensing techniques and collaborate with Indian Space Research Organisation, Space Application Centre and National Remote Sensing Agency for this purpose.

3.6.2 **Waterlogged area due to surface flooding** : A detailed analysis made by the Rashtriya Barh Ayog shows that the problem is predominant in the States of West Bengal,

Assam, Bihar, Orissa, Andhra Pradesh, Uttar Pradesh, Tamil Nadu, Kerala, Punjab and Haryana. The observations taken during 1982 by Central Ground Water Board indicate that about 36.36 million ha. becomes waterlogged due to surface flooding during the month of August, while 3.42 million ha. becomes waterlogged in the month of April. This is considering the water table within a depth of 2 metres from the surface. Bulk of such temporary waterlogging in the monsoon season is due to excessive rainfall, soil characteristics such as heavy soils or sandy soils, abrupt changes in topography, and low land areas with no clear outfall. Some of the monsoon flood areas in the States of Uttar Pradesh, Bihar, West Bengal and Assam are also known as 'tals', 'chaura', 'jheels' and 'beels'. According to Rashtriya Barh Ayog, about 2-3 million ha. of such land is being covered by the cultivation of deep water paddy or floating paddy. National Commission on Agriculture examined the production potential of land which remains waterlogged for a long period and observed that a sizeable portion of such fresh water bodies (about 4 lakh ha.) could be considered for fishery development particularly in the States of Uttar Pradesh, Bihar, West Bengal and Assam.

3.6.3 The problem of monsoon flooding has been studied in consideration of the crop performance such as jute, sugarcane and paddy. It has been observed that jute-based rotations suitable for flood prone States are :

(*i*) jute followed by photo-sensitive 'Manoharsali paddy for lower Assam valley and northern West Bengal ;

(*ii*) jute-tall indica paddy or early paddy and deep water paddy for Goalpara, Kamrup and Nowgong districts of Assam ;

(*iii*) jute-wheat or jute-mustard for southern West Bengal ;

(*iv*) jute followed by late paddy or paddy-onion for low land Kosi region of Bihar ;

(*v*) jute-wheat or jute-pea for the north-west Bihar and eastern Uttar Pradesh ;

(*vi*) jute-paddy (T-141 paddy, photo-sensitive) in Gangetic West Bengal ;

(*vii*) jute-paddy in general for the flood prone deltaic districts (Puri, Cuttack and Balasore) and jute-paddy, paddy-pulses or early paddy-late paddy for low lands in Orissa.

In case of sugarcane, the Rashtriya Barh Ayog observed that the crop is grown in the riverine areas in Haryana, Uttar Pradesh and Bihar which is subject to submergence of more than a metre depth of flood water sometimes for several weeks. This occurs two to three times in the monsoon months. The improved varieties of sugarcane have been introduced with improved methods of farming to increase the productivity of sugarcane crop in these areas. In case of deep water paddy cultivated in Bihar, Uttar Pradesh, West Bengal and Assam where water depth ranges from 0.5 to 5 metres, the possibility of improving the production from 0.5 to 1 tonne per ha. has been explored in West Bengal, Uttar Pradesh and Bihar. The varieties like Jalmagna, Madhukar, Jaladhi, Jaya and Pankaj have been developed for such areas. While for shallow water locations, the deep water paddy varieties available are BR 7 and BR 8 with yield expectations of 2-3 tonnes per ha. in Bihar. In West Bengal, Latisal and Patnai-23 while in Assam, Manoharsali are considered promising varieties. The Rashtriya Barh Ayog advocated the following line of action ;

(*i*) the deep water paddy areas should be systematically surveyed, production constraints identified, and research-cum-operational projects implemented under an all-India coordinated project to benefit the farmers in the flood-prone areas ; and

(*ii*) research efforts on deep-water paddy should be further intensified for genetical and agronomic improvements in order to stabilise per hectare yields at a higher level.

Both National Commission on Agriculture and Rashtriya Barh Ayog have also explored the possibility of taking up fishery in some of the areas with a productivity ranging from 2 tonnes per ha. of water to 5 tonnes per ha. The possibility of combining crop cultivation with pisciculture particularly carps and catfish has also been found to be promising.

3.6.4 **Waterlogged areas in irrigated commands** : A study was conducted by the Administrative Staff College of India, Hyderabad in three irrigation projects *viz.* Tungabhadra, Sriramsagar (Pochampad) and Nagarjunsagar to study the problem of waterlogging, its extension to new areas, reduction in production, causes and possible remedial measures. It revealed that there had been a steady increase in waterlogged area in the command area of the irrigation projects as well as in adjoining areas of the commands. As a result of waterlogging and salinity, it observed that there is loss of 4800 tonnes of rice production which amounts to significant reduction of about 30 per cent in yield. In Tugabhadra alone, after 30 years of continuous irrigation 33000 ha. have become waterlogged and the area is increasing at the rate of 6000 ha. per annum. In Sriramsagar (Pochampad) out of 2800 ha. irrigated land studied, 400 ha. was found to be severedly waterlogged while in a single non-command village alone, 40 ha. has been rendered useless for production.

3.6.5 Examination of observed data reveals that reasons for waterlogging in the three projects are :

(*i*) Low rate of ground water drafting or withdrawal.

(*ii*) Low annual rain falling on soils which are having large volume of salts and thus does not help in leaching.

(*iii*) Incompatible cropping systems vis-a-vis irrigability of soils, such as putting larger area under heavy irrigation contrary to what has been planned.

(*iv*) Initiating irrigation without proper land development with a view to ensuring equitable absorption, utilisation and removal of excess water through field drainage.

(*v*) Operational schedule of canal system vis-a-vis rainfall distribution, physiographic conditions and crop water requirement.

(*vi*) Though some major drains are constructed as a part of irrigation projects *i.e.* serious gap in terms of intermediate and field drains exists. There is also lack of attention to utilise available natural drains.

(*vii*) Owing to poor management of the catchment as well as command area, erosion goes unabated. As a result field irrigation channels get silted up causing loss of design capacity of the channel system which results in waterlogging.

(viii) Lack of awareness among the farmers about the consequence of waterlogging through heavy irrigation and necessity to regulate application of irrigation.

(ix) In addition to these causes observed in irrigation system, National Commission on Agriculture and Rashtriya Barh Ayog recorded excessive rainfall in areas having either heavy or sandy soils, or shallow soil as the cause of waterlogging.

(x) Besides with heavy run off from rolling topography and overflow from rivers during highflow periods, water accumulates in low lands without clear outfalls.

3.6.6 Remedial measures have been suggested as follows :

(i) Provision of a complete network of drainage system.

(ii) Ensuring leaching availing of natural rainfall or through special efforts.

(iii) Adopting conjunctive use of canal and ground water resources.

(iv) Developing a canal operation schedule to meet the crop water requirement and adopt efficient application system suiting to soil, topography, etc.

(v) Taking up aquatic and semi-aquatic crops or those having high water demand. Green manuring crops should also be taken to help in leaching and removal of the salt.

(vi) Adopting land development measures to promote better distribution of water, drainage and leaching. Measures to reduce erosion and divert run off that cause surface flooding should also be included.

(vii) The farming system and the measures mentioned above should be integrated with the growing of trees in waterlogged areas such as eucalyptus, willows, poplar, etc.

(viii) Educating and training farmers in regulated irrigation application.

(ix) Departments of Irrigation and Agriculture as well as Command Area Authorities should consider waterlogging as a serious problem in the context of agricultural production, lasting degeneration of resource base and environment. The personnel of these departments/bodies should be oriented in this complex problem and related matter.

3 6.7 National Commision on Agriculture while reviewing earlier studies and experiments gained in Punjab, Haryana, Rajasthan, Uttar Pradesh etc. indicated the need for drainage at all levels, lining of canals to reduce seepage, sinking tubewells and growing high yielding paddy varieties with proper time of sowing etc.

3.6.8 **Need for the Programme.** The country has been creating large irrigation potential with heavy investment to increase agricultural production. But waterlogging in command areas is retarding this effort Similarly, large areas in the productive plains are remaining idle in productive months because of continuous submergence. Besides waterlogging is putting scarce arable land out of production which is not a renewable base.

3 6.9 The problem of waterlogging is closely followed by that of salinity and alkalinity both in the coastal areas as well as in other parts. A few schemes have, however, been proposed to be

operated during the Seventh Five Year Plan for saline and alkaline soils in the inland States as well as for coastal saline-sandy areas. Command Area Development authorities are monitoring waterlogging problem in the command areas of 102 on-going irrigation projects only out of about 550 major and medium irrigation projects completed so far in the country. Similarly, the areas which are getting inundated due to runoff as a result of monsoons are not being monitored adequately. The extent of the problem of waterlogging in these areas and its impact on overall productivity of the country is quite serious. It is, therefore, proposed to take up the scheme to tackle the problem in these areas. The scheme will cover—

(i) Survey and categorisation of the problem areas ;

(ii) Development of waterlogged command areas which are not covered under the Centrally sponsored scheme of Command Area Development Programme ;

(iii) Development of the areas which are waterlogged and remain so for considerable period of the year due to monsoon flooding and thereby making it not-available for remunerative crop production.

3.6.10 Survey and categorisation would have to provide a complete picture of the problem of waterlogging at various periods of the year and also indicate the variations over the years. The exercise should also indicate at intervals the extent of problem area due to rise of water table, that due to surface flooding and also the extent due to both the factors together.

3.6.11 The treatments for developing the waterlogged areas in command areas will include drainage along with leaching, compatible cropping system, land development activities, scheduling canal operations to suit the crop water requirement, conjunctive use of surface and ground water and intensive extension activities to appraise the farmers, departmental functionaries and other agencies on the economic implications of total irrigation water application etc.

3.6.12 For waterlogged areas through surface flooding, attempts to reclaim these areas by providing necessary field drainage through surface and sub surface drains and by introducing clear outlets, including pumps, have been meagre in the past. Necessary drainage for lowering water table and outlets with pumps, wherever necessary, should be provided systematically and a network for such waterlogged areas Since the cause of flooding is the surface run off/over-flow from the rivers, protection through dykes and bunds and by providing diversion drains should be given. Selected storage in the low-lying areas may help in reducing the duration of submergence of some adjoing areas and thus help in taking up more remunerative crops. The storage which will have to be developed in some of the low lying areas to release a part of the waterlogged areas for cultivation, could also be used as a source to provide irrigation to areas for the succeeding crop. Many a time, this possibility could also be combined with the necessity to remove excess water by providing pumps if overall economy of the integrated production system justifies. The possibility of various crop rotations depending on climatic and physiographic conditions in different States and combining these with pisciculture have already been indicated earlier.

3.6 13 In addition, it would be possible to combine some afforestation works for raising trees which will help in meeting severe shortage of fodder, firewood and raw material for paper and

other allied industries. The species of trees are to be selected depending upon depth of water, latitude, and other climatic and edaphic conditions.

3.6.14 The problem of waterlogged areas has not received an integrated approach from a multi-disciplinary organisation so far. The programme will have to be tackled with a view to retain productivity of the command areas as well as increase productivity of other areas, which are subject to seasonal and prolonged submergence or waterlogging due to surface flooding. The package of practices will vary considerably but invariably would demand inputs from a multi-disciplinary team. It would, therefore, be necessary to augment and strengthen the existing soil and water conservation organisation in the States for meeting this additional demand. At the Centre a unit under one Joint Commissioner will be required to plan and monitor the scheme.

3.6.15 The components of the project for both the categories of waterlogged areas will, therefore, include the following :

(*i*) Survey and investigation ;

(*ii*) Land development, drainage, storage structure, dykes, bunds, etc ;

(*iii*) Crop and plant management and introduction of pisciculture ;

(*iv*) Machineries, equipments, pumps, etc.

(*v*) Organisational capability—creation or strengthening of existing one.

3.6.16 In consideration of various components of this scheme and the trend of cost escalation, it is estimated that treatment of one hectare of waterlogged area during the Seventh Five Year Plan may range from Rs. 6,000 to Rs. 10,000. An average unit cost of Rs. 8,000 per ha. is taken for the entire plan period. In consideration of the magnitude of the problem area and the sign of extension of the same in new areas, a target of one lakh ha. is proposed for the entire Seventh Plan with an outlay of Rs. 80 crores. The pattern of assistance of the scheme is proposed to be 100 per cent Central assistance for the survey and investigation while 100 per cent Central assistance for developmental activities covering 50 per cent grant and 50 per cent loan advance to the States.

Sixth Plan outlay	...	Rs. Nil
Seventh Plan outlay	...	Rs. 80.00 crores

3.7 Reclamation of Alkali Soils (Usar) in Punjab, Haryana and Uttar Pradesh

3.7.1 **Problem, area and review of progress**. There are about 25 lakh ha. of alkali soils in the country out of which about 22.68 lakh ha. or about 90 per cent occur in the three States of Uttar Pradesh (11.0 lakh ha.), Punjab (7.18 lakh ha.) and Haryana (4.5 lakh ha.). A Centrally sponsored scheme 'Pilot Project for amendment of Alkali and Acid Soils in Compact Areas' was operated during the Fifth Plan from 1974-75 to 1979-80 in the States of Punjab, Haryana and Uttar Pradesh. The pattern of Central assistance was 50% subsidy on the cost of amendments only to the farmers having holdings up to 3 ha. and 25% for others while preparation of land and provision of irrigation and other pre-requisites, were made available to the beneficiaries through other sources. By the end of 1978-79, an area of 63,000 ha. of

alkali soils was reclaimed in the three States at an expenditure of Rs. 5.75 crores. This scheme was transferred to State Sector from 1979-80 in accordance with the decision of the National Development Council. After the scheme was transferred in 1979 80 to the State Sector, the pace of progress was slowed down in Uttar Pradesh and Haryana while Punjab maintained steady progress as will be seen from the annual rate of reclamation at the time of transfer and in subsequent years.

Area reclaimed (in thousand hectares)

Year	*Uttar Pradesh*	*Haryana*	*Punjab*
1979-80	18.9	4.9	30.0
1980-81	17.0	2.0	33.0
1981-82	14.9	2.5	34.6

3.7.2 The State-wise problem area already treated and area to be reclaimed for Agriculture and Forestry is given below :

State	*Total problem area*	*Area not available/ unfit for reclamation*	*Area available for reclamation*	*Area already treated*		*Area to be reclaimed*
	Area in lakh hectares					
Uttar Pradesh	11.00	1.00	10.00	0.80	9.20	Agri. 5.00
Haryana	4.50	2.50	2.00	0.23	1.77	Agri. 4.50 Forest 0.27
Punjab	7.18	0.20	6.98	1.70	5.18	Agri. 5.28 Forest Nil

Note : In Uttar Pradesh, an area of 1.0 lakh ha. is not available because this is under community use. In Haryana 2.50 lakh ha. have brackish underground water and may not be reclaimed. In Punjab 0.20 lakh ha. are saline for which the technology is yet to be perfected.

Areas to be reclaimed :	Agri.	11.78
	Forest	4.47
	Total	16.25

3.7.3 **Technology.** Alkali soils have excessive amount of sodium in the exchange complex and are dominated by the salts of carbonates and bicarbonates of mainly sodium. The soil pH is high (more than 8.5 and often exceeding 10) and exchangeable sodium percentage (ESP) is greater than 15. These soils have extremely low infiltration rate and their physical condition including movement of air and water in soil profile is not suitable for crop growth.

The reclamation process consists mainly of replacing sodium with calcium. This is done by either direct application of soluble calcium by addition of gypsum or by addition of pyrite which produces acids and activates the native calcium. Good quality water is required to facilitate the chemical reaction and leach out undesirable chemical substances. Continuous cropping helps in keeping the soil in good condition for crop group. The entire technology has been successfully applied in the states of Punjab, Haryana and Uttar Pradesh. A successful reclamation programme consists of five important components *viz.*

(*i*) Assured irrigation water ;

(*ii*) On farm development works including land levelling, bunding, deep ploughing, drainage system including community drainage etc. ;

(*iii*) Application of soil amendments—Gypsum/Pyrites ;

(*iv*) Organic matter—green manuring, organic manures, etc. ; and

(*v*) Inputs for continuous cropping.

3.7.4 **Programme content and cost structure** : Alkali soils can be reclaimed for agricultural purposes or for raising forests and pastures. The component and cost structures for reclamation for agricultural purposes are given below :

Agriculture

Project components	*Cost per ha. in Rupees*
1. Tubewell, shallow-well including water distribution system	3000.00
2. On Farm Development including drainage	1500.00
3. Soil Amendments—Gypsum/Pyrites	3000.00
4. Inputs :	
(*a*) Fertiliser for paddy and wheat for one year @ Rs. 1500/- per crop	3000.00
(*b*) Seed for paddy, wheat crop in the first year	500.00
5. Organic Matter—Green Manure, FYM etc.	200.00
	11,200 00

3.7.5 **For Afforestation and Pasture Development** : The cost of afforestation at the rate of Rs. 3500 per ha. and pasture development at Rs. 2500 per ha. will be financed through budgetary source as these will be implemented mostly on community lands. The cost will be shared on 50 : 50 basis between Central and State Governments.

3.7.6 **Physical and Financial Dimensions proposed for Seventh Five Year Plan:** During Seventh Five Year Plan it is proposed to reclaim about 3.09 lakh ha. (2.27 lakh ha. for Agriculture and 0.82 lakh ha. for afforestation and pasture development) at a total cost of

Rs. 292.31 crores *i.e.* (Rs. 173.44 crores Institutional Finance and Rs. 118.87 crores Budgetary Finance The latter will be shared by Central and State Governments equally. The physical targets and requirements of Budgetary Finance over different years is given below :

		1st year	*2nd year*	*3rd year*	*4th year*	*5th year*	*Total*
Physical targets	Agri.	32,000	39,900	47,872	51,861	55,851	2,27,484
(Area in ha.)	Forest	10,972	14,395	17,280	18,720	20,160	81,527
Institutional)	(Rs. in	31.71	28.93	34.70	37.60	40.49	173.83
Budgetary)	Crores)	16.96	20.80	24.96	27.04	29.11	118.87
Central share)		8.48	10.40	12.48	13.52	14.55	59.43

3.8 Reclamation of Saline/Alkali Soils in irrigated areas of States other than Punjab, Haryana and Uttar Pradesh

3.8.1 With the introduction of flow irrigation in the command areas of irrigation projects the problems of drainage congestion, waterlogging and salinization have been appearing. These problems are expanding at alarming rate in the command areas of Mahi Kadana in Gujarat, Chambal in Rajasthan and Tawa Project in Madhya Pradesh. Similar problems have been reported from the command areas of many irrigation reservoirs in different parts of the country. Since the good quality sweet water is available, the reclamation of saline and alkali soils should not be difficult. However, reliable information about the occurrence and extent of problem areas in different commands is not available. Nevertheless, there is an urgent need to take effective measures for prevention of good cultivated lands from being salinized and reclamation of lands that have already been affected. But some provision of funds should be made in the Seventh Five Year Plan so that comprehensive schemes of survey, categorization and reclamation of salt-affected lands in command areas may be planned and implemented. A sum of Rs. 120 crores is proposed for Seventh Five Year Plan so that comprehensive scheme for survey and categorisation (Rs. 8 crores) and reclamation of saline/alkali soils in command areas (Rs. 112 crores) for an area of one lakh ha. may be planned and implemented.

Sixth Plan outlay ... Nil

Seventh Plan outlay ... Rs. 120 crores

3.9 Reclamation of saline soils in Arid and Semi-Arid regions

3.9.1 There is a vast stretch of arid saline land spread over areas including southern parts of Haryana, North Eastern parts of Uttar Pradesh, extensive areas in Rajasthan and Gujarat as well as in semi-arid region of black cotton soils. The cultivation is practised under rainfed conditions with two constraints *viz.*

(*i*) excess of soluble salts ; and

(*ii*) scarcity of moisture,

The crop yields are considerably reduced on areas which suffer from higher degree of salinity. Under natural conditions some thorny vegetation thrives which has practically no economic value. Since ground water is brackish and sweet water is not available, these soils cannot be reclaimed for intensive crop production. However, technologies including such varieties of crop plants, which have higher salt tolerance and appropriate rain water utilisation measures, are available which can improve the production of crops, fuel, fodder and bushes substantially. Central Soil Salinity Research Institute, Karnal have identified some species of grasses which can be grown on stretch of lands suffering from high degree of salinity and moisture scarcity. In Australia, a large variety of plants have been identified and utilised for growing on arid salt lands. These include Atriflex spp., Maireana, brevifolia, etc. Moreover, there are certain varieties of barley in Australia which can be utilised for improving the production on arid salt lands. Australian Government has already shown interest in bilateral collaboration in this area.

3.9.2 It is proposed to launch a programme for improving the production and productivity of these arid and semi-arid saline regions during Seventh Five Year Plan both because these areas are backward and as well as the technology has recently become available. A sum of Rs. 60 crores may be provided in the Seventh Five Year Plan. This would include Rs. 4 crores for survey and categorisation of such lands and Rs. 56 crores for reclaiming 50,000 ha. for crop and plant management.

Sixth Plan outlay	Nil
Seventh Plan outlay	Rs. 60 crores

3.10 Development of Coastal Saline Sandy Areas

3.10.1 India has a long coast line of about 6,000 km. This coast line is subject to the problem of salinity as well as shifting of sand-dunes. The National Commission on Agriculture had reviewed the problems and observed that shifting coastal sand dunes cause serious damage to agriculture and a lot of fertile land is becoming unproductive. The Commission particularly identified these problems in the coastal districts of Tamil Nadu, Maharashtra, Gujarat and Orissa. It has also observed that the area under coastal sand dunes is on the increase.

3.10.2 On the other hand, extensive coastal areas have been found saline and becoming more saline over the years. This problem occurs in various degrees in West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Maharashtra and Gujarat. This particular problem was studied in detail by the National Committee on the Development of Backward Areas (NCDBA). These areas were one of the six identified backward areas which need immediate attention according to the Committee. Though no survey has been made, the Committee had placed on record that an estimated 30 to 40 thousand sq. km. is affected by such salinity against 50 to 80 thousand sq. km estimated by National Commission on Agriculture National Committee on Development of Backward Areas (NCDBA) has divided such coastal saline lands into six categories such as—

(i) Sunder Bans of West Bengal ;
(ii) Delta areas in Krishna, Godavari and Kaveri ;
(iii) Kari Soils (Peaty) Kerala ;

(*iv*) Khar Land of Maharashtra ;

(*v*) Coastal areas of Gujarat ; and

(*vi*) Rann of Kutch.

3.10.3 State-wise review of coastal saline lands indicates many serious degradation problems. In Gujarat, increase in salinity has rendered vast fertile/productive coastal strip into saline lands Areas affected by the salinity of ground water has increased from about 85,000 ha in 1971 to one lakh ha in 1977. About 120 villages in five Talukas with a combined population of 2.8 lakhs are adversely affected due to this factor alone. The overdraft of ground water could continue to provide fresh water for a long time before the detrimental effects due to ingress of sea water would become perceptible. Thus the damage now visible in about 12,500 wells, which are out of commission or under restricted use, has been developing over many years. Water levels in some districts of Kerala coast have dropped alarmingly below sea level.

3.10.4 In Maharashtra the Khar land (coastal saline soils) is due to frequent inundation of sea water through the creeks during high tides and affecting productivity of the coastal land. About 720 km. of coastal belt covering the districts of Thana, Colaba and Ratnagiri is getting affected in spite of high rainfall ranging from 2540 mm to 3160 mm which directly goes into the Arabian sea, and these areas do not have any other source for irrigation.

3.10.5 In Karnataka, coastal saline land occupies 12500 ha. in the district of North and South Canara even though rainfall received over 3000 mm. The problem of salinity increases when there is break in the monsoon, specially if it is too long, besides inundation due to high tides. In any case effect of a crop with good rainfall is positive in Kharif while inundation in rabi increased salinity.

3.10.6 In Tamil Nadu, salinity exceeds both in coastal areas and islands. The exact nature and intensity of problem has not been systematically surveyed. It is reported that about one lakh ha. is affected. In Tamil Nadu, many attempts have been made to understand the impact of coastal salinity and shifting sand dunes on the changing land use pattern.

3.10.7 Nearly half of the agricultural production in Andhra Pradesh comes from 8 coastal districts extending over a length of 900 kms Even though no systematic survey has been carried out it is estimated that about 1.75 lakh ha. is subject to salinity particularly in the districts of Prakasam, Guntur, Krishna and East Godavari. Cultivation in Kharif is done due to good rainfall while in Rabi in absence of rainfall and good quality ground water, cultivation is restricted.

3.10.8 The Coastal saline affected area in Orissa is about 4 0 lakh ha. which is in the districts of Balasore, Puri, Cuttack and Ganjam. The problem is severe in a 18 miles wide strip of Cuttack district running along the Bay of Bengal. The State has made some estimates through remote sensing survey. This has categorised the land in two groups *viz* :

(*i*) low land mixed forest mangrove (3.04 lakh ha.) ; and

(*ii*) sand/salt flats (0.42 lakh ha.)

3.10.9 The coastal salinity in West Bengal is divided into two parts :

(i) South Parganas forming huge Gangetic Delta with dense brushwood forest, and

(ii) South Midnapore formed mainly with silt carried out by Rupnarayan, Kosi, and Subarnarekha.

A total area of about 10 lakh ha. is affected by salinity.

To sum up, the problem of coastal areas of India are :

(i) Wind erosion and shifting of sand dunes ;

(ii) Salinity due to inundation by sea water during the high tides ;

(iii) Salinity due to continuous submergence by sea water ;

(iv) Salinity due to loss of considerable volume of fresh water into sea and inundation by sea water particularly in rainy months ;

(v) Overdraft of ground water wherever good quatity ground water is available and thus lowering the ground water and subsequent ingress of sea water and gradual salinisation of ground water.

3.10.10 **Remedial Measures** : National Commission on Agriculture recorded that plantation of casurina on sandy sea shore followed by coconut cashew further inland, have got the promise to minimise the problem. In respect of saline soils the Commission has indicated that many of these can be tackled by planting trees such as coconut etc. The National Committee on the Development of Backward Areas have laid down strategy as follows :

(a) Soil salinity areas where the top soil is saline ;

(b) Water salinity areas due to increasing saline ground water or non-availability of fresh water on surface.

For providing an appropriate type of technology, the areas have been classified as saline soils, saline-alkali soils and saline and degraded alkali soils An integrated approach for crop production, fisheries, animal husbandry, forestry, providing improved drainage and harnessing irrigation potenttial has been suggested. It has been felt that agriculture in the model of Kuttanad of Kerala may not become economically viable due to high cost of development. On the other hand, it is very essential to utilise the considerable volume of fresh water available from rainfall to ensure recharge of ground water, flushing of salts and raising of crop/vegetables in Kharif and Rabi. The long duration kharif paddy is to be replaced and suitable rabi crop such as sunflower etc to be tried. Possibilities of introducing inter-cropping, for instance with coconut plantations, should be explored. For this purpose cashew among the horticultural plants while eucalyptus among the forest species could be considered. The experience of Sunderbans project for integrated development, by crop production, irrigation and drainage, raising of forests, coastal shelter belts, should be the model with due modifications to suit the site conditions. Amendments, such as Gypsum and rice husk, could be adopted to improve physical characteristics of soil and thus help in recharging ground water. The overdraft of ground water is the major problem for the widescale ingress of sea water into fertile lands such as in Saurashtra area. The NCDBA felt that recharge technique would be preferred for adoption to the engineering solution such as

regulators. The Committee felt that static structure for salinity control, besides being costly cannot stop upward movement of salt water. To impound the rain water, it has been recommended that check dams, percolation ponds, recharge wells etc. be extensively constructed preferably on the basis of watershed strategy in the upstream areas along the river.

3.10.11 The Committee on Direction set up by the Planning Commission for formulation of the Seventh Five Year Plan stressed on the need for taking up programmes for these lands. It would, therefore, be desirable to take up a Centrally Sponsored Scheme in representative areas to control wind erosion and reduce salinity for promoting crop and plant management. The organisation in the States will have to be strengthened suitably. At the Centre, a unit under one Joint Commissioner should be provided to plan and monitor the programme implementation. During the Seventh Plan, therefore, it is proposed to carry out the following activities :

(i) Survey and categorisation of the problem areas—an amount of Rs. 4 crores may be provided.

(ii) Introduction of control and ameliorative measures—vegetative and engineering ones, for restoring such lands into productive use. It is proposed to cover 50,000 ha. representing various conditions in all the States at a cost of Rs. 56 crores. The pattern of assistance is proposed 100% Central assistance covering 50% grant and 50% loan to the States.

Sixth Plan outlay	...	Rs. Nil
Seventh Plan outlay	...	Rs. 60 crores

3.11 Amendment of Acid Soils

3.11.1 It is estimated that about 4.5 million ha. of crop land is suffering from various degrees of acidity which acts as a barrier in raising the yields. These soils are located in the States of Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa, Bihar, West Bengal, Sikkim and North Eastern region. However, these soils have production potential if treated with lime. Lime affects the physical, chemical and biological properties of the soil and improves its capacity as medium of plant growth. Ground lime stone, burnt shells, basic slag, press-mud, calcium carbonate obtained as bye-product of fertiliser factories have been successfully utilised for treating the acidic soils. A Centrally sponsored Pilot Project for Amendments of Acid Soils in Compact Areas was operated till 1978-79 and an area of 1,13,800 ha. was treated at a cost of Rs. 1.41 crores in the States of Kerala, Karnataka, Orissa, Bihar, Assam, West Bengal and Sikkim. The scheme provided subsidy on the cost of amendments at the rate of 50 per cent for farmers having holdings up to 3 ha. and 25 per cent for others. The State Governments were giving additional subsidy at the rate of 25 per cent to all farmers. This scheme was transferred to State Sector from 1979-80 in pursuance of the decision of the National Development Council.

3.11.2 It is felt that there is an urgent need to revive the centrally sponsored scheme during Seventh Five Year Plan so that the pace of progress could be accelerated and the coverage of the scheme may be extended to all the States and Union Territories having acidic soils. A sum of Rs. 16 crores may be provided during Seventh Five Year Plan for meeting cost of subsidies on amendment in the same pattern as was in the scheme in the Fifth Plan for 2 lakh ha.

Sixth Plan outlay	...	Nil
Seventh Plan outlay	...	Rs. 16 crores

3.12 Strengthening of State Land Use Boards for Land Reclamation and Development Activities

3.12.1 The problem of land resource base vis-a-vis the increasing demand had received attention of the highest authorities during early seventies. While reviewing a comprehensive write up on the problem and the demands of conntry's limited land and soil resources, the Prime Minister had recorded that there is an urgent need to look into these. Thus, in 1974, the then Union Minister of Agriculture had addressed the Chief Ministers of the States to establish State Land Use Board under the chairmanship of respective Chief Minister as the apex body at the State level to provide policy direction and guidance on matters relating to soil and land resources. As a result, all the States and six Union Territories have established State Land Use Boards or an alternative body. These Boards, however, were diverse in their composition and were not generally active. After the setting up of National Land Board, and National Land Resources Conservation and Development Commission in 1983, situation has been reviewed at the first meeting of the Commission as well as that of the Board. The recommendations of the Commission and of National Land Board are as follows :

(i) State Land Use Boards under the chairmanship of Chief Ministers should be activised.

(ii) The Board should function as a coordinating agency and for giving policy directions which have a bearing on land use, forests, soil and water conservation within the State.

(iii) A senior officer and nucleus staff should be identified and placed in position to service the Board.

3.12.2 Since the land reclamation and development programmes are being taken up in a big way to provide effective support to the agricultural sector and to achieve the quantum jump in the production of foodgrains, the role of the State Land Use Boards will be crucial. The Boards have been specifically advised to take effective measures to protect good agricultural lands against soil erosion, waterlogging, salinity and alkalinlty, diversion due to urbanisation and industrialisation, as well as injudicious use such as of culturable wastelands, fallows, etc It is, therefore, proposed that the State Land Use Boards are made more active and functional in the context of the large programme of land reclamation and development being proposed in the Seventh Five Year Plan. The Boards should sponsor surveys, reviews and case studies, relating to various degradation hazards or social inhibition making the land unproductive For this purpose, the Board will have to be strengthend in terms of nucleus staff, as recommended by the National Commission and provided with certain funds to sponsor specific surveys, studies, reviews etc. It is, therefore, proposed that Rs 25 lakhs for a period of five years for each of the States and Rs. 10 lakhs for each of the Union Territories for the same period be provided in the Seventh Plan. Thus, a total of Rs. 6.40 crores will be required for the Seventh Five Year Plan.

Sixth Plan outlay	...	Nil
Seventh Plan outlay	...	Rs. 6.40 crores.

CHAPTER 4

BENEFITS FROM LAND RECLAMATION AND DEVELOPMENT PROGRAMMES

4.0 **Multiple Benefits :**

4.1 Land reclamation and development programmes would include the following :

(*i*) Field measures to protect land against erosion or degradation through other means.

(*ii*) Measures for improving productive management.

(*iii*) Adopting management system to generate employment opportunities.

The benefits from implementing land reclamation and development programmes can be grouped into four categories, *viz.* :

(*i*) Protective,

(*ii*) Restorative,

(*iii*) Productive, and

(*iv*) Employment generation

4.2 **Approach** : During Seventh Plan, a total area of 15.04 lakh ha. will be reclaimed where crop cultivation and other plant management system will be introduced. All lands subject to problem of acidity are generally under crop cultivation. Out of the target to reclaim and develop 3.09 lakh ha. of alkali soils, 2.27 lakh ha. will be reclaimed for crop cultivation while 0 82 lakh ha. will be put under forestry and pastures. The programmes for other degraded or idle lands *viz.* ravines and gullies, coastal saline sandy areas, culturable wastelands and fallows other than current fallows, etc. will have roughly equal distribution of area under agriculture and under forestry and pastures. It is estimated that the break-up of area between crop and other plant management will be as follows :

(*i*)	Area to be reclaimed for agriculture	... 9.25 lakh ha.
(*ii*)	Area to be reclaimed for forestry and pasture	... 5.79 lakh ha.
		15.04 lakh ha.

4.3 Protective Benefits

4 3.1 **Prevention of on-site erosion** : The loss of major nutrients through soil erosion is prevalent on all types of lands requiring reclamation except those affected by waterlogging.

Thus, a total area of 14.04 lakh ha. will need to be protected against soil erosion. Soil which is eroded also carries major plant nutrients with it. The loss which could be protected is estimated to be 0.03 tonnes per ha. per year. Thus, from 14.04 lakh ha., an amount of 0.42 lakh tonnes of NPK will be preserved annually. At the rate of Rs. 3000 per tonne NPK, the equivalent cost will be Rs. 12.6 crores. The equivalent production of foodgrains protected will be 2.52 lakh tonnes at the rate of 6 tonnes additional production for each tonne of fertiliser.

4.4 Restorative Benefits

4.4.1 **Appreciation of Land Value** : Reclamation and development of degraded lands will appreciate the land value through improved productivity. Though the value of land which will be afforested or developed as pasture is difficult to assess, the area of 9.25 lakh ha. which will be put back to remunerative and stable cultivation will become valuable. Much of this reclaimed land will also have irrigation. The average value of such land with regular or crop saving irrigation facility is likely to be around Rs. 5000 per ha. in accordance with study conducted in Hirakud Catchment in Orissa. Thus, the total appreciated land value will be Rs. 462.5 crores.

4.5 Productive Benefits :

4 5.1 **Additional production of crops** : Experimental evidence as well as field experience show that reclamation of alkali soils could enhance crop production on an average by 5 tonnes per ha. per year taking rabi and kharif together. However, increase in production from acid soils may not be more than 0.3 tonnes per ha. per year, while from other types of degraded lands such as ravines, waterlogged areas, culturable wastelands and fallows, coastal and inland saline areas, etc., the average add tional production may range from 0.5 to 2 tonnes per ha. per year. This is because the areas are badly degraded and fertility level can be raised over a number of years only For such areas, the average rate of one tonne per ha. per year may be taken. Thus, the total additional production of foodgrains at the terminal year of the Seventh Plan is likely to be as follows :

(i)	Alkali Soils @ 5 tonnes per ha.	(2.27 lakh ha.)	—	11.35 lakh tonnes
(ii)	Acid Soils @ 0 3 tonnes per ha.	(2 00 lakh ha.)	—	0.60 lakh tonnes
(iii)	Other degraded lands @ 1 tonne per ha.	(4.98 lakh ha.)	—	4.98 lakh tonnes
		Total		16.93 lakh tonnes

At a support price of Rs. 1200 per tonne, the equivalent value of additional production is likely to be Rs. 203 crores in the terminal year of the Seventh Plan.

4.6 Employment Generation

4 6.1 **Casual Employment Opportunities** : Land reclamation and development works are basically labour intensive. About 50 per cent of the total outlay of Rs. 987.21 crores *i.e.* Rs. 493 crores will go as labour wages. Daily wage rate range between Rs. 7 and Rs. 17.5 per manday

which would further rise by 1989-90. At an average of Rs. 15 per manday for the country, a total of about 329 million mandays of additional casual employment opportunities will be created.

4.6.2 **Regular jobs** : Except for acidic soils, two crop cultivation with some irrigation will be taken up in an area of 7.25 lakh ha. Each hectare will need at least additional 100 mandays in a year. Thus, on an average, the total regular employment of 72.5 million mandays will be created.

4.6.3 **Technical and allied jobs** : Planning and implementation of these programmes will need considerable man-years for survey and categorisation and for reclamation and development works. The present norms indicate that a subdivision of 35 man-strength will be able to execute a programme of Rs. 25 lakhs in a year. Thus, an outlay of Rs. 987.21 crores will need about 3948 sub-division years. Besides, another 500 sub-division years will be needed for survey and categorisation. Thus, a total of 4448 sub-division years or 0.15 million man-years will be needed. Taking 300 mandays as a working year, total mandays of such jobs will be 45 million mandays.

4.7. **Other benefits** : In addition to these benefits from crop sector, the implementation of the schemes will create renewable forest and other plant resources to meet fuel and local timber needs and fodder. Besides, production through fishery development in waterlogged area could be sizeable. However, quantification of these benefits has not been possible immediately.

4.8 To sum up, the benefits are as follows :

		Quantity	*Rs. in crores*
I. Protective	—Saving NPK worth (equivalent to 2.5 lakh tonnes of foodgrains/ year)	0.42 lakh tonnes	12.6
II. Restorative	—Bringing back to production appreciated land	0.92 million tonnes	462.5
III. Productive	—Additional production per year	1.69 million tonnes	203.00
	Total		678.1

IV. Employment Generation	*Million mandays*
(*i*) Casual	329.00
(*ii*) Regular on land	72.50
(*iii*) Technical & allied jobs	45.00
	446.50

Statement Showing Physical Targets and Financial Outlay for the Seventh Five Year Plan—Land Reclamation and Development Schemes

(Area in lakh ha.)
(Rupees in crores)

S.No.	*Name of the Scheme*	*Target*	*Outlay*	*Unit Cost Rs./Ha.*	*Remarks*
1	2	3	4	5	6
1	Development and stabilisation of Ravinous Areas	1.95	97.50	5,000	U.P.—0.60 ; Rajasthan—0.55 ; Madhya Pradesh—0.50 ; Gujarat—0.30
2	Survey, Categorisation and Restoration of Culturable Wastelands and Fallows other than Current Fallows	5.00	255.00	5,000	Includes Rs. 5 crores for survey and categorisation of 2 million ha.
3	Protection and Development of Waterlogged Areas for increasing productivity	1.00	80.00	8,000	Survey and Categorisation included in outlay both in canal commands and surface ponded area.
4	Reclamation of Alkali Soils (Usar) in Punjab, Haryana and Uttar Pradesh	3.09	292.31	11,206	Target—2.27 lakh ha.—Agri. 0.82 lakh ha.—Non-agri., afforestation and pasture. Outlay—Institutional Finance Rs. 173.44 crores Budgetary Finance Rs. 118.87 crores
5	Reclamation of Saline/Alkali Soils in Irrigated Areas of States other than Punjab, Haryana and Uttar Pradesh	1.00	120.00	11,200	Includes Rs. 8 crores for Survey and Categorisation,

S. No.	*Name of the Scheme*	*Target*	*Outlay*	*Unit Cost Rs./Ha.*	*Remarks*
1	2	3	4	5	6
6	Reclamation of Saline Soils in Arid and Semi-Arid Region	0.50	60.00	11,200	Includes Rs 4 crores for Survey and Categorisation.
7	Development of coastal saline sandy areas	0.50	60.00	11,200	Includes Rs. 4 crores for Survey and Categorisation.
8	Amendment of Acid Soils	2.00	16.00	800	Unit rate here covers subsidy only.
9	Strengthening of State Land Use Boards (SLUB)	—	6.40	—	
	Total	15.04	987.21		

NB : None of these schemes were in the Sixth Plan.

APPENDIX-I

Composition of the Working Group on Land Reclamation and Development for Formulation of the Seventh Five Year Plan

1.	Additionol Secretary (A), Department of Agriculture & Cooperation		Chairman
2.	Agriculture Commissioner, Deptt. of Agriculture & Cooperation	...	Member
3.	Economic & Statistical Adviser, Deptt. of Agriculture & Cooperation	...	,,
4.	Joint Secretary (Production), Deptt. of Agriculture & Cooperation	...	,,
5.	Joint Secretary (F&M), Deptt. of Agriculture & Cooperaiion	...	,,
6.	Joint Secretary (F&SC), Deptt. of Agriculture & Cooperation	...	,,
7.	Joint Secretary (Extension), Deptt. of Agriculture & Cooperation	...	,,
8.	Joint Secretary (Credit), Deptt. of Agriculture & Cooperation	...	,,
9.	Commissioner (Coordination), Deptt. of Agriculturc & Cooperation	...	,,
10.	Director (Machinery), Deptt, of Agriculture & Cooperation	...	,,
11.	Representative of Director General, ICAR	...	,,
12.	Representative of Ministry of Irrigation	...	,,
13.	Representative of Ministry of Rural Development	...	,,
14.	Representative of ICRISAT, Hyderabad	...	,,
15.	Representative of Indian Agricultural Research Institute	...	,,
16.	Representative of NABARD, Bombay	...	,,
17.	Representative of Adviser (Agri,) Planning Commission	...	,,
18.	Agriculture Production Commissioners/Agriculture Secretaries of	...	,,
	(*i*) Bihar		
	(*ii*) U.P.		
	(*iii*) Punjab		
	(*iv*) Haryan		
	(*v*) Rajasthan		
	(*vi*) Andhra Pradesh		
19.	Shri A.C. Garg	...	Member
	Joint Commissioner (Projects), Department of Agriculture & Cooperotion		Secretary

APPENDIX-II

List of co-opted members of the Working Group on Land Reclamation & Development for formulation of the Seventh Five Year Plan

1. Dr. N.S. Randhawa
   Deputy Director General Indian Council of Agricultural Research.
2. Dr. I.P. Abrol
   Director, Central Soil Salinity Research Institute, Karnal
3. Shri B.K. Sarkar
   Joint Secretary (SCBCD),
   Ministry of Home Affairs,
   Room No. 604, A Wing, Shastri Bhavan, New Delhi
4. Shri D.N. Tiwari
   Director, Tribal Development,
   Ministry of Home Affairs, New Delhi
5. Dr. N.N. Goswami
   Head of the Division of Soil Science and Agricultural Chemistry,
   Indian Agricultural Research Institute, New Delhi
6. Shri D.C. Das,
   Joint Commissioner (SC), Department of Agricultute & Cooperation
7. Dr. S.L. Seth,
   Director (Dry Farming)
   Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi
8. Dr. R.N. Gupta,
   Additional Director of Agriculture, U.P., Lucknow
9. Dr. V.V Dhruv Narayana, Director,
   Central Soil Conservation & Training Research Institute, Dehra Dun
10. Dr. K. Shankranarayana, Director,
    Central Arid Zone Research Institute, Jodhpur.
11. Dr. C.C. Majhi
    ADG (AES&M)
    Indian Council of Agricultural Research, New Delhi
12. Credit Expert,
    Department of Agriculture & Cooperation
13. Shri K.P.S. Verma
    Assistant Commissioner (HVP)
    Department of Agriculture & Cooperation
14. Dr. A.K. Bhattacharya
    Project Coordinator
    Water Technology Centre,
    Indian Agricultural Research Institute, New Delhi
15. Dr. G.P. Gupta,
    Joint Commissioner (FC & WM)
    Department of Agriculture & Cooperation.

APPENDIX-III

Proceedings of the Select Group of the Working Group on Land Reclamation and Development for formulation of 7th Five Year Plan held on 1.2.84

A meeting of the Select Group of the Working Group on Land Reclamation and Development for formulation of the 6th Five Year Plan proposals was held under the Chairmanship of Shri Harbans Singh, Agriculture Commissioner. on 1st February, 1984. A list of those who attended the meeting is enclosed.

2. The Chairman welcomed the participants. He further invited the participants for a discussion about the various aspects of the terms of reference of the Working Group on Land Reclamation and Development for formulation of the 7th Five Year Plan. During discussions it was revealed that the scope for the Working Group on Land Reclamation and Development was over-lapping with another working group dealing with forestry and soil water conservotion particularly dealing with soil and water conservation aspect which covered important spheres like soil erosion, ravine development, etc. After considerable discussions it was decided that the Working Group on Land Reclamation and Development may concentrate on activities concerned with bringing additional area of land, with production potential but not at present under cultivation to productive use which may include saline alkali lands, water-logged and shrub infested areas etc.

3. The select Group thereafter undertook detailed discussions about the various aspects to be covered in the Working Group report. It also decided the different chapters to be incorporated in the Working Group report and the officers were identified who will prepare the draft chapters so that the draft working paper is compiled and put up for the consideration of the main Working Group at the earliest. The details of the chapters and the officers entrusted with the work of drafting these chapters are as under :-

S. No.	*Chapter*	*Officers requested*
1.	Introduction	
	a. Extent and nature of the problem	1. Dr. I.P. Abrol, Director, Soil Salinity Research Institute, Karnal.
	b. Constitution of the Working Group	2. Dr. G.P. Gupta, Joint Commissioner (FC & WM) 3. Shri A.C. Garg, Joint Commissioner (Projects).
2.	Review of land reclamation and development programmes in Central and State sector-schemewise	1. Shri K.S. Puri, Joint Secretary (SC) & LRC 2. Shri D.C. Das, Joint Commissioner (Soil Cons.) 3. Dr. S.L. Seth, Director (Dry Farming).
3.	Constraints and problems faced in the implementation of land reclamation and development programmes.	1. Shri K.S. Puri Joint Secretary (SC) & LRC

		2. Shri G.V. Rao, Deputy Secretary (P. II) Ministry of Irrigation. 3. Dr. S.L. Seth, Director (Dry Farming).
4.	Status of available technology	1. Dr. N.S. Raadhawa, DDG, ICAR 2. Dr. I.P. Abrol, Director, Soil Salinity Research Institute, Karnal. 3. Dr. V.V. Dhuruv Narayanan, Director, Central Soil Conservation & Training Research Institute, Dehra Dun 4. Dr. K. Shankarnarayana, Director, Central Arid Zone Research Institute, Jodhpur
5.	Strategy and policy during 7th Five Year Plan	1. Dr. I.P. Abrol, Director, Central Soil Salinity Research Institute, Karnal 2. Shri A.C. Garg, Joint Commissioner (Projects) 3 Shri G.V. Rao, Deputy Secretary (P. II) Minstry of Irrigation
6.	Proposals for 7th Five Year Plan	1. Shri S. Som, Joint Secretary (Production) 2. Dr. G.P. Gupta, Joint Commissiener (Soil Cons.) 3. Dr. S.L. Seth, Director (Dry Farming).
7.	Operational aspects and infrastructural needs	1. Sh. K. Ardhanareeswaran, Joint Secretary (Credit) 2. Representative of Water Technology Centre, IARI, New Delhi 3. Dr. R. N. Gupta, Addl. Director of Agriculture, U.P.
8.	Socio-Econmic benefits from land reclamation and development programmes	1. Dr. C.C. Majhi ADG (AES&M), ICAR 2. A representative of PPM Cell 3. Shri D.C. Das, JC (SC)
9.	Summary	1. Shri S. Som Joint Secretary (Production) 2. Dr. I.P. Abroal, Director Central Soil Salinity Research Institute, Karnal 3. Shri A.C. Garg, Joint Commissioner (Projects)

It was decided that the first named officers for drafting respective chapters would kindly ensure that the draft chapters are made available by 15th February, 1984.

The meeting ended with a vote of thanks to the Chair.

List of participants in the meeting of the Select Group from Working Group on Land Reclamation and Development, held on 1.2.1984

S. No.	*Name and designation*	
1.	Shri Harbans Singh Agricultural Commissioner	Chairman
2.	Shri Somenath Som, Joint Secretary (Production)	
3.	Dr. I.P. Abrol, Director, Central Soil Salinity Research Institute, Karnal	
4.	Shri D.C. Das, Joint Commissioner (Soil (Cons.)	
5.	Shri A C. Garg, Joint Commissioner (Projects)	
6.	Shri N.N. Goswami, Head Soil Science & Agril. Chemistry IARI, New Delhi	
7.	Dr. P.C. Bhatia, Senior Scientist ICAR, New Delhi	
8.	Shri Kartar Singh Yadav, Formerly Joint Commissioner (My.)	
9.	Dr. S.L. Seth, Director (DF)	
10.	Shri Surinder Singh, SRO Planning Commission	
11.	Shri R.P. Barampuria, Under Secretary Ministry of Irrigation	
12.	Shri K.P.S. Verma, Asstt. Commissioner (HVP)	
13,	Shri Paramjit Singh, Asstt. Director (Progress)	

APPENDIX—IV

Note for the Working Group on Land Reclamation and Development by Dr. I.P. Abrol, Director, Central Soil Salinity Research Institute, Karnal

The problem of salt affected soils in India is primaeval and afflicts wide tracts to an estimated extent of about 7 million hectares. However, detailed soil surveys to evaluate the the extent of the problem in different parts of the country are still lacking, but the existing information on salt-affected soils in different geographical zones are presented in *Table 1*. There are fears that the extent of salt-affected soils has been rapidly increasing particularly in the canal irrigated areas but monitoring of the extent has been lacking thus far.

From the management point of view. the salt-affected soils can be broadly divided into the following two classes :

(*i*) **Alkali or sodic soils.** These are soils which contain excess exchangeable sodium which adversely affected soil properties and crop growth. These soils also contain variable quantities of salts like sodium carbonate. The soils have high pH, always about 8.2 when measured on the saturated soil paste, alkali soils generally occur in areas receiving a mean annual rainfall between 550 and 900 mm. The ground water quality in most alkali soil dominated areas, is good such that the ground water can be usefully used for irrigation. When ground water is used for irrigation through pumping by tubewells, this acts as an excellent measure of drainage. Because of their poor permeability most of the rainfall goes as run-off and causes acute of flood problems in the adjoining villages. For the quick reclamation of alkali soils, application of amendments is essential.

(*ii*) **Saline soils.** The soils which contain excess neutral soluble salts to a affect crop growth adversely are called saline soils. The neutral soluble salts present widely include sodium chloride, sodium sulphate, calcium chloride, calcium sulphate, magnsium chloride and magnesium sulphate. The saline soils may occur as such or in areas which have also high water table. Saline soils tend to occur in areas which have mean annual rainfall approximately less than 550 mm. When the water table is high reclamation of saline soils basically requires that the water table is lowered and salts leached out of the root zone However, the quality of ground waters in saline areas unlike alkali soils is generally poor, and therefore, its use for irrigation in most areas can result in problems For this reason pump drainage as is feasible in alkali soils areas may not be always feasible in the saline areas and therefore, proper outlets for saline drainage waters will need to be found for disposal of the drainage waters.

1. SODIC SOILS

1.1 **Extent.** Sodic soils are widespread in the Indo-Gangetic plains in the states of Haryana, Punjab, Uttar Pradesh and parts of Bihar and Madhya Pradesh. The extent of these soils is estimated at about 2.5 million hectares. The distribution of sodic soils in individual states is given in *Table 2*. It has been found that sodic soils are dominated in areas with a mean

annual rainfall ranging from 550 to 900 mm. and generally occur in the relatively low-lying areas with insufficient surface/subsurface drainage.

1.2 **Reclamation Technology.** To reclaim these soils fro crop production and silve-pastoral management, the Central Soil Salinity Research Institute, Karnal, after its inception in 1969, has developed technically feasible and economically viable technology. The essential components of the reclamation technology for crop production are as follows :—

(*i*) Proper bunding and land levelling.

(*ii*) Avai lability of assured irrigation water.

(*iii*) Application of suitable amendment, generally gypsum, in right quantity and right manner.

(*iv*) Adequate application of fertilizers and manures along with zinc application.

(*v*) Choice of proper crops and varieties and cropping sequences.

(*vi*) Use of appropriate cultural and agronomic practices.

(*vii*) Proper water management.

1.3 The Progress

The land reclamation technology was economically feasible and sound under prevailing situation of farmers' resources therefore. It reflected a widespread adoption in the states of Punjab, Haryana and Uttar Pradesh. The progress of land reclamation in these three states is presented in Appendix *Table 3* It is estimated that nearly 2.33 lakh hectares have already been brought under cultivation in these three states. The cummulative progress of land reclamation, by the end of 1981-82, was 1.37 lakh hectares in Punjab, 0.66 lakh hectares in Uttar Pradesh and 0.30 lakh hectares in Haryana. The annual progress of sodic soil reclamation was estimated to be 27.62, 15.94 and 3.95 thousand hectares in the Sates of Punjab, Uttar Pradesh and Haryana respectively. Punjab, in the field of reclamation reflected a remarkable progress and the commulative linear trend implied that if the present trend continued, the fifty per cent alkali area would be reclaimed by the end of Sixth Five Year Plan. The progress of alkali soil reclamation in Haryana was quite slow after 1980-81. The reason for such a slow growth is being stated that most of the private owned alkali soils in Haryana gave already been reclaimed The major part of the remaining alkali soils exist with the village Panchayat/ community lands for which a suitable policy is urgently needed.

1.4 Constraints and Problems in Implementation

Because of its high production and profitability, the need for large scale reclamation programme has been well recognised. Despite of this fact, several factors became obstacle to the progress of the land reclamation programme. These constraints can broadly be divided into : (*i*) management of community land, (*ii*) amendment and resource availability, (*iii*) infrastructural development, (*iv*) Legal factors, and (*v*) technical knowledge.

(*i*) Reclamation and Management of Community Lands

A large chunk of alkali soils is belonging to the village panchayat/community. Since these are common property of the village society, therefore, no successful attempts could be

made to reclaim and manage these alkali soils under ownership of village panchayat. In this direction, the land under ownership of Panchayats should be developed by either government or an appropriate organisation, namely, cooperatives, voluntary agency etc., for forest/ pasture to provide the much needed fuel and fodder for rural areas. In this line, there is an urgent need to develop an appropriate organisational set-up to reclaim and manage these panchayat lands in a productive way.

(ii) Amendment and Resource Availability

The alkali soil reclamation technology needs a suitable amendment which is a core component for launching the programme. The quantity of amendment depends on soil characteristics and properties. However, the effective use of amendment depends on several management practices during and after reclamation. It has been experienced in the past that the amendment is not available well in advance. In this direction necessary acquisition, transport and distribution of network should be established in problem areas, so that the cultivators could easily have this important input. The existing subsidy on gypsum by the State and Central Government should be continued and its feasibility must be tested regularly.

Apart from soil amendment, in most cases, the availability of appropriate type of crop varieties, adequate amount of fertilizers including zinc sulphate, shall have to be arranged specially for the project. These may be made available through commercial banks, cooperative banks, gramin banks and through a special line of credit which may be refinanced by NABARD. It would be wise that implementation of all programmes should be done through a single authority so that the farmers do not have to go from piller to post.

(iii) Infrastructural development

To encourage the land reclamation programme, basic infrastructural development needs to be provided in the problem areas. This includes provision of assured irrigation facilities and electric supply. In this aspect, the tubewell should be owned by individual farmers so that they have an assured supply of water. Priority electrification would be wel-coming for installing the tubewells. Further, regular electric supply for irrigation would be essential for the success of the programme.

Another essential component on which the adoption of reclamation depends is the availability of capital with the cultivators. In this direction, financial support through credit would be of vital importance in large scale adoption of the programme. Nevertheless, efforts were made in the past to develop necessary infrastructure, for making easy availability of credit but flexibility and simplicities of the procedures laid down by the banks also play important role, particularly to the marginal and small farmers. Therefore, the credit policy for land reclamation needs to be modified. It would be welcoming that all the long and medium term loans on tube-well and on-farm development could have a 3 years initial moratorium after which the recovery should be done within a period of 10 years from small and marginal farmers and after 5 years from other farmers.

(iv) Legal factors

The fragmentation of land holdings hinders the reclamation programme. Due to fragmental land holdings, the cultivators, particularly the marginal and small could not

develop assured irrigation facilities at each fragment. Efforts in the past were made to consolidate the holdings but progress was quite slow in most of the states in India. In this aspect, suitable law should be passed for effective implementation of consolidation of land holdings, particularly those having alkali soil patches.

(v) Technical knowledges

The success of the programme depends entirely on the efficiency of the extension personnel to transfer the technical knowhow to the farmers. Appropriate training at field level, state level and national level should be made an integral part of the programme, so that proper understanding of the technology and its scientific implementation leads to success stories, and creates a sound impact on the subsequent programmes. In this direction following programmes would be beneficial :

(*a*) 2-days orientation programme for administrator and planners.

(*b*) 1-week training for field level staff.

These training programmes may be started before launching the field reclamation programmes.

In the new areas where the programme is to be initiated, a pilot project and demonstration programme should be taken up in the beginning.

(vi) Magnitude of the problem

Since the salt-affected soils in most of the states in the country have been assuming a great proportion, the exact magnitude of the problem is unknown. Therefore, centrally sponsored scheme of salt affected soils should be launched through Remote Sensing so that the exact size of the problem is known and the nature is detected for recommending appropriate technology.

1.5 Proposal for the Seventh Five Year Plan

Realizing the importance of increasing production surface in agriculture, a national lfvel policy to reclaim the alkali soils by 2000 A.D. would be most effective proposition. In this line, annual targets to reclaim these soils should be estimated and implementation may be carried out by allocating funds such that necessary infrastructure can be created. It has been estimated if the existing rate of land reclamation programme would be maintained in Punjab in near future, it would complete the programme by the year 1993-93. But the case of Uttar Pradesh and Haryana is quite different, where progress is slow as compared to Punjab. To complete the land reclamation programme by 2000 A D. the annual target for Haryana and Uttar Pradesh were estimated to be 13,002 hectares and 25,479 hectares, respectively. To achieve the targets, infrastructure may be created alongwith the arrangements of the crucial inputs in the problem areas. It has been estimated that roughly 131 67 lakh tonnes of gypsum would be needed to reclaim about 10.97 lakh hectares of land for crop production in the states of Punjab, Haryana and Uttar Pradesh. Accordingly crucial inputs, namely, seed, fertilizer, zinc sulphate, etc., would also be supplied in the places of use to meet the demand well in advance.

2. Saline Soils

2.1 Progress achieved

It has been estimated that saline soils occupy about 4.5 million hectares of the total salt affected soils in the country. The problem of salinity is widespread in the coastal regions. It is also rapidly developing in the areas where canal irrigation is being introduced. It has been observed that additional areas are being affected by the problem of soil salinity with faulty water management practices. It is being warned that without proper water management practices, the problem of soil salinity would increase gradually and pose a serious threat to the national food production. During the last three decades many major irrigation projects created the serious problem of water logging and soil salinity. Despite of recognising the problem by administrators and polity makers, efforts are still awaited to reclaim these lands in a large scale. In this direction, specific policies, organisational set-up and infrastructural development for coastal and inland salinity would be welcoming steps to utilize these problem soils for cultivation.

2.2 Constraints and problems in Implementation

To mitigate the evil of waterlogging and soil salinity drainage has been considered the most effective measure. Unlike alkali soil reclamation by individual farmer, the saline soils require cooperation and participation of all cultivators in the problem area. The main difficulties observed is adopting drainage for saline soil reclamation are: (*i*) peoples participation, and (*ii*) financial constraints. In fact, the reclamation of saline soils by drainage requires the participation of entire society to exploit the full potential of the programme, which is completely lacking in the existing administrative and organisational set up. Further, financial constraints are obvious with the cultivators owingl saline soils. It has been worked out that drainage requires huge investment in the initia stage of the programme.

Therefore, for effective implementation of the saline soil reclamation, peoples participation may be called for through launching several programmes. To overcome the problem of financial difficulties in implementing the programme, Central or State Government should undertake full responsibility of laying drainage in problem areas on a priority basis.

2.3 Proposals for the Seventh Five Year Plan

The technology for reclamation and utilization of saline soils is to be refined and perfected. Drainage programmes coupled with proper agronomic and silvi-pastoral practices should be tried on a sizeable scale so that the same may be replicated to other areas. In this contevt, starting of pilot projects during the plan period, in area of 500-1000 hectares would be most effective and useful. This should be taken up in all the States having a severe salinity problem. These pilot projects will help in defining proper options for drainage and organizational set-up required for management of salt-affected soils on a long term basis.

TABLE 1

Geographical distribution of salt-affected soils

Problem	*States in which the soil occur*	*Approximate area (million ha.)*
1. Coastal salt-affected soils		
(*a*) Coastal salt-affected soils of arid regions	Gujarat	0.714
(*b*) Deltaic coastal salt-affected Soils of humid regions	West Bengal, Orissa, Andhra Pradesh, Tamil Nadu	1.394
2. Salt-affected soils of the medium and deep black soils regions	Karnataka, Madhya Pradesh, Andhra Pradesh, Maharashtra, Rajasthan	1.420
3. Salt-affected soils of the arid and semi-arid regions	Gujarat, Rajasthan, Punjab, Haryana, Uttar Pradesh	1.000
4. Salt-affected soils of the Indo-Gangetic plain.	Haryana, Punjab, Uttar Pradesh Bihar, Rajasthan, Madhya Pradesh	2.516
	Total	7.044

Source : Bhumbla D.R. (1977) Indo-Hungarian Seminar on Management of Salt-Affected soil, 7-12 Feb. 1977 in abrol, I.F.P.M. Reclamation and Management of Salt-affected soils, *Review of Soil Researdh in India*, Part II, 12th International Congress of Soil Science, New Delhi, 8-12 Feb. 1982, p. 635-654.

TABLE 2

Extent of Salt-affected Soils in different states of India

State	*Area occupied by salt affected soils (million hectares)*
Uttar Pradesh	1.295
Gujarat	1.214
West Bengal	0.850
Rajasthan	0.728
Punjab	0.689
Maharashtra	0.534
Haryana	0.526
Orissa	0.404
Karnataka	0.404
Madhya Pradesh	0.227
Andhra Pradesh	0.212
Delhi	0.016
Kerala	0.016
Bihar	0.004
Tamil Nadu	0.004
Total	6.950 or 7.00

Source : Abrol ibid,

TABLE 3

Annual progress of sodic soil reclamation in Punjab, Haryana and Uttar Pradesh

State	*Total salt affected area (Lakh ha.)*	*Area reclaimed during the year (hectares)*							
		1974-75	*1975-76*	*1976-77*	*1977-78*	*1978-79*	*1979 80*	*1980-81*	*1981-82*
Punjab	6.88	NA	1486	1740	9348	26990	30000	33000	34000
Haryana	5.26	1800	3049	5610	4400	5360	4940	2050	2470
Uttar Pradesh	12.95	NA	NA	NA	3977	11448	18512	17065	14899

NA : Figures not available,

APPENDIX—V

Note on Land Reclamation and Development for formulation of the Seventh Five Year Plan—By Shri K S. Puri, Joint Secy. (SC) & LRC

PREAMBLE

Land is a natural endowment and inelastic in nature. It is the primary base for all agricultural and allied production systems. It is, however, not often realised that land is also the critical element for ensuring availability of most crucial input to any production system, namely, water. It serves as a storage as well as a medium to replenish the channel flow and the ground water storage to sub serve all socio-economic activities With the increasing population, both human and livestock, and greater developmental activities, the projected demand of requirement of food fodder & firewood, and industrial raw material will demand that more land is put under crop and plant management As per NCA's report, by 2000 A D. the country would need to put another 87 million ha. under various plant and crop management. On the other hand, available estimates compiled in the report of NCA, indicate that approximately 175 million ha. *i.e.* 53% of the country's geographical area is subject to soil erosion and land degradation. The country is also losing good arable lands to non agricultural uses such as urbanisation and industrialisation. Lot of forest areas are also being diverted due to developmental activities as well as extension of cultivation to meet the increasing demand. Much of the extension of cultivation is taking place on marginal lands.

INCREASED DEMAND FROM AGRICULTURAL SECTOR

In this context, activities of land reclamation and development need to be viewed. As per NCA's report sectoral socio economic compulsion are brought out in the following paras :

Requirement of Food & Allied Commodities :

By 2000 A D. for an estimated population of one billion, India will need an estimated 250 million tonnes of foodgrains, 35 million tonnes of sugar and gur and 10 million tonnes of oilseeds, besides 25 million bales of cotton and 17 million bales of jute and mesta In spite of increase in irrigation potential and taking other steps for increasing production, the area under some crops has to be increased. Though total cropped area has been projected for increasing to 200 million ha., the net sown area has been projected to 150 million ha.

Requirement of Forest Products

By 2000 A.D. industrial demand for wood is estimated at 20.7 million cu m. or 71 million tonnes This will demand that at least 48 million ha. be put under production forests. This means at least another 9 million ha. should have to be brought under production forest even after taking all present reserved forest areas as equivalent to such forests. At present 45% of household energy need is met from non-commercial sources such as agricultural wastes, cowdung and firewood. About 60-70 million cu m of firewood comes from industrial bye products and 13 million cu.m from recorded forest sources. Thus, bulk of the fuelwood need is met from unrecorded or unauthorised forest sources. The projected firewood need will be 225 million cu.m. as against 150 million cu.m. in 1970. Another estimate puts the need at 300 million cu.m. at 1990 itself against 256 million cu.m at 1980. Whatever may be the estimate,

by 2000 A.D. additional need of about 75 million cu.m. should have to come from trees and shrubs. This means that the country puts atleast another 30 to 40 million ha. under energy plantation alone besides increasing, through improved management, the firewood supply from the existing 36 million ha. of protected and unclashed forest.

Requirement of Fodder

Livestock population increased from 302 million in 1956 to 355 million in 1972 and projected at a staggering total of 473 million. While it is expected that the large number of non-descript cattle heads will be replaced by lesser number of cross-bred heads, the requirement of fodder will not decrease. Besides population of sheep and goats is expected to increase. This will mean additional area under fodder crops to meet the green fodder requirement of 595 million tonnes. The area under this has to be raised by 9.59 million ha. Similarly, need for providing meaningful grazing ground will also rise very considerably. Though grazing pressure within the limits of carrying capacity is not inimical to forest (except goat, the number of heads grazing in forest rose from 35 million in 1956 to 54 million in 1972 registering a rise of 52%. This means safe carrying capacity of 1.6 ha. per cow per year has already been far exceeded. It would, therefore, be necessary to relieve much of the existing forest areas from such exploitation.

RATIONALE FOR RECLAMATION

It would, therefore, be seen that a search has to be made through total land budget of the country to locate additional areas to the tune of 7 million ha. for cultivation, 35 to 45 million ha. for production & fuel wood plantation and 10 million ha. for fodder. With the intensive development of agriculture and advancement in technology, particularly for cultivation of paddy and wheat, as well as millets and oilseeds, there is some scope for marginal re-adjustment to reduce area under wheat and paddy by about 6 million ha. and increase yield of oilseeds and millets from existing acreage put under them. However, this will meet the additional requirement only marginally. The scope for horizontal expansion for various land management practices seems to be in the culturable wastelands (16.73 million ha.), fallows other than current fallows (9.82 million ha.), ravines and gullies (4 million ha.), saline and alkaline soils (7 million ha.), waterlogged area (6 million ha.), and coastal sandy areas and desert (effectively 20 million ha). Total of these comes to about 64.55 million ha. Utilisation of areas immediately along the railways, highways, roads and canals (total of about 1.5 million kms. length) may offer energy-cum-fodder plantation equivalent to 4 to 6 million ha. If tank bunds and field bunds are used possibly another 1 to 2 million ha. equivalent area may become available for plantation of grasses, utility shrubs and trees. It is, therefore, imperative for the country to take the programme of restoration of lands and utilisation of land lying idle in a perspective manner.

PROGRAMME AREAS AND EFFORTS MADE THROUGH SOIL CONSERVATION

The areas which could be considered for taking up programmes are as follows :—

Culturable Wastelands : The necessity of assessing the extent of such wastelands and identifying these areas in blocks more than 100 ha was recognised as back as 1959. A committee, namely, Waste Land Survey & Reclamation Committee, was set up which surveyed such areas in 12 States and identified nearly 6.4 lakh ha. in blocks 100 ha. and more. In the

Third Plan the Soil & Water Conservation Division implemented a Centrally sponsored scheme for Soil and Categorisation of Waste Lands in blocks of less than 100 ha. Under this scheme about 2.3 million ha. were identified in 15 States. In both these surveys it was felt that the terms 'culturable waste' serves little purpose unless supported by detailed information about the ownership, kind of limitations and availability of technology as well as cost needed for reclamation. It has been felt that after the identification of such blocks a diagnostic survey must be carried out for the locations where developmental and rehabilitation programmes are envisaged.

The National Commission on Agriculture reports that over the Plan periods *i.e.* from 1950-51 to 1973-74 through another Centrally sponsored scheme of Soil Conservation Division, about 1 11 lakh families were settled in an area of 1.9 lakh ha. The scheme was transferred to the State Sector at the end of the Third Five Year Plan. In review, NCA recommended such programme be undertaken through a Centrally sponsored scheme to maintain good progress.

Gullied and Ravinous Areas : About 4 million ha. area was degraded by gullies and ravines in about 12 States throughout the country. Gullies are found in different physiographic and rainfall conditions such as foothills along the Shivaliks as much as at elevation of 1300 metres, along the foothills of the Eastern Himalayas. Plateau in the East and South are variously eroded while ravines are found along the rivers of Chambal, Yamuna, Mahi, Sabarmati and others. These problems extend over different soil and topographic conditions. About 23.65 lakh ha. of such area are located in 4 States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat, while the first three States are having the special problem of dacoity. These ravines and gullies are again threatening another 4 to 6 million ha. of productive upland or command areas. The problem received attention of the State Governments as well as Centre even in early 50s. 3 out of 8 Research Stations set up by the Govt. of India during the First Plan were located in the ravinous areas, namely, Agra for Yamuna ravines, Kota for Chambal ravines and Vasad (Gujarat) for Mahi ravines. These Centres are now under the control of ICAR. During 1961-62 a Centrally sponsored scheme was launched for Identification and Categorisation of Ravinous Areas. Under the scheme an area of 8 3 lakh ha. was covered in 4 States. The surveys were carried out for categorising the ravines in depth groups indicating the feasibility of reclamation and cost thereof as well as ownership categories for determining the necessary land use practices. In accordance with these surveys it appeared that most of the table lands and shallow ravines, accounting 40% of the total ravinous areas, were owned by individuals. Medium and deep ravines, representing 29% of the total ravinous areas, mostly were waste lands and owned by Government, while 23% of the area in various physiographic descriptions are found to be grazing lands and owned by Panchayats and Villages. A Central Ravine Reclamation Board was set up which also went into the strategy for development, stabilisation and reclamation of ravinous areas. During 1967 this Board evolved a National Policy for treating ravinous areas on the following lines :—

(*a*) Treating table lands to control runoff and prevent erosion ;

(*b*) Preventing encroachment of ravines in the table lands ;

(*c*) Reclaiming shallow and broad ravines for agriculture/horticulture with irrigation.

(*d*) Stabilising medium and deep ravines for purposes of fuel and fodder reserves through afforestation supplemented by conservation structures.

In the context of dacoity problem, the Ministry of Home Affairs had set up an Inter Ministerial Working Group. The Working Group brought out the report in 1972 which endorsed the national policy and also gave an Action programme for 7 years for treating the areas of 3.3 lakh ha. in the States of Uttar Pradesh, Madhya Pradesh and Rajasthan. In the light of these developments the Union Government launched a Central Sector Pilot Project for Reclamation of Ravines with a view to demonstrate the feasibility of carrying out integrated ravine development works in compliance to the national policy as well as in accordance with the available research results. This scheme was also continued during the Fifth Plan in the name of Pilot Project for Protection of Table Lands & Stabilisation of Ravinous Areas. During 1979-80 it was transferred to the State Sector and till then an area of 3667 ha. at a cost of Rs. 6.49 crores was treated. After the transfer the States also operated this scheme on some modest scale. An area of about 1.15 lakh ha. was treated. The Sixth Plan programme for the States was to treat an area of 50,000 ha. at a cost of Rs. 10.97 crores. The States also have been implementing some of the foreign assisted programmes as part of the command area development, the details of which are not available. There had been attempts to obtain institutional finances for implementing these programmes on larger scale. However, establishing the bankability has been a problem. Besides, lending banks/financial institutes restrict their support only to the eligible farmers while bulk of the areas falling within the ravine watershed, which is not owned by individual, should also have to be treated with appropriate technology. Finance for this sector is not forthcoming. The banks do not seem to consider the total benefits in terms of appreciation of the land, generation of employment, in addition to increasing production for purpose of giving loans. Government, on the other hand, recognise that the critical degradation has resulted over the decades which resources of individual farmers cannot tackle to restore to productivity. Investment needs to be provided to insist the farmers initiate the reduction process. It may be mentioned that proper development of ravinous areas could help the country produce about 3 million tonnes in terms of foodgrains, fodder and firewood, besides generating employment and creating new resource base.

Alkali Soils : About 2.5 million ha. is affected by alkalinity while 4.5 million ha. is affected by salinity throughout the country. Nearly 2 million ha. out of 2.5 million ha. of alkali soil lie in the States of Punjab, Haryana and Uttar Pradesh. These areas do not grow anything and are subject to erosion as they lie fallow. Owing to their inability to absorb and re-utilise rain water for production of crops they also add to the problem of flood havoc. A viable technology is now available and it includes provision of quality irrigation water and preparation of field with bunding, land levelling, application of amendments such as gypsum/pyrites and cultivation of paddy and wheat in rotation. More nitrogen is required while application of zinc sulphate is also necessary for higher production. To ensure better performance higher plant population is recommended and special effort is made to hold water in the fields. With this available technology a pilot project for amendment of alkali soils for compact areas was initiated during the Fifth Plan in the States of Haryana, Punjab and Uttar Pradesh. The pattern of assistance was 50% of subsidies on the cost of amendments to the small farmers and 25% for others. The State Govt. provided additional subsidy to all to the tune of 25%. Till

1978-79 an area of 0.063 million ha. was treated in these States at a cost of Rs. 5.75 crores. After the transfer of this scheme during 1979-80 the States continued to increase their efforts and till date an area of 0.273 million ha. was treated in the three States.

There has been considerable effort at the instance of concern viewed by Prime Minister to prepare plan covering large tract. Besides, the technology for raising trees in the non agricultural land afflicted by lakalinity also became available which would help in generating village woodlot to meet part of the firewood requirement. During the discussions held on a draft Centrally sponsored scheme as well as proposal seeking World Bank assistance, prepared by this Division, a number of difficulties came up. The important ones are as follows :

(i) The first necessity for such programme is assured water sources and it is in most cases tubewell. In the State of Uttar Pradesh particularly a plea was made that the tubewell should be made by and large at the cost of Government as the beneficiaries are of economically backward sector. This meant considerable increase in cost.

(ii) The technology became economically acceptable as yield from the available varieties of wheat and rice vis-a-vis the cost of application of gypsum was favourable. However, with the steady increase in the cost of gypsum/pyrites and also cultivation cost, the proposition that remain still economically viable, is no more that attractive.

On both these counts, therefore, it is to be considered whether an element of subsidy fort he total package of programme should be given or not.

Restoration of Waterlogged Areas: There has been no serious effort even to identify the cause of waterlogging and its affect on the cropping pattern. Central Ground Water Board takes the depth of water table as the basis for categorising the malady whereas water-logging is both due to surface flooding as well as rise in water table through excessive irrigation, inundation, etc. The effect of water logging on the yield of crops, both in command areas or other areas, need to be studied more critically. No specific programme has been taken up to determine the adverse effect on crop as well as reclaiming these lands for remunerative uses.

Restoration of Fallows other than Current Fallows : During the productivity year 1981-82 a target of 4 lakh ha. was fixed for 8 States which had such areas more than 5 lakh ha. It was suggested to the States to bring these areas under productive land management either by raising trees or by extending cultivation with appropriate supply of inputs and supporting soil conservation measures. Wherever feasible development of orchards was also recommended. The States went with all earnest to locate such areas in the districts and carried out the programmes, as a result during 1982-83 an area of 3.83 lakh ha. *i.e.* 95% of the target was achieved. Out of this, about 2 lakh ha. was covered by agro-forestry activities, while 1.5 lakh ha. was brought under cultivation and about 23,000 was put under orchard plantation. Nearly 12,500 ha was provided with soil conservation and moisture conservation measures. During 1983-84 this programme was extended to 4 more States with a target of 4.30 lakh ha. Till September an area of 1.76 lakh ha. has been treated.

The States who took up this programme as a part of the productivity year drive faced a serious handicap on the following counts :

(*i*) Though there are some statistics about the availability of such lands, these data are not free of confusions. Some of the States like Gujarat and Orissa felt that some fresh surveys for identification and locating such areas need to be carried out before launching any programme.

(*ii*) The cause of keeping these lands fallow are very variable starting from lack of finance, absence of the owner, water-logging, extreme degradation, etc. It is therefore, absolutely necessary to have a diagnostic survey before launching the programme with appropriate land management practices.

(*iii*) These lands, though apparently lie idle, serve, some purpose to the village population and their livestock in one way or the other. The restoration of these lands to any other land management must consider these aspects and should not endorse a management practice which may interfere with their present usage.

(*iv*) There was no specific fund available for implementing this programme. The States, however, availed of the resources provided under various State and Central Schemes to implement this programme.

In order to achieve a significant breakthrough in restoring the culturable waste lands and fallows, it would be necessary to carry out survey for locating them and follow it with another diagnostic survey to determine the reclamability and management prescription. Definite funds must be provided to implement this programme. For all restoration programmes one of the most important things will be to acknowledge that these degradations have gone too far over the years and the resource base of individual beneficiaries cannot be considered adequate, even with credit flow, to tackle them. To some extent Government support, as one time investment, will be absolutely necessary.

Other Soil Conservation Programmes with Reclamation Elements

In all soil conservation works, through Central or State Sector, an element of land development and land reclamation exists. Representative studies carried out under the Centrally sponsored schemes of soil conservation in catchment of RVPs and integrated watershed management in floodprone river catchments had demonstrated utility of such works. These are in the form of treating gullied areas or areas subject to extreme erosion hazards. Mostly gullied areas in the Eastern and Deccan Pleatue are treated with small structures to develop small storage which help in reclaiming lands variously and providing mini-irrigation to such lands. These structures help in generating casual and regular employment. The case study of 16 such structures in Hirakud Catchment reveal that they together could restore 92 ha. of degraded lands, protecting about 352 ha. of table land from encroachment of gullies and providing irrigation to 541 ha. On the other hand utility tree plantations and shrubs like cashew, American silk cotton, sisal, karanja, amla, etc. on private/government wastelands have helped in rehabilitating wastelands owned by individuals or government very considerably. These lands have been used to re-settle landless people particularly in the State of Orissa. The

same state has found the species of sisal and cashew economically very viable. These species are being accepted by the farmers as part of their crop management to supplement their income and employment. The State has also gone ahead in a big way and even established a Corporation to handle cashew plantations. The exact extent of areas reclaimed and irrigation from such micro sources provided is not available from all States. These works, however, are very popular and little financial and technical support from the Government side can transform considerable areas, particularly those which are subject to water stress condition, into reasonably productive ones.

Similarly, in Rangali Mandira catchment, 113 silt detention structures constructed since 1977-78 at a cost of Rs. 3,86,058 could protect 477 ha. from further degradation, reclaim 211 ha. of gullied area and could generate an irrigation potential of 210 ha. During 1981-82, alone the Soil Conservation Scheme could benefit 1097 families including 125 Scheduled Castes and 872 Scheduled Tribe families.

In Damodar Barakar catchment of the DVC 5216 structures (erosion control/water harvesting/silt retention tanks) have been constructed till 1981-82 as a result of which 8576 ha. of degraded land have been reclaimed and protection was afforded to 99,448 ha. while in case of Hirakud, Orissa 1353 structures were constructed till 1977-78 As compared to Damodar Valley Corporation, in Hirakud these structures have resulted in more extensive restoration of degraded lands, irrigatmg additional lands both in Kharif and Rabi and thus providing very sizeable regular employment and returns to the beneficiaries.

In Lower Bhawani catchment, till 1981-82, 978 silt detention Dams/percolation ponds and permanent erosion control structures have been constructed in the catchment. These structures have 1608 wells and 2031 ha. of command area under their influence.

Waste lan ls, which were otherwise unproductive, could be profitably planted with cashew (8251 ha) and sisal (1300 ha) till 1977-78. Employment generation till 1977-78 in Hirakud catchment was 5.9 million mandays while in Machkund it was 3 42 million man days.

In the catchment of Machkund 22 gully control and storage structures were constructed till 1981-82 which could generate irrigation for an area of 1029 hac. The employment generated among the local tribal people during 1980-81 alone was to the tune of 1 97 lakh mandays.

Degraded gullied areas in Mayurakshi catchment, Bihar were treated with check dams, diversion bunds for irrigation, development of retention or bench terracing and afforestation. Analysis of data from two mini-watersheds with area of 114 ha. in Tepra and Matihara watersheds have revealed that 26 ha of erstwhile barren land could be put back to paddy cropping and 45 ha. under forest plantation. Against a total investment of Rs. 1,30,165 net annual income of Rs. 14,472 could be ensure.

SHIFTING CULTIVATION

The area of 4 33 million ha. under shifting cultivation need stability in terms of management to permit socio-economic development of the area. Measures for regulating shifting

cultivation should be carried out within the existing social framework in the best interest of the individual families, the community and the ecology.

During the Fifth Five Year Plan, a pilot project for control of shifting cultivation was launched in the N.E. Region and the States of Andhra Pradesh and Orissa under the Central Sector. During the Sixth Plan, the scheme is continuing only in Arunachal Pradesh and Mizoram. So far, 1700 families have been provided with permanent vocation through mixed land management on 2 ha. of developed land per family.

CONSTRAINTS

Owing to high investment in programmes of land development and reclamation and long gestation period there is constraint of adequate funds. There is also the difficulty of institutional finance due to low credit worthiness of the beneficiaries living on such marginal and sub-marginal lands.

APPENDIX—VI

Working Paper on Land Reclamation and Development

By

Dr. N N. Goswami
I.A R I. New Delhi

No doubt that with the continuous improvement in crop production technology, the growth rate in agriculture can be maintained to meet the requirements of the growing population for a decade or two at the most. Therefore, simultaneously we have to plan for developing new areas for cultivation by reclaiming waste lands wherever it is economically feasible. According to Planning Commission's report on waste lands (1963), the waste land available for cultivation are under categories of land utilisation statistics They are (*i*) other uncultivated land excluding fallow land, and (*ii*) fallows other than current fallows. The All India figures (1978-79) are 42.5 million hectares out of which 16 9 million hectares has been estimated as "cultivable waste land" and 9 5 million ha. as "Fallows other than current fallows".

The causes of land deterioration are many but the more important amongst them are the wanton misuse and continuous disease of the land as a result of interference by men and animals. Majority of the waste lands can be classified into six major categories : (*i*) land infested with shrubs and bushes, (*ii*) waterlogged land, (*iii*) salt affected lands, (*v*) riverine lands, and (*vi*) coastal sandy lands During the last 15 years newer technologies have been developed and also demonstrated to reclaim some of these lands particularly, eroded and salt affected lands but no large scale efforts have been made to reclaim and develop large blocks of such lands. Many State Governments have set up Land Reclamation and Development Corporations with a major responsibility to help the farmers in the reclamation.

Reclamation of salt affected soils

It is estimated that about 7 m hectares of land are affected by salinity or alkali or both. Research efforts over the past 10-15 years have resulted in evolving a package of practices for the reclamation and management of such soils particularly, alkali soils in the Indo-Gangetic plains.

In many states, there are Government agencies which help the farmers in procurement of inputs such as gysum, installation of tube-wells for irrigation, land levelling etc. They also assist the farmers in getting loans repayable in easy instalments. To make the programme further acceptable, the Government also provides a subsidy on the cost of gypsum. In the past 4-5 years nearly 100,000 ha of alkali soils have been reclaimed in the States of Punjab, Haryana and U.P.

In the 7th Five Year Plan, a target of 500,000 ha of salt affected soils can be achieved at the rate of 100,000 ha. in each year of the Plan. This additional area will produce about

3 m. tonnes of foodgrains at the present level of technology by following a rice-wheat rotation.

Waterlogged Soils

Precise data on the extent of waterlogged areas is not available, but according to estimates by different agencies and research workers, there are about 6 m. hectares of waterlogged lands. Out of this, 3.4 m ha. are subject to surface flooding, mostly in the States of West Bengal, Orissa, Andhra Pradesh, Punjab, Uttar Pradesh, Gujarat, Tamil Nadu and Kerala. The remaining 2.6 m. ha. have high water table occurring mainly in canal irrigated areas. The problem of waterlogging due to high water table conditions is very serious in the irrigated areas of Haryana, Punjab, Rajasthan and Uttar Pradesh.

Based on experience and years of research, the four methods have been suggested for improvement of water-logged soils. Used singly or in combination according to the situation, reclamation is ensured.

(*a*) **Drainage-surface or sub-surface or both to remove surplus water**

Experience shows that sub surface tile drains are not effective in lowering the water table in most of the waterlogging areas. Instead, vertical drains *i.e.* sinking of shallow tube-wells appears to be an ideally suited drainage measure for the control of water table.

(*b*) **Lining of canals to prevent seepage and rise of water table**

As far as new canals are concerned, they are being line, but gradually all existing canals and large distributors should also be lined.

(*c*) Sinking of tubewells and utilising the same water for irrigation.

(*d*) Connecting high water table areas with low water table tracts. This requires high level engineering techniques.

Various studies in Punjab have indicated that combination of surface drains and tubewells can effectively eradicate water-logging. The drainage water is generally suitable for irrigation and should be utilised as far as possible in the region itself.

Ravines

There are extensive areas of undulating lands with deep gullies, commonly known as ravines along the banks of the rivers Yamuna, Chambal, Mahi, Sabarmati and their tributaries in the States of Uttar Pradesh, Madhya Pradesh, Rajasthan and Gujarat. The rivers in high floods cut back into the ravines, thus further deepening and widening them. It is estimated that there are about 3.7 m. ha. of ravine lands in the country.

The earlier efforts of ravine reclamation have been in the nature of (*a*) forest plantations of economic species and (*b*) development of fuel/fodder reserves. During the early plan periods, systematic research in soil and water conservation in ravine lands has been emphasized and consequently a number of Soil Conservation Research Centres were established. Three of them being located in the ravine areas at Agra (U.P.), Kota (Rajasthan) and Vasad (Gujarat). More recently (1972), the Government of India appointed a working group to review the ravine problems and to formulate a programme of their reclamation. It has been

estimated that the production potential of ravine areas in U.P., M.P., Rajasthan alone would amount to 3 million tonnes of foodgrains annually, besides the programmes.

In the 7th Five Year Plan, before any large scale reclamation measures are taken, it is proposed to conduct a systematic survey of ravine lands with the help of aerial photo interpretation and remote sensing so that priority areas are identified and demarcated. This will help in selecting areas for agriculture, forest, fuel and fodder development.

As the ravine reclamation will have to be done on watershed basis land ownership boundaries, which might come in the way of scientific planning, will have to be suitably tackled, even by suitable legislative measures, if needed.

The other types of waste lands which require reclamation measures are : (*a*) Land infested with shrubs and bushes, (*b*) Riverine land, (*c*) Coastal sandy land, and (*d*) Lateritic soils.

(*a*) **Lands infested with shrubs and bushes** : These areas are best suited for fodder and fuel wood development. There is lot of information available with the silviculturists and the forest research Institutes about the suitability of the fuel wood and timber species of such areas. The other important use to which these lands can be put is to develop them into fodder reserves and link up with intensive programmes of cattle and sheep development.

(*b*) **Riverine lands** : The problem of 'Diara', 'khads', etc. occur on both sides of the river course, but their width varies with the flow characteristics of the river. In U.P. and Bihar alone there are about 2 5 m.ha. of such lands. Research findings from various Soil Conservation Research Centres are available to evolve suitable technologies for different ecological situations for successful establishment of permanent cover of economic species of fuel, fodder and inferior fruit trees.

(*c*) **Coastal sandy lands** : India has a long coast line of about 5,600 km. Sea and wind erosion, specially during the monsoon, is serious and extensive.

In Orissa, lot of work has been done in the reclamation of the sandy coastal areas by providing a wind break of '*Casurina equisitafolia*' along the coast line. There is second line of wind break and soil conservation through plantation of cashewnuts. In the third line, coconut plantations have been started Large scale reclamation of the coastal areas along these lines will be very effective and economically viable

(*d*) **Lateritic soils** : Extensive areas of land measuring about 12 m.ha. and consisting of lateritic soil, have severe crop production limitations due to low fertility and low water retention property. As the soil depth becomes shallow, it is extremely difficult to establish any vegetation, therefore, extensive areas of shallow soils are lying waste. Research is, therefore, to be strengthened to identify suitable species and develop technology for increasing production from such lands. Lands with thick soil cover may be utilised for tree plantations and shallow soils may be developed as grass lands.

APPENDIX-VII

Wasteland Reclamation, Soil Conservation and Land Development Work in Bihar by Shri S.K. Sarivastava, Agriculture Production Commissioner, Government of Bihar

In Bihar State, net cultivated area is 78.78 lakh hectares. Besides this, the current fallow is 21 lakh hectares and other fallow land is 14 lakh hectares. Mostly in North Bihar, the droblem of salinity and alkalinity exists in nearly 4 lakh hectares of land. With the system of canal irrigation coming up with the Gandak and Kosi Canal System, the problem of salinity and alkalinity may get aggravated further. Similarly soil acidity is major problem of arable land in Chhotanagpur and Santhal Parganas and a part of Purnea district. The problem of water-logging in *Chour* and *Tal* areas is also increasing with the construction of Kosi and Gandak Project in North Bihar.

During the plan period and even before, reclamation of Wasteland in this state was taken up under the Revenue Department of the State Government. This programme was implemented by manual labour supplemented by mechanised method of reclamation (Statements I & II). For proper utilisation of irrigational potential of Kosi Canal System in the year 1955-56, State Tractor Organisation was started for levelling of Vast tracts having undulating topography in Kosi belt Besides, the reclamation of Wasteland was also undertaken in North Bihar by this organisation.

Soil Conservation section was created under Agriculture Department of the State Government in the year 1957-58 during the Second Five-Year Plan. This section used to operate its programme in cultivator's fields whereas Wasteland Reclamation Programme under Revenue Department, operated on public lands. The wasteland reclamation programme of Revenue Department merged with Soil Conservation Section of Agriculture Department in the year 1968-69. After the merger of these two agencies, the Soil Conservation Department is functioning on watershed basis particularly in priority areas in the plateau and sub-plateau region. The works done are indicated in Statement III.

In the year 1962 63, Centrally Sponsored Scheme of Soil Conservation in Mayurakshi River Catchment for checking the siltation in the reservoir of Masanjore Dam was started. The progress of this scheme has been given in Statement IV.

In order to check the flow of silt in the reservoir of Teliaya, Konar, Maithan and Panchet dam, the Damodar Valley Corporation has undertaken soil conservation measures in the catchment of the river Damodar mainly in Hazaribagh District. This Centrally Sponsored Scheme is under D.V.C. The year-wise progress is given in Statement V.

Another Centrally Sponsored Scheme in Simdega sub-division of Gumla District was taken up under soil conservation department, of State Govt. to check the siltation in the reservoir of Mandira Dam constructed on the river Sankh. The progress of this scheme is placed at Statement VI.

Recently, in the year 1981-82, Centrally Sponsored Anti-flood Scheme in the catchments of the rivers Ajoy, Sone and Punpun has been started to reduce outflow of silt in rivers causing floods in Ganga basin The achievement has been given in Statement VII.

Consolidated achievement of wasteland reclamation, land development and soil conservation have been furnished at Statement VIII.

Besides above mentioned centrally sponsored schemes, soil conservation measures in drought prone area is also in progress in the State (Statement IX). Under the centrally sponsored scheme of Soil Conservation under Tribal sub plan with Special Central additive, nearly 35,782 hectares were treated during the Fifth Five-Year Plan and the Sixth Five-Year Plan, which would be evident from the figures furnished in Statement X.

This will appear from the enclosed report (Statement VIII) that till date only a fraction of the area (8.52 lakh hectares) has been treated under soil conservation programme, but still nearly 19 lakh hectares of the problematic area need immediate attention Besides problem of vast area of undulating land and salinity and alkalinity problem of north Bihar alongwith acidic problem of South Bihar need immediate attention

No proper identification of cultivable and unculturable waste land or culturable fallow land has been done for which Land Capability Survey is essential. The magnitude of problem can only be ascertained correctly after such scientific survey of problematic area is conducted.

Constraints and problems

The problems encountered in the process of land development are enormous and massive, some of which are enumerated below :—

(1) Lack of adequate resources to accelerate the rate of development so that all the problematic 19 lakh hectares may be covered under soil conservation measures immediately in shortest possible period.

(2) Lack of capital and trained manpower are the major constraints which have restricted the progress and kept it to 8 52 lakh hectares only till date.

(3) Enforcement of the Bihar Soil and Water Conservation and Land Development Act 1981 is a difficult job. Very few provisions of the said ct are enforced till now. The penal measures suggested in the Act for the offenders have yet to be enforced. This is due to present social structure which hardly permits the enforcement of the rules on the vast multitude of people responsible for causing erosion or apathetic to soil health.

(4) A separate cadre of personnel working in this job should be constituted with provision of future prospect and promotions so that trained persons with talent and dedication for job may be available to man the department.

(5) Lack of separate independent organisation for scientific survey investigation and planning of problematic area is also a constraint. This organisation can identify and survey scientifically the lands requiring treatment The soil conservation wing would be the executing organisation. This separation of survey and execution should be implemented by creating two organisations in phased manner.

(6) Strengthening of the Research Institute. It is felt that there should be full-fledged Institute for research for land reclamation, development and soil conservation located preferably at Hazaribagh. This institute can develop specifications and designs for different soil conservation measures keeping in view the guideline of the recommendation of Soil Conservation Manual issued from Dehradun from time to time.

(7) **Lack of Tractor Organisation.** In the year 1978-79 the State Govt. closed the State Tractor Organisation as it was running in loss. Due to high spurt in the levelling cost by tractors, poor cultivators could not afford to pay the levelling charges, as such the organisation was closed. The Organisation may be started again on the pattern of subsidy prevalent under the different categories of soil conservation measures.

(8) The problem of Saline-alkaline soils and acidic soil is dealt by the Deptt. of Agriculture of the State to the extent of availability of resources. However, the magnitude of the problem necessitate strengthening of the efforts and development of infrastructure.

Proposal for 7th Five-Year Plan

The proposal for 7th Five-Year Plan for this State is yet to be worked out. The points suggested above, however, would be carefully considered at the time of formulation of the programme.

STATEMENT—I

Progress of Land Reclamation Work Under State Sector Scheme of Waste Land Reclamation with Manual Labour

Sl.No.	*Period*	*Achievement (in hectares)*	*Remarks*
1.	Pre plan period	36,902	
2.	First plan period	63,200	
3.	Second plan period	10,039	
4.	Third plan period	27,054	
5.	Interim period (1966-67 to 1968-69)	13,545	
6.	**Fourth Plan period**		
	1969-70	2,040	
	1970-71	1,460	
	1971-72	2,120	
	1972-73	2,2.0	
	1973-74	2,070	
	Total	1,60,720	

STATEMENT—II

Progress of Land Reclamation Work under State Sector Scheme of Waste Land Reclamation by Tractors

Sl. No.	*Period*	*Achievement (in hectares)*	*Remarks*
1.	Pre-plan period	3,620	
2.	First plan period	2,872	
3.	Second plan period	10,636	
4.	Third plan period	5,618	
5.	Interim period (1966-67 to 1968-69)	1,381	
6.	**Fourth Plan period**		
	1969-70	25	
	1970-71	150	
	1971-72	1066	
	1972-73	1821	
	1973-74	5175	
7.	**Fifth Plan period**		
	1974-75	3387	
	1975-76	1167	
	1976-77	574	
	Total	37492	

STATEMENT—III

Progress of Soil Conservation Works under State Sector Scheme

Sl. No.	*Name of the Scheme*	*Year-wise Physical achievement*										
		Second plan	*Third plan 1961 to 66*	*Fourth Plan*					*Fifth Plan*				*Interim*
				69-70	*70-71*	*71-72*	*72-73*	*73-74*	*74-75*	*75-76*	*76-77*	*77-78*	*78-79 and 79-80*
1.	Soil Conservation Demonstration	30992	1,20,000 +214 small dams	—	—	—	—	—	—	—	—	—	—
2.	Soil Conservation works in Rainfed Areas	Nil	Nil	17540	10770	16230	19206	10430	16320	16349	16976	13502	13655
3.	Soil Conservation work in the catchment of Irrigation Project/ Dams	Nil	Nil	—	—	—	—	—	—	3779	3655	3552	2960
4.	Soil Conservation work under special employment programme	Nil	Nil	—	—	—	5350	6230	—	—	—	—	—
5.	Soil Conservation works as relief in Drought affected areas	Nil	Nil	—	—	—	—	—	—	—	—	—	—
	Total	30992	1,20,000 +214 S.D.										

STATEMENT—III (Continued)

Sl. No.	*Name of the Scheme*	*Year-wise physical achievement*				*Total*
		Sixth Plan				
		1980-81	*1981-82*	*1982-83*	*1983-84 (up to Oct.)*	
1.	Soil Conservation Demonstration	—	—	—	—	1,50,992 +214 S.D.
2.	Soil Conservation works in Rainfed areas	20157	17672	16547	5444	2,26,335
3.	Soil Conservation works in the catchment of Irrigation Project/Dams	3577	3304	2199	726	30,585
4.	Social Conservation works under Special Employment Programme	—	—	—	—	11,580
5.	Soil Conservation works as relief in Drought affected areas	4555	—	—	—	4,555
						4,23,467

STATEMENT—IV

Progress of Centrally Sponsored Scheme of Soil Conservation in Mayurakshi River Catchment (R.V.P.)

Sl. No.	*Period*	*Physical achievement (Area in hectares)*
1.	**Third Five Year Plan**	
	(from 1962-63 to 1965-66)	3968
2.	**Interim period**	
	1966-67	1532
	1967-68	1195
	1968-69	1551
3.	**Fourth Five Year Plan**	
	1969-70	2296
	1970-71	6030
	1971-72	3360
	1972-73	2650
	1973-74	1580
5.	**Fifth Five Year Plan**	
	1974-75	1611
	1975-76	2260
	1976-77	1838
	1977-78	1964
5.	**Interim Period**	
	1978-79	2321
	1979-80	2990
6.	**Sixth Five Year Plan**	
	1980-81	2452
	1981-82	2432
	1982-83	2777
	1983-84 (up to October)	821
	Total	45622

STATEMENT—V

Progress of Centrally Sponsored Scheme of Soil Conservation in Damodar River Catchment

Sl. No.	*Period*	*Physical achievement (Area in hectares)*
1.	**Third Five Year Plan** (1961 to 1966)	7884
2.	**Interim Period**	
	1966-67	2546
	1967-68	3728
	1968-69	3472
3.	**Fourth Five Year Plan**	
	1969-70	3380
	1970-71	2560
	1971-72	2070
	1972-73	1900
	1973-74	1900
4.	**Fifth Five Year Plan**	
	1974-75	1012
	1975-76	914
	1976-77	1623
	1977-78	2153
5.	**Interim Period**	
	1978-79	2362
	1979-80	1958
6.	**Sixth Five Year Plan**	
	1980-81	2446
	1981-82	1951
	1982-83	896
	1983-84 (up to October)	257
	Total	45012

STATEMENT—VI

Progress of Centrally Sponsored Scheme of Soil Conservation in Rangali—Mandira Catchment (R.V.P.)

Sl. No.	*Period*	*Physical achievement (Area in hectares)*
1.	**Fifth Five Year Plan**	
	1976-77	313
	1977-78	977
2.	**Interim period**	
	1978-79	1759
	1979-80	1637
3.	**Sixth Five Year Plan**	
	1980-81	2245
	1981-82	1708
	1982-83	1768
	1983-84 (up to October)	457
	Total	10864

STATEMENT—VII

Progress of Centrally Sponsored Scheme of Soil Conservation in the Catchments of River Sone, Ajay and Punpun

(Anti-flood Scheme)

Sl. No.	*Period*	*Physical Achievement (Area in hectares)*	*Remarks*
1.	**Fifth Five Year Plan**		
	1976-78	653	Only in the catchment of Sone under R.V.P.
2.	**Interim Period**		
	1978-79	1412	—do—
	1979-80	2037	—do—
3.	**Sixth Five Year Plan**		
	1980-81	2382	—do—
	1981-82	2870	Only in the catchment of Sone under Anti-flood.
	1982-83	2960	—do—
	1983-84	1180	In the catchment of Rivers Sone, Ajay and Punpun under Anti-flood.
	Total	13495	

STATEMENT—VIII

Consolidated Report of Cumulative Progress of Different Soil Conservation Programmes under State and Centrally Sponsored Schemes

Sl. No.	*Name of the Scheme*	*Physical progress (Area in hectares)*
	State Schemes	
1.	Waste Land Reclamation (With Manual Labour and Tractors)	1,99,471
2.	Soil Conservation Demonstration	1,50,992
3.	Soil Conservation works in Rainfed areas	2,26,355
4.	Soil Conservation works in the Catchment of Irrigation Projects/Dams	30,585
5.	Soil Conservation works under Special Employment Programme	11,580
6.	Soil Conservation works under Relief Scheme	4,555
	Total	6,23,538
	Centrally Sponsored Schemes	
1.	Soil Conservation works in Mayurakshi Catchment	45,622
2.	Soil Conservation works in Damodar Catchment	45,012
3.	Soil Conservation works in Mandira Catchment	10,864
4.	Soil Conservation works in Anti-flood Schemes	13,495
5.	Soil Conservation works under D.P.A.P.	75,304
6.	Soil Conservation works under Special Central additive in T.S.I. Area	37,492
	Total	2,27,820
	Grand Total	8,52,061

STATEMENT—IX

Progress of Soil Conservation Works Under Drought Prone Area Programme (Centrally Sponsored)

Sl. No.	*Period*	*Physical Achievement (in hectares)*
1.	**Fourth Five Year Plan**	
	1971-72	291
	1972-73	1511
	1973-74	591
2.	**Fifth Five Year Plan**	
	1974-75	2763
	1975-76	8154
	1976-77	5003
	1977-78	5048
3.	**Interim period**	
	1978-79	7769
	1979-80	9787
4.	**Sixth Five Year Plan**	
	1980-81	13957
	1981-82	10313
	1982-83	10117
	1983-84 (Up to October)	N.A.
	Total	75304

STATEMENT—X

Progress of Centrally Sponsored Scheme of Soil Conservation in Tribal Sub-Plan Area with Special Central Additive

Sl. No.	*Period*	*Physical Achievement (in hectares)*
1.	**Fifth Five Year Plan**	
	1975-76	5202
	1976-77	6531
	1977-78	7067
2.	**Interim period**	
	1978-79	5317
	1979-80	3122
3.	**Sixth Five Year Plan**	
	1980-81	2951
	1981-82	2213
	1982-83	2310
	1983 84 (Upto October)	1069
	Total	35782

APPENDIX-VIII

Note on Land reclamation and development for formulation of the VII Five Year Plan as desired by Shri K.C S. Acharya based on the reports received from different agencies by Shri M. Gopalakrishnan, I.A.S., Principal Secretary to Govt. and Agricultural Production Commission, Government of Andhra Pradesh

I. Present position

There is no scheme under operation f r land reclamation and development under the Centrally sponsored and State Sector Programme in Andhra Pradesh. Land reclamation development has been taken up in different districts with the cultivator's own resources or loans raised from Agricultural Development Banks.

In Andhra Pradesh under major and medium projects, saline alkali soils have been identified over 2.00 lakh hec Besides, this another 6.00 lakh hec. are estimated to be affected by salinity and alkalinity and are spread all over the State. In addition to that 1.00 lakh hec. of Acid soils have been reported.

As per the report of A.P. State Agro Industries Dev. Corporation, the Corporation is continuing land development works, both in command and non-command areas. As lands were developed also for utilising waters of irrigation projects, it is difficult to indicate how much of the area developed can be put under the category of "reclaimed alkaline lands, lands reclaimed after floods etc." The overall acreage developed since 1970 is to a tune of 1,87,110 hec.

II. The following were the general constraints pointed out by the Director of Agriculture, Managing Director, Agros Managing Director, Seeds Development Corporation

1. Reclamation of saline and alkaline lands are possible, only under the projects, where the lands are localised for wet cultivation.
2. Reclamation will cost about Rs. 1,500 per hec. in case of alkali soils. This is to be heavily subsidised, as farmers will be hesitant to invest from their own or loans for reclamation work.
3. A detailed survey is to be undertaken in each district, with regard to topography, soil type and the soil depth etc. In case of rainfed areas based on soils and existing land utility pattern appropriate cropping systems are to be recommended. For raising social forestry, orchards, pasture and annual crops in the rainfed fallow areas, there will be a need for formation of farm ponds and graded bunds along the contours.
4. Finances and machineries are required to take up from Govt. side land development for badly affected areas in areas where, with land development production, generated will be enough to meet the repayment of loans such as, one to be made available to the cultivators so that they may be encouraged to go for loans.
5. In the coastal low lying areas, drainage is a major constraint, which has to be taken up on a systematic line at Govt. cost or at subsidised rates.
6. Inter-disciplinary administrative set up consisting of Agriculture, irrigation, horticulture, ground water and forest department is a must.
7. Multiplication and supply of seeds and seedling material for suitable species, and

appropriate type, of plants to develop social forestry, horticultural and crop varieties suitable for saline, Alkaline lands are to be identified and should be supplied along with other inputs like fertilisers and credits.

III. **Changes suggested**

A.P. State Agro Industries Dev. Corp. feels that loans provided by A.P. Coop., Central Agrl. Dev. Bank or World Bank through NABARD, may be arranged to be routed through Agros. in order to ensure prompt and speedy development, for SLD works to be taken up in different commands, wherein Govt. of Andhra Pradesh is providing subsidy to a tune of Rs. 220 lakhs for next three years to farmers at the rate of 25% to 33-1/3%. It was considered that 50% of the loan could be released to Agros and subsidy for the same directly passed on to Agros, for taking up the work. Govt. used to subsidies, tariffs for work of land development undertaken by department of agriculture, prior to formation of the Agro Industries Corp. This is not being continued now. Subsidising tariffs will create tremendous response for land development through machines by organisation or agency like Agros.

While explaining the constraints for not entrusting work to Agros by the cultivators in project area under bulk programme of CADA, Managing Director, Agros suggested that legislation is needed making land development compulsory through Govt. agencies. He also stated that the cost of development with machinery according to the experiments in SRSP is about Rs. 1,313 per ha. where as with manual labour, it worked out to Rs 2,125 Not only the loaning limit is to be modified so that cultivators may go for SLD work but also to cover reasonably large area, under SLD Agro will have to go for new machinery. Project reports submitted to the Govt. of Andhra Pradesh be included in the Seventh Five Year Plan

IV. **The proposals for the 7th Five Year Plan suggested by A P. State Seeds Development Corporation, Director of Agriculture and A.P. State Agro Ind. Dev. Corp. are as follows**

1. **A.P. State Seeds Development Corporation :**

1. The extent of the area for reclamation and development in each district are to be identified ; lands are to be grid-surveyed for grading and to provide for better drainage.
2. Adequate drainage facilities must be provided in the areas affected by waterlogging and susceptible for waterlogging in new commands.
3. Use of ground water is necessary to reduce the spread of salt in the soils owing to flow irrigation ; Conjunctive use of ground water of these areas along with canal irrigation water for diluting the salt effect.
4. Suitable croping systems and crop varieties that can come up well in these soils are to be applied.
5. Supply of Gypsum for reclamation of Alkaline soils.
6. Arrangements must be made for supplying the required equipment for providing drainage facilities etc.
7. Adequate staff is to be provided to survey the areas for drainage purposes, for providing drains and also to provide the technical knowhow about the cropping systems etc.

8. Adequate quantities of seeds of suitable varieties in different crops and other inputs like fertilisers, pesticides and credit are to be made available at least at Firka level.

2. **Director of Agriculture's views :**

1. Under major projects (NSP, Right Canal, Left Canal, Pochampad Project, Tungabhadra Project high level canal) and under Krishna and Godavari deltas, reclamation of saline and saline-alkali soils over an area of 10,000 hec. per year is proposed at a cost of Rs. 15 00 lakhs per year covering cost of soil amendment and Rs. 5 00 lakhs towards the operational cost. Total outlay for the VII Five Year Plan will be about Rs. 100.00 lakhs
2. Flood-prone and coastal areas, saline alkaline areas are identified in case of Krishna & Godavari deltas only under rapid reconnaissance soil surveys which do not give required details for formulation of schemes. For formulating any scheme in those areas, detailed soil survey becomes essential for which 3 soil survey units are required during the 7th Five Year Plan.
3. However, a scheme for reclamation of saline coastal area on a small scale would be formulated shortly after undertaking detailed survey deploying the staff from other schemes. (The salinity index map of coastal area in respect of Krishna and Godavari deltas and also map showing approx. estimated saline alkaline areas are enclosed for perusal).

3. **A.P. State Agro Industries Dev. Corporation :**

1. There is need to provide continuous programme, at least 50% of the targetted areas should be entrusted to the Corporation by the C A.D. Deptt. All Govt. Land Development Work must be entrusted to Corporation.
2. To consider grant of subsidy on the Agricultural tariff being charged to farmers which should be at the disposal of the Corporation along with the loan amount in the beginning of the financial year so that the Corporation can meet the working capital needs
3. For providing World Bank Loan of Rs 120 lakhs per year for 5 years for purchase of new machinery to replace the existing old machinery. Which have outlived their life.
4. For reclamation of flood prone areas, saline and alkaline lands in coast. The funds earmarked by the Govt. both under Central and State Govts. should be kept at the disposal of the Corporation for timely deployment of machinery and men to complete the works in time.
5. Govt. of India to provide, as per the Finance Commission formula 3/4th the balance 1/4th being provided by the State Govt to meet the expenditure on land development works after Natural calamities. The State Govt. allocates margin money every year to meet expenditure on natural calamities A portion of this at the disposal of the Corporation so that the attend to these works on war-footing if natural ounts required can be paid while the works are under lps to increase the production due to timely actions onditions of the farmers will be restituted in the

6. For improving the present performance of about 1 lakh hours to develop about 14 to 15 thousand acres of land per annum with old machinery purchased during 1965-66 It has been proposed that out of 11.42 lakh acres identified, which need about 74 lakh hours of work, the Corporation can cover 25% of area by land development. Hence every year it can plan to achieve about 2 lakh hours/30,000 acres, provided the government helps in procuring new machinery besides liberal release of subsidies, loans and working capital for operation of this vital activity in the State.