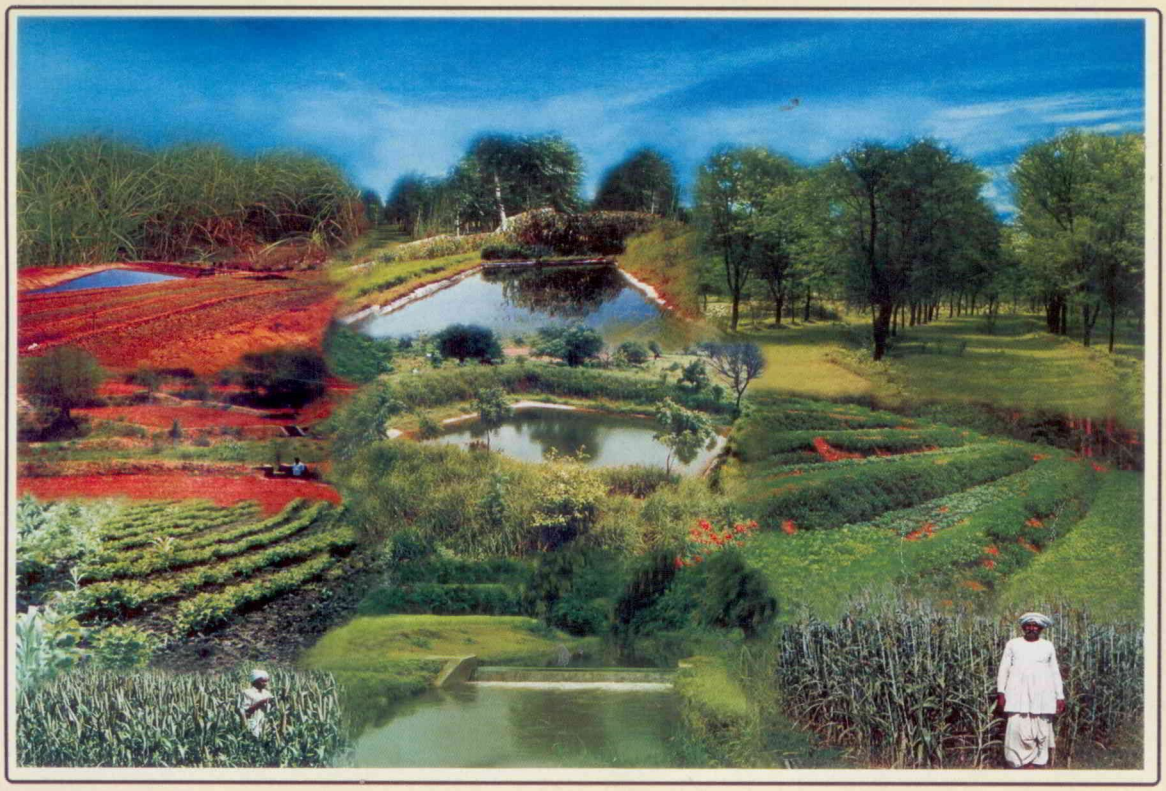
REPORT OF THE WORKING GROUP

OF

SUB-COMMITTEE OF THE NATIONAL DEVELOPMENT COUNCIL(NDC)



ON

AGRICULTURE AND RELATED ISSUES ON DRYLAND / RAINFED FARMING SYSTEM INCLUDING REGENERATION OF DEGRADED / WASTE LAND,WATERSHED DEVELOPMENT PROGRAMME

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CONTENTS

PREFACE

The Planning Commission, Government of India vide their Order No. Q-11050 / 19/2005 – Agri. Dated 9th December, 2005 constituted a Working Group of the Sub-Committee of the National Development Council (NDC) on **Agriculture and Related Issues on Dryland / Rainfed Farming System including Regeneration of Degraded / Waste Land, Watershed Development Programme** under the Chairmanship of Shri Narendra Modi, Chief Minister, Gujarat. the composition and Terms of Reference (ToR) of the Working Group are given at Appendix-I

2. The Terms of Reference (ToR), *inter-alia* included review of the on-going Dryland / Rainfed Farming and Wasteland Development Programmes, based on watershed approach, executed by the Central Ministries / Departments with critical analysis of the programmes and identification of gaps; performance and impact of various watershed development programmes in the country including regeneration of degraded / waste land; delineating outline contours of a "Watershed Plus" strategy that would build on natural resource potential of rainfed / dry farming areas to foster sustainable livelihoods and to integrate livestock husbandry and inland fisheries into this strategy; suggesting measures for reclamation and efficient use of waste land such as alkaline lands, ravine lands and seriously degraded lands, which require high cost for their reclamation and identify the role of PRI's and public-private-partnership in securing this objective; study the feasibility of public-private-partnership and scope for the investment by private sector in Watershed Development Programmes; delineating the outlines of an institutional mechanism (at all levels) to ensure high quality implementation of Watershed Programmes; suggesting measures for enrichment and improvement in the watershed programmes and for ensuring convergence of other development programmes in rainfed areas where watershed programmes are undertaken and to suggest measures / programmes for land resources development in the XI Five Year Plan and requirement of funds and also the area to be covered under the programmes of various Ministries / Departments as well as the State Governments.

3. The Working Group met for its first meeting under the Chairmanship of Chief Minister of Gujarat on 20.02.2006 at Gandhinagar. a copy of the proceedings of this meeting are annexed as Appendix-II. In order to get a systematic feedback and analysis of the schemes of the Central Government Ministries/Departments and to deliberate upon the ToR and allied issues, the Working Group decided to constitute four sub-groups. Each sub-group was assigned with specific ToR and allied issues. On the basis of reports submitted by the four Subgroups, the draft report of the Working Group was prepared.

4. The Sub-Group reports were consolidated and draft report was circulated to all the Working Group members for their considered views, comments and suggestion. The full working Group under the Chief Minister of Gujarat met at Gandhinagar on 21.12.2006 to discuss these Sub-Group reports as well as the draft final report. The proceedings of the Working Group meeting on 21.12.2006 are

annexed (Appendix-III). Based on the discussion held, the final report has been prepared.

5. The cooperation extended by all Members in preparation of the Working Group Report is duly acknowledged. I appreciate the efforts put by all the Working Group Members for giving their vulnerable thoughts and taking part in discussions and proceedings of the Working Group and Sub-Group meetings. The Chairmen of four Sub-Groups *viz.*, Shri Prem Narain Joint Secretary, DAC and Member Convenor (Sub-Group-I), Shri Y.S.P.Thorat, Chairman NABARD (Sub-Group-II), Dr. J.S.Samara Deputy Director General ICAR (Sub-Group-III) and Shri Vivek Bharati FICCI (Sub-Group-IV), took all sincere efforts in organizing Sub-Group Meetings and preparing Sub Group Reports. The four Sub-Group coordinators viz., Shri L.K.Tewari (Sub-Group-I), Shri K.R. Dandapani (Sub-Group-II), Shri Shamsher Singh (Sub-Group-III), and Shri S.K.Dalal (Sub-Group-IV) were instrumental in compilation of Sub Group Reports and therefore deserve special mention. Shri B. Rath Deputy Commissioner DAC, Shri B.V.Nageshwar Rao and Smt. Aarti Choudhary of RFS Division of DAC, Ministry of Agriculture helped in compilation and preparation of the final report and their contribution is thankfully acknowledged.

6. I take this opportunity to put on record the hard work done and valuable contribution made by Shri Prem Narain, Joint Secretary, Ministry of Agriculture, Government of India who served as the Member Convener of the Working Group. It was his sincere effort that this task could be accomplished in a short period.

7. I wish the report of the Working Group will provide a direction in determining the future National strategy in the field of Agriculture and Related Issues on Dryland / Rainfed Farming System including Regeneration of Degraded / Waste Land, Watershed Development Programme.

Narendra Modi
Chief Minister, Gujarat

INTRODUCTION

1. Food grain production in the country accrues from approximately 142 million hectares of cultivated land. Of this, 40 per cent is irrigated and accounts for 55 per cent of production. The remaining 85 million hectares are rainfed and contribute 45 per cent to total agriculture production. The Green Revolution was the principal instrument in imparting dynamism to agricultural growth in the post Independence era in India. Modern agricultural technology developed and extended since independence has contributed to unprecedented agricultural growth in the country. Green Revolution mainly concentrated in the irrigated areas and therefore, by and large bypassed the rainfed regions. Rainfed agriculture is complex, diverse and risk prone and is characterized by low levels of agriculture productivity and low input usage. Dependence on rainfall makes crops production considerably unstable in rainfed areas which are the habitat of the bulk of rural poor in the country. Rainfed areas are further subjected to large scale soil degradation problems and rapid depletion of ground water tables which deteriorate the production levels in these thirsty and unhealthy soil conditions. Similarly, in other dryland, degraded and wasteland areas it is difficult to achieve agricultural production due to large scale soil degradation, scarcity of water and non availability of required nutrients in the soil. There are, however, some technologies available for stepping up the productivity and production level in the rainfed areas, degraded and wastelands, on a sustainable manner. In order to exploit the available potential for stability and growth of agricultural production and to achieve the various national objectives like reduction in regional inequalities and poverty, creation of income generating and productive employment opportunities and improvement of ecological balance a systematic and strategic approach is required for holistic development of rainfed, dryland, degraded and wasteland areas.

2. Farming in rainfed areas is possible only when adequate precipitation is available to keep soil moist for supporting cultivation. Rainwater therefore, plays a pivotal role in providing livelihood support for rural people in these regions. Eighty percent of the world's agricultural land is rainfed and contributes to about 60 percent of the global food production. An insight into the rainfed regions of India, however, presents a grim picture of water scarcity, fragile ecosystems and land degradation due to soil erosion by wind and water, low rainwater use efficiency due to poor investments, high population pressure, poverty, poor infrastructure and inappropriate policy support. In the Indian context, poverty and hunger remain stubbornly which is evident from the fact that the last two Plans the agriculture sector was plagued with lowest growth rates of production and productivity. The total farm production and farm income has by and large declined and country has witnessed acute agrarian crisis.

3. As per studies conducted by various research organizations, the current rainwater use efficiency for crop production in these regions in India is low, ranging between 30 to 45 %. Therefore, a major chunk of seasonal rainfall goes unproductive; lost either as surface run-off or deep drainage. The cropping pattern is restricted to availability of rainy days *vis-à-vis* the extent of precipitation. There is lesser scope for crop diversification. As a result the uses of inputs, which are essential ingredients for

enhancing yields, are also lower. The net result is therefore, the low productivity, which affects the economy of the region to a large extent. The challenge before Indian Agriculture, therefore, is to improve agriculture system based rural livelihoods through efficient and sustainable rainwater management technologies for increasing productivity in a sustainable manner and to contribute to livelihood security.

4. Although, Green Revolution in India is a success story but unfortunately, the revolution eluded the rainfed areas. As a result, food security continues to be fragile in these areas. During the years of drought when rainfed crops suffer, there is sharp decline in annual production of food grains. Agricultural statistics reveal that whereas the production and productivity of irrigated crops has increased manifold since independence, thanks to the Green Revolution, the production of oilseeds and pulses which are largely grown in rainfed areas has maintained relatively at low levels. The serious shortages of oilseeds and pulses and the resultant increase in their prices are, therefore assuming proportion of crises and need to be tackled on a sustained basis.

5. Despite various schemes of Government of India, State Governments and the Externally Aided Projects, the fate of farmers' in these areas continues to remain a gamble in the monsoon. Rainfed farming continues to be critical for meeting the livelihood needs of a vast majority of small, marginal and tribal farmers in such areas of the country. The benefit of development of new technologies related to crops, resource management, livestock, and fisheries have not filtered down amongst farmers in rainfed areas to the extent that this has happened amongst farmers in irrigated areas. This is mainly due to the low and fluctuating productivity as well as the low risk bearing capacity of the rainfed farmers, for whom risk aversion is more important than productivity enhancement. Although during the past ten years more than 30 million hectare land belonging to rainfed, dryland and degraded categories has been treated under different schemes, yet the out come / impact has not been captured in the national agricultural production, productivity, income and equity indicators.

6. Low rainwater use efficiency and the constant threat of water scarcity and consecutive droughts further aggravate the situation. Land degradation and declining soil health are matters of serious concern. As per an estimate the value of soil degradation during 1980s and 1990s ranged from 11 to 26 % of GDP. The cost of salinity and water logging has been estimated at Rs. 120 billion to Rs. 270 billion. If the cost of environment damage is taken into account, India's economic growth comes to minus 5.73 % per annum as against plus 5.66 % estimated other wise. The challenges are further compounded due to acute fodder shortage and poor livestock productivity along with institutional and infrastructural deficiencies like appropriate resource mobilization and lack of assured and remunerative marketing opportunities. Thus improvement in the efficiency of available water, land, bio resources and forests is critical task for the development.

7. The rainfed agriculture has remained a high priority area in past few Five Year Plans. The Government of India has identified this area as one of the key priorities to address the problems of poverty, food insecurity and regional and gender inequity. Any

improvement in the livelihood of the farmers and landless labourers in these areas is intimately linked to the progress to be achieved in rainfed agriculture systems including horticulture, agro-forestry, livestock, poultry and other related farming systems. A Rainbow Revolution is therefore, needed for achieving congruent and synergistic improvement of all the components leading to enhanced and sustainable agricultural productivity and profitability and strengthening of livelihoods through eco-technologies, diversification, value addition, and employment opportunities.

8. National Agriculture Policy (2000) accords abiding importance to the development of rainfed areas, degraded and waste lands. But unfortunately so far the investments made in this regard have remained confined mainly to the Government schemes and a few externally aided projects. Since systematic development of these regions will require a huge sum as well as appropriate technical know how, it is high time that a strategy involving private sector both in terms of supply of technical know how and investments be resorted to. The credit, insurance and other economic instruments which are essential for development of rainfed areas, degraded and wastelands are also needed to be properly geared. A uniform and more conducive institutional mechanism for programme formulation, implementation, monitoring and evaluation has become an urgent need of the hour. At the same time impact assessment of various programmes and replication of successful models else where is also required to be taken on priority basis.

9. All the aforementioned concerns have been evaluated in the context of the programmes implemented so far and particularly with reference to schemes undertaken during the X Five year plan. Identification of gaps and measures to fill them in successive programmes have been suggested which are likely to help in improving the quality of programme implementation in the XI Plan. Issues like Public Private Partnership, Involvement of Panchayat Raj Institutions in watershed programmes, a uniform institutional mechanism, coordination of inter-departmental programmes, appropriate strategy for sustainability of watershed programmes and convergence and dovetailing of programmes in rainfed degraded and wastelands under development through watershed approach need to give adequate thrust in the XI Plan.

10. About 146.80 m ha hectare land has been identified as degraded in the country consisting of water erosion (93.7 m ha), wind erosion (9.5 m ha), water logging (14.3 m ha), salinity and alkalinity (5.9 m ha), soil acidity (16.0 m ha) and complex problems (7.4 m ha). These degraded areas, have potential to increase the productivity of land after appropriate amelioration / development. The evaluation studies have showed that in the treated areas of degraded land, the crop yield and intensity have increased significantly, and, therefore offers a promising hope for the future. These areas, therefore, should be accorded high priority in XI Plan.

11. Sustainability of developmental work taken up in watershed areas has not been evaluated satisfactorily. Most of the programmes could not make impact beyond project phase since watershed programmes focused on soil and moisture conservation, land development and employment generation. Proper integration of other farming systems

in these programmes as well as livelihood support systems are, therefore, essential. This will require promotion of these systems through watershed plus activities with the help of credit support.

12. It has been observed that weak institutional mechanism is one of the important reason for failure of watershed programmes. A weak institutional mechanism affects the watershed development programme both in its implementation as well as in its sustainability. Involvement of community from planning through implementation and in post project phases with appropriate institution, is therefore, essential for success of these programmes. The appropriate linkage with Panchayati Raj Institutions (PRIs), watershed communities, implementing agencies and research institutions are required. At district, state and central level separate coordinating bodies are essential. Setting of the National Rainfed Area Authority (NRAA) at the central level is a step in the right direction.

13. Realizing the importance of problem soils, watershed plus activities, institutional mechanism and Public-Private Partnership in the context of Natural Resource Management and Watershed Development Programmes, separate chapters have been dedicated on these issues.

CHAPTER - I

CRITICAL REVIEW OF THE ONGOING DRYLAND/ RAINFED FARMING/ WATERSHED DEVELOPMENT PROGRAMMES BASED ON WATERSHED APPROACH EXECUTED BY THE CENTRAL MINISTRIES / DEPARTMENTS

Introduction

14. The land serves as storage for water and nutrients required for plants and other living organisms. The demand for food, energy and other human requirements depends upon the preservation and improvement in the productivity of the land. But, our land resources are limited. India has about 18% of world's population and 15% of livestock population to be supported from only 2% of geographical area and 1.5% of forest and pasture lands. The increasing human and animal population has reduced the availability of land over the decades. The per capita availability of total land has declined from 0.89 hectare in 1951 to 0.37 hectare in 1991 and is projected to slide down to 0.20 hectare in 2035. As far as net cultivated land is concerned its per capita availability has declined from 0.48 hectare in 1951 to 0.16 hectare in 1991 and is likely to decline further to 0.08 hectare in 2035. This decline in per capita land availability in the country is mostly on account of rising population.

15. Out of 328.7 million hectare of geographical area of India, 142 million hectares is net cultivated area. Of this, about 57 million hectare (40%) is irrigated and the remaining 85 million ha (60%) is rainfed. The entire 69 million ha. of forest land is essentially rainfed with a large scope for enhancing its productivity and complementarities to arable land for reducing pressure on utilizable resources. A statement showing state wise Geographical area, Net sown area, Net irrigated area and Rainfed area is given at **Annexure – I**. This area is generally subject to wind and water erosion and is in different stages of degradation for subjecting to intensive agricultural production. There are immense possibilities of land reclamation, conservation and recycling of rainwater for harnessing multiple use.

16. The information on the extent of soil degradation in the country has been assessed by various agencies. The estimates of these agencies vary widely *i.e.* from 63.9 m. ha to 187 m. ha, due to different approaches in defining degraded soils and adopting various criteria for delineation. The main agencies that have estimated soil degradation are; National Commission on Agriculture (NCA, 1976), Society for Promotion of Wasteland Developments (SPWD, 1984), National Remote Sensing Agency (NRSA, 1985), Ministry of Agriculture (1985), and National Bureau of Soil Survey and Land Use Planning (NBSSLUP, 1984 & 2005).

17. The problems of land degradation are prevalent in many forms throughout the country. In most cases, a combination of such problems exists. In the absence of comprehensive and periodic scientific surveys, estimates have been made on the basis of localized surveys, estimate or studies. As per recent (2005) study conducted by National Bureau of Soil Survey and Land Use Planning, (NBSS&LUP), Nagpur, an ICAR Institute, a total of 146.82 million ha. area is reported to be degraded. This

indicates land affected by water erosion (93.68 million ha.), wind erosion (9.48 million ha.), water logging/flooding (14.30 million ha.), salinity/alkalinity (5.94 million ha.), soil acidity (16.04 million ha.) and complex problems(7.38 million ha.). The details of area suffering from various kinds of land degradation are given at **Annexure-II**. The Waste Land Atlas prepared by National Remote Sensing Agency, Hyderabad, in 2005, for the Ministry of Rural Development , however indicates that only 55.27 million hectare land falls under various categories of wastelands. The category wise and State wise details are given at **Annexure-III & IV** respectively.

Evolution of watershed approach

18. With decreasing per capita availability of land and water resources livelihood for growing population and urbanization is to be met by increasing productivity especially of rainfed agriculture and restoration of wasteland. The benefits of Green Revolution remained confined to irrigated areas which account for 40% of the cultivable land. The remaining 60% of the cultivable land, which largely depends on monsoon rains for agriculture production, was by and large surpassed by the Green Revolution. As the rainfed areas, including dryland and the degraded lands of the country, have peculiar hydrological, and pedological problems, a specific approach for development of these areas, to cater the need of agricultural production was necessitated.

19. As a first step, to stabilize the catchments of large reservoirs and to control siltation, a Centrally Sponsored Scheme of “Soil Conservation Work in the Catchments of River Valley Projects (RVP) ” was launched by the Ministry of Agriculture in 1962-63. The MoA also started a scheme of Integrated Watershed Management in the Catchments of Flood Prone Rivers (FPR) in 1980-81. During 1980s several successful experiences of participatory managed watersheds, such as, Sukhomajri in Haryana and Ralegaon Sidhi in Western Maharashtra came to be reported. In 1982-83 MOA launched a scheme for propagation of water harvesting/ conservation technology in rainfed areas in 19 identified locations. The Ministry of Rural Development adopted the approach in 22 other locations in rainfed areas. The Indian Council of Agriculture Research (ICAR) was also involved to provide necessary research and technology support to these 41 watersheds, so as to develop “ model watersheds” in different agro-climatic zones of the Country. With experience gained from all these, the concept of integrated watershed development was first instutionalized with launching of National Watershed Development Project for Rainfed Areas (NWDPRA) in 1990 covering 99 districts in 16 States.

20. Incidentall*y,* rainwater conservation and management work was ongoing under the Drought Prone Areas Programme (DPAP) launched by MoRD in 1972-73. The objective of this programme was to tackle the special problems of areas constantly affected by severe drought conditions. In 1977-78, the MoRD started a special programme for hot desert areas of Rajasthan, Gujarat and Haryana and cold desert areas of Jammu & Kashmir and Himachal Pradesh (which were earlier under DPAP) called Desert Development Programme (DDP).

21. In 1994, a Technical Committee under the Chairmanship of Prof. C.H. Hanumantha Rao was appointed to appraise the impact of DPAP/DDP; to identify weaknesses of the development process and to suggest improvements. The Hanumantha Rao Committee felt that "the programmes have been implemented in a fragmented manner by different departments through rigid guidelines without any well-designed plans prepared on watershed basis by involving the inhabitants. Except in a few places, in most of the cases the achievements have been dismal. Ecological degradation has been proceeding unabated in these areas with reduced forest cover, declining water table and a shortage of drinking water, fuel and fodder" (Hanumantha Rao Committee, 1994, Preface). The Committee, therefore, recommended to revamp the strategy of implementation of these programmes, drawing upon the "the outstanding successes" of some ongoing watershed projects. It recommended that sanctioning of works should be on the basis of the action plans prepared on watershed basis instead of fixed amount being allocated per block as was the practice at that time. It called for introduction of participatory modes of implementation, through involvement of beneficiaries of the programme and non-government organisations (NGOs). It recommended that "wherever voluntary organizations are forthcoming, the management of watershed development should be entrusted to them with the ultimate aim of handing over to them one-fourth of total number of watersheds for development". The Committee also called for a substantial augmentation of resources for watershed development by "pooling resources from other programmes being implemented by the Ministry of Rural Development, e.g., Jawahar Rozgar Yojana, Employment Assurance Scheme, etc., and by integrating them with DPAP and DDP". The Committee recommended suitable institutional mechanism for bringing about coordination between different departments at the central and state levels with a view to ensuring uniformity of approach in implementing similar programmes for the conservation of land and water resources. On the basis of these recommendations, the Hanumantha Rao Committee formulated a set of "Common Guidelines", bringing five different programmes under the MoRD, namely, DPAP, DDP and Integrated Wastelands Development Programme (IWDP), as also the Innovative- Jawahar Rozgar Yojana (I-JRY) and Employment Assurance Scheme (EAS), 50% of the funds of both of which were to be allocated for watershed works. The watershed projects taken up by MoRD from 1994 to 2001 followed these Common Guidelines of 1994. In 2000, it was agreed that watershed projects with a specific focus and unique characteristics; such as, reclamation of problem soil (MoA), and Integrated Afforestation and Eco-development Projects (MoA) would require a different approach in keeping with their unique project components and special institutional requirements. Therefore, in respect of major Watershed Development Projects; *viz;* NWDPRA and WDPSCA of MoA, DPAP, DDP, EAS and IWDP of MoRD which account for the major share of funds and geographical area, a Common Approach / Principles was accepted. Accordingly, the Ministry of Agriculture revised its Guidelines for NWDPRA, making them "more participatory, sustainable and equitable". These were called WARASA – JAN SAHABHAGITA Guidelines. The Common Guidelines of 1994 were revised by MoRD in 2001 and then again modified and reissued as "Guidelines for Hariyali" in April 2003. The watershed programme became the centerpiece of rural development in India. The Ministry of Environment and Forests as

well as bilateral funding agencies are also involved in implementation of watershed projects in India.

Perspective Plan for Watershed Development Programmes

22. The Working Group on Watershed Development, Rainfed Farming and Natural Resource Management for the Tenth Plan constituted by the Planning Commission had assessed that 88.5 million ha. degraded wasteland including rainfed areas would need development. The Working Group report envisaged to cover the entire 88.5 million ha. land in four successive Five Year Plans, commencing from the Tenth Plan up to the Thirteenth Plan at an estimated cost of Rs 72,750 crore (at 1994 prices). Cost sharing ratio between the Center, States and People/ Community in each Plan was also suggested. The details are given at **Annexure-V.**

23. Approximately, 20.00 million ha. area is likely to be developed during the Tenth Plan period and therefore, about 68.50 million ha of area will require development after the Tenth Five Year Plan.

Ongoing Watershed Development Programmes

24. Various Central Ministries and Departments are implementing programmes for the development of degraded lands and rainfed areas, on watershed basis. These programmes, besides land resource development, have an inherent focus on rainwater conservation and water harvesting technologies for their effective use in the development process. The scheme wise physical and financial achievements of watershed programmes of MoA, DoLR, MoEF and the Planning Commission, up to the end of the Ninth Five Year Plan and in the first four years of the Tenth Plan (2002-03 to 2005-06) are given in Table-I.

Table-I: Degraded Lands Developed under various Watershed Development Programmes

(Area in Lakh ha and Expenditure in Rs.Crore)

Sl.	Ministry/ Scheme and year of start	Progress up to IX Plan		Progress in X Plan (first 4 years) (2002-06)		Total since inception up to March, 2006	
		Area	Expr.	Area	Expr.	Area	Expr.
(A) **Ministry of Agriculture (Department of Agriculture & Cooperation)**							
1.	NWDPRA (1990-91)	69.79	1877.74	15.80	793.82	85.59	2671.56
2.	RVP & FPR (1962 & 81)	54.88	1516.26	7.63	521.48	62.51	2037.74
3.	WDPSCA (1974-75)	2.58	166.27	0.95	89.31	3.53	255.58
4.	RAS (1985-86)	5.81	76.39	1.06	29.55	6.87	105.94
5.	WDF (1999-2000)	-	-	0.39	21.02	0.39	21.02
6.	EAPs	13.35	2039.81	3.80	1527.54	17.15	3567.35

Sub Total		**146.41**	**5676.47**	**29.63**	**2982.72**	**176.04**	**8659.19**
(B) **Ministry of Rural Development (Department of Land resources) ***							
1.	DPAP (1973-74)	68.95	3284.74	52.82	1197.76	121.77	4482.50
2.	DDP (1977-78)	33.56	797.38	33.82	882.50	67.38	1679.88
3.	IWDP (1988-89)	37.34	616.51	47.22	1336.64	84.57	1953.15
4	EAP	1.4	18.39	2.57	194.28	3.97	212.67
Sub Total		**141.25**	**4717.02**	**136.43**	**3611.18**	**277.68**	**8328.20**
(C) **Ministry of Environment & Forests**							
1.	NAP (1989-90)	**0.70**	**47.53**	**-**	**-**	**0.70**	**47.53**
TOTAL (A+B+C)		**288.36**	**10441.02**	**166.06**	**6593.90**	**454.42**	**17034.92**

* *Expenditure indicates the amount released and the progress area is the area targeted to be covered under the approved projects.*

Abbreviations

NWDPRA - National Watershed Development Project for Rainfed Areas; **RVP & FPR** - River Valley Project & Flood Prone River; **WDPSCA** - Watershed Development Project for Shifting Cultivation Areas; **RAS** - Reclamation of Alkali Soil ; **WDF** - Watershed Development Fund.
DPAP- Drought Prone Area Programme; DDP-Desert Development Programme;
IWDP - Integrated Wasteland Development Project.
NAP - National Afforestation Programme
EAP - Externally Aided Projects

Watershed Development Programmes of Ministry of Agriculture :-

National Watershed Development Project for Rainfed Areas (NWDPRA)

25. The National Watershed Development Project for Rainfed Areas (NWDPRA) was launched during 1990-91 (Seventh Five Year Plan) on pilot basis. In the Eighth Plan, the NWDPRA was extended to twenty five States and two Union Territories (Andaman & Nicobar Islands and Dadar & Nagar Haveli). The programme continued in the Ninth Plan. Since November 2000, the NWDPRA has been subsumed under Macro Management of Agriculture (MMA). During the Tenth Five Year Plan this programme is being implemented in twenty eight States (including the three newly created states of Chattisgarh, Jharkhand and Uttaranchal) and the two Union Territories.

26. The broad objectives outlined for the NWDPRA are;

1. Conservation, up gradation and sustainable utilization of natural resources.
2. Enhancement of agricultural productivity in sustainable manner.
3. Restoration of ecological balance in the degraded and fragile rainfed eco-systems by greening these areas through appropriate mix of trees, shrubs and grasses.
4. Reduction in regional disparity between irrigated and rainfed areas, and,
5. Creation of sustained employment opportunities for the rural poor.

27. NWDPRA has been thoroughly restructured by retaining the technical strength of the earlier programme and incorporating the lessons learnt from successful projects, especially on community participation. The average unit cost of treatment for less (<8%) sloppy areas is Rs.4500 per ha and for highly (>8%) sloppy area is Rs.6000 per ha. The pattern of sharing between Centre and State is in the ratio of 90:10 and the financial assistance is provided to the States as 80% grant and 20% loan. The programme is being implemented under the WARASA – JAN SAHBHAGITA Guidelines, since October,2000.

28. Salient Features of the scheme are as below**:**

- Conservation of natural resources
- Integrated development of natural as well as social resources
- In-situ moisture conservation
- Sustainable farming system
- Adoption of ridge to valley approach
- Due emphasis on production enhancement activities for land owners and livelihood support for landless families
- Democratic decentralization in decision making
- Transparency in transactions
- Formation of an autonomous institution at the village level
- Direct funding to the community
- Emphasis on “our” participation in “their” plans
- Contributory approach to empower the community
- Building upon indigenous innovations, initiatives and ideas
- Equity for resource-poor families and empowerment of women
- Moving away from subsidy oriented development to self-reliant development
- Convergence of activities / schemes of government and non-governmental organizations etc.

29. The fund under the project is allocated for Management Component (22.5%) which include administrative cost, community organization and training and Development component (77.5%) which include natural resource management, farm production system and livelihood support system. The broad activities under the scheme are:

- Organization of Watershed Community into Self Help Groups (SHG), User Groups (UG), Watershed Association (WA) and Watershed Committee (WC).
- Training and skill development of key functionaries of WA/WC
- Development of natural resources namely land and water through various activities, such as bunding, drainage line treatment, vegetative barriers, contour trenching, gully stabilization measures, water harvesting structures, etc.
- Assistance in adoption of proven farm technologies and demonstration of new technologies in agriculture and allied sectors.

- Activities for improving income, nutrition and food supplement from existing livelihood as well as from new micro-enterprises for landless and marginal farm households through a revolving fund.

30. The Programme is being implemented by a multi-disciplinary team of Officers of State Governments on Watershed basis. The data in the prescribed proforma are collected at project and State level and periodically reported to Government of India. At the national level the programme is reviewed in meeting of National Watershed Committee, beside periodic visit of regional, State and National level functionaries. The programme is also reviewed in Annual /Half Yearly and Quarterly Desk Review by the Ministry of Agriculture to assess the actual implementation status. A mechanism of mid-term assessment of the programme and to suggest the plan of action for improvement in the implementation is also in place. At the State level also, the progress is monitored by Project Level Implementation Committee & State Level Implementation Committee. Similarly, the programme is also monitored and reviewed at District and Watershed levels.

31. Since inception up to the end of the IX Plan, an area of 6.98 million ha. has been treated with an expenditure of Rs.1877.74 crore under NWDPRA. During first four years of X Plan, an area of 1.58 million ha. has been developed incurring an expenditure of Rs.793.82 crore. Therefore, since inception up to 2005-06 a total area of 8.56 million ha. has been treated by incurring an expenditure of Rs.2671.56 crore. During 2006-07, approximately 6.0 lakh ha area is proposed for development at a projected cost of about Rs.280.00 crores.

Soil Conservation for Enhancing the Productivity of Degraded Lands in the Catchments of River Valley Projects and Flood Prone Rivers (RVP & FPR)

32. The Centrally Sponsored Programme of Soil Conservation for Enhancing the Productivity of Degraded Lands in the Catchments of River Valley Projects & Flood Prone Rivers (RVP & FPR), in the present form, is being implemented through Macro Management of Agriculture (MMA), since November 2000 of IX Five Year Plan.

33. The main objectives of the programme are:

1. Prevention of land degradation by adoption of a multi– disciplinary integrated approach of soil conservation & watershed management in catchment areas;
2. Improvement of land capability and moisture regime in the watersheds;
3. Promotion of land use to match land capability;
4. Prevention of soil loss from the catchments to reduce siltation of multipurpose reservoirs and enhance the in-situ moisture conservation and surface rainwater storages in the catchments to reduce flood peaks & volume of runoff.

34. Presently, this programme is being implemented in 53 catchments having total catchment area of 113.40 million ha. falling in 27 States namely, Assam, Andhra Pradesh, Arunachal Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh,

Maharashtra, Mizoram, Meghalaya, Manipur, Nagaland, Orissa, Punjab, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Uttaranchal and West Bengal. The name of catchments and States covered is at Annexure-I.

35. In this programme all type of lands *viz* , Agriculture, Waste and Forest are treated in an integrated manner with suitable package of treatment *viz* construction of Contour Vegetative Hedge, Contour/ Graded Bunding, Horticulture Plantation, Contour/ Stagger Trenching, Sowing and Planting of plants, Silvi-Pasture Development, Pasture Development, Afforestation, Farm Pond, Percolation Tank, Drainage Line Treatment (such as, Earthen Loose Boulders, Water Harvesting Structure, Check Bund, Spill-way, Sediment Detention Structures etc.) etc. The unit cost of Rs. 6500 per ha. and Rs.10,000 per ha. are adopted for the Category-I (75% area having less than 8% slope) and Category-II (75% having more than 8% slope) respectively for treating the area in its entire treatment period (which varies from 3-5 years).

36. The catchments included under RVP & FPR Programme are surveyed by the All India Soil & Land Use Survey (AIS&LUS) Organization by conducting Priority Delineation Survey (PDS) and categorized into five categories i.e. Very High, High, Medium, Low and Very Low using Silt Yield Index (SYI) methodology. As per norms of Guidelines only Priority Watersheds (Very High and High watersheds) are taken for treatment.

37. The financing pattern of the programme after amalgamation of this scheme under Macro Management Mode of Agriculture is in the ratio of 90:10 between Central & State Governments. The funds are provided to State Governments as 80% grant and 20% loan.

38. The Programme is being implemented by the Multidisciplinary team of Officers of State Governments on Watershed basis. The data in prescribed proforma are collected at project and State level and periodically reported to Government of India. Hydrologic & Sediment Monitoring is also conducted for collection of hydrologic & sediment responses for assessment of impact of watershed interventions. In addition to above, at national level the programme is reviewed in meeting of Standing Committee constituted for this purpose, beside periodic visit of regional, State and National level functionaries. The programme is also reviewed in Annual Desk Review, Quarterly Desk Review to assess the actual implementation. There is a Standing Committee under the chairmanship of Additional Secretary to review the programme on Regional basis annually to suggest the plan of action for improvement in the implementation. At State level also, the progress is monitored by Project Level Implementation Committee & State Level Implementation Committee.

39. Since inception of the programme upto end of the IX Plan, an area of 5.49 million ha. has been treated with expenditure of Rs.1516.26 crore. During first four years of X Plan, an area of 0.763 million ha. has been treated with an expenditure of Rs.521.48 crore. Since inception upto 2005-06, an area of 6.25 million ha. has been

treated with expenditure of Rs.2037.74 crore. During 2006-07, an area of 2.5 lakh ha is proposed for treatment at a cost of Rs.200.00 crores.

Watershed Development Project for Shifting Cultivation Areas (WDPSCA)

40. Shifting cultivation (Jhum cultivation) is a primitive practice of cultivation and regarded as the first step in transition from food gathering and hunting to food production. Initially, when this system of food production emerged, it worked well as the Jhum cycle was 20-30 years. Now the cycle has reduced to 3-6 years and causing serious threat to land degradation and ecological problems. An area of 43.57 lakh ha. is affected by Jhum/Shifting Cultivation mainly in the States of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Orissa and Tripura. Such cultivation is also found in sporadic occurrence in the States of Andhra Pradesh, Bihar, Madhya Pradesh Maharashtra Kerala Karnataka and Sikkim. The State- wise extent of shifting cultivation areas is at **Annexure-VIII**. As per recommendation of the Task Force on Development of Shifting Cultivation Areas, constituted by the Ministry of Agriculture in the year 1983, the Scheme for Control of Shifting Cultivation /Jhum was launched in the VII Five Year Plan (1987-88) with 100% central assistance to the State Plan covering North Eastern States and 2 States viz. Andhra Pradesh and Orissa. The Scheme was initially implemented on Family Development Approach (FDA) and 26512 jhumia families were benefited under the programme with an expenditure of Rs.60.72 crore. As per decision of NDC, the scheme was transferred to State Sector and was discontinued in 1991-92. Again on the demand from North Eastern States, the Planning Commission revised the scheme for North Eastern Region only from 1994-95 onwards. Accordingly, the scheme is being continuing in seven North Eastern States, namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland and Tripura on watershed basis with 100% additional assistance to the State Plan.

41. The main objectives of the programme are:-

1. To protect the hill slopes of jhum areas through soil an water conservation measures on watershed basis and to reduce further land degradation
2. Encourage relocation of jhumia families by providing developed productive land and improved cultivation packages.
3. To improve the socio-economic status of jhumia families through household/land based activities
4. To mitigate the ill effects of shifting cultivation by introducing appropriate land use as per land capability and improved technologies.

42. The programme of WDSCA is presently being continued in seven States of North Eastern Region, namely, Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura.

43. The main components of the Scheme are :- (i) Management Component (22.5%), (ii) Development Component (60%), and (iii) Rehabilitation Component (17.5%). The Management Component includes Administration (10%), Community organization (7.5%) and Training Programme (5%). The development component

includes treatment of arable and non-arable land with complete drainage line treatment, water harvesting structures, farm ponds, horticulture, forestation, silvipasture, crop demonstration, etc. The rehabilitation component includes improvement of land based and household production system depending on the choice of the farmers like piggery, poultry, duckery, fishery, sericulture, basket/rope making, tailoring, carpentry, etc. About 60% of total expenditure is utilized for the components leading to creation of employment in remote rural areas.

44. The scheme is being implemented through Government and Non-Government Organizations, Scientific and Technical Institutions in the North-Eastern States in the watershed where a minimum of 25% area is under shifting cultivation (abandoned jhum and current jhum) and 50%, above families is engaged in shifting cultivation as the only means of livelihood, and is living below poverty line. The Watersheds are identified by
the District Level Watershed Committee on the request of PIA and finally approved by the State Level Steering Committee.

45. Additional Central Assistance to the North – Eastern States is 100% grant. The important key issues relating to the finance and implementation are:-

1. Emphasis is given for settlement of jhumia families by assisting all the needy jhumia families through land based/household production systems.
2. The present unit cost of development is Rs.10, 000.00 per ha.
3. Financial assistance to jhumia families under production system is Rs.10,000.00 per family
4. Watershed selected for development must have at least 25% of the area under shifting cultivation
5. Provision of corpus of fund for maintenance of assets and facilitation of marketing activities

46. The Programme is being implemented by the Multidisciplinary team of Officers of State Governments on Watershed basis. The data in prescribed Performa are collected at project and State level and periodically reported to Government of India. At national level the progress of the implementation is reviewed in meeting of Standing Committee constituted for this purpose beside periodic visit of regional, State and National level functionaries. In addition to Annual Desk Review, Quarterly Desk Review is also conducted to assess the actual implementation and phase in the implementation, if any at national level. At State level also, the progress of implementation of programme is monitored by Project and State Level Committee namely, Project/Village Level Committee and State Level Implementation Committee constituted for this purpose.

47. Since inception upto, end of IX Five Year Plan, an area of 2.58 lakh ha. has been developed with expenditure of Rs.166.27 crores. During first four years of X Five Years Plan (2002-06) an area of 0.95 lakh ha. has been developed with expenditure of Rs.89.31 crores. Since inception upto end of 2005-06, an area of 3.53 lakh ha. has

been developed with expenditure of Rs.255.58 crores. During 2006-07, an area of 0.4 lakh ha is proposed for treatment at a cost of Rs.40.00 crores.

Reclamation of Alkali Soils (RAS)

48. The Centrally Sponsored Programme for Reclamation of Alkali Soil (RAS) was launched in the Seventh Five Year Plan for reclamation of soils, which are suffering from alkalinity. The Alkali Soils contain more than 15% Exchangeable Sodium Percentage (ESP) on clay complex basis and pH (reciprocal of hydrogen ion concentration) of saturated soil paste is more than 8.2. This programme is now being implemented through Macro Management of Agriculture (MMA).

49. The main objectives of the programme are:-

a) Reclamation of the lands affected by alkalinity and improves land productivity by growing salt tolerance crops and horticulture plantations.
b) Increase the production of fuel wood and fodder.
c) Improve capacity of extension personnel and beneficiaries in various aspects of alkali land reclamation technology and
d) Generate employment opportunities & thereby reduce rural urban migration.

50. About 70.00 lakh ha. area is affected by salt problem, out of which about 35.81 lakh ha. area suffers from alkalinity in the country. Such alkali soils are largely located in the 11 States namely, Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh as per State-wise details given in **Annexure-VI.**

51. The financing pattern of this programme is in the ratio of 90:10 between Central and State Governments respectively. This assistance to the States is provided as 80% grant and 20% loan. The subsidy on the soil amendment is restricted to 25% of the actual cost of the amendment.

52. The Alkali area is selected keeping in view, the severity of the alkalinity as per scientific parameters, availability of irrigation source and cropping condition. Isolated approach is adopted for the area having lesser degree of Alkalinity (pH 8.2 to 9.2), occurring in isolated patches. The projectised approach is adopted in case of higher degree of Alkalinity existing in contiguous manner with minimum village as unit.

53. The isolated and projectised approaches for reclamation of alkali soils are adopted. The main components/activities to be covered under project are:-

(A) Isolated Approach:

- Survey, planning and awareness campaign and training of beneficiaries & staff.
- Formation of Water User Group, Site Implementation Committee (SIC)
- On Farm Development (OFD) – land leveling, construction of field channels, bunding, construction of field drains etc.

- Providing soil amendment (Gypsum/Pyrite) @ 50% of Gypsum required value or maximum of 5 tonnes per ha. in addition, it's application/mixing with soil when temperature is around 40 degree centigrade.
- Overall unit cost of reclamation under Isolated Approach is Rs.11300.00 per ha.

(B) Additional components for Projectized Approach:

- Providing soil amendment (Gypsum/Pyrite) @ 50% of Gypsum required value or maximum of 15 tonnes per ha. in addition, it's application/mixing with when temperature is around 40 degree centigrade.
- Boring and installation of pump sets (if does not exist) for four ha. each,
- Providing critical inputs like seed high yielding variety, fertilizer, insecticides, pesticides etc. for summer and winter crop for two years.
- Providing green manure seed @ 60 kg. per ha. for two years
- Plantation of fruit trees/ fuel wood/fodder species @ 160 plants per ha.
- Maintenance of planted area for three years on minimum cost basis.
- Overall unit cost of reclamation under Projectized Approach is Rs.57300.00 per ha.

54. The Programme is being implemented by the Multidisciplinary team of Officers of State Governments on Watershed basis. The data in prescribed proforma are collected at project and State level and periodically reported to Government of India. At national level the progress of the implementation is reviewed in meeting of Standing Committee constituted for this purpose beside periodic visit of regional, State and National level functionaries. At national level, the programme is reviewed by holding Annual Desk Review, Quarterly Desk Review to assess the actual implementation and suggest plan of action for the improvement in the implementation. At State level also, the progress of implementation of programme is monitored by Project and State Level Committees constituted for this purpose.

55. The present guidelines envisage isolated and projectised approaches for reclamation of Alkali Soils. In isolated approach, the main components are survey, planning, on farm development and application of gypsum within a unit cost of Rs.11,300 per ha. The projectised approach is comprehensive development of large area affected with high severity of alkalinity for comprehensive 3 years package the unit cost is Rs. 57,300 per ha. However, during X Plan, it was observed that the State Govts. opted only for isolated approach and not the projectised approach. The programme was subsumed under the Macro Management of Agriculture in the year 2000 and subsidy on gypsum was reduced from 75% to 25%. Due to reduction of subsidy implementation of the programme by State Govt. in X Plan reduced drastically in all States. Only few States, namely, Haryana, Gujarat and Tamil Nadu were able to implement the programme by providing additional subsidy of 25%. There is need to consider enhancing subsidy for gypsum, pyrites and other items of community nature to 50%.

56. Since inception upto IX Plan, an area of 5.81 lakh ha. has been reclaimed with expenditure of Rs.76.39 crores. During first four years of X Plan (2002-06) an area of

1.06 lakh ha. has been reclaimed with expenditure of Rs.29.55 crores. Since inception upto end of 2005-06, an area of 6.87 lakh ha. has been reclaimed with an expenditure of Rs.105.94 crores. During 2006-07, an area of 0.16 lakh ha is proposed for treatment at a cost of Rs.14.70 crores.

Watershed Development Fund (WDF)

57. The Union Finance Minister, in his budget speech for 1999-2000 had announced the creation of a Watershed Development Fund (WDF) with the National Bank for Agriculture and Rural Development (NABARD) with broad objectives of unification of multiplicity of watershed development programmes into a single national initiative through involvement of village level institutions and Project Facilitating Agencies (PFAs). As a follow up action a Watershed Development Fund (WDF) has since been established at NABARD with a total corpus of Rs.200.00 Crores which included Rs.100 Crores by NABARD and a matching contribution of Rs.100 Crores by Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India.

58. The objective of the Fund is to spread the message of participatory watershed development. The fund is to be utilized to create the necessary framework conditions to replicate and considerate the isolated successful initiatives under different programmes in the Government, Semi-Government and NGOs sectors. Thereby, all the partners involved, viz. watershed community, Central and State Government Departments, Banks, Agricultural Research Institutions, NGOs and NABARD can act in concert to make a breakthrough in participatory watershed development. WDF is proposed to be operationalized in close coordination with the Central and State Ministries as a continuum of their efforts but with the distinct identity.

59. The NABARD issued operational guidelines for WDF during the year 1999, which were subsequently revised on 31st January, 2006. As per the revised guidelines, the WDF Fund is expected to be utilized mainly for the following purposes :-

- Promotional efforts with Communities, NGOs, SHGs, Panchayats, Bankers and Government Departments on grant basis.
- Taking up “capacity building” projects, on grant basis, with Communities, NGOs, SHGs and Panchayati Raj Institutions (PRIs) in different States.
- Selectively, full scale financing of collaborative watershed projects on a pilot basis, with grant and / or land finance, with any of the partners mainly for trying out new institutional or other arrangements.
- Supplementary flexible financing (grant and / or loan) for watershed projects, on selective basis, in government programmes, to fill in the critical gaps perceived in the field but which are not met under the existing budgetary arrangements.
- Financing implementation of watershed projects through the State Governments on loan basis.
- Supporting (on grant and / or loan basis) promotional activities for micro-credit; promotion of SHGs of women, land-less, members of the SC/ST communities

and other weaker sections of the community and other related activities in the watershed development programme.

- The WDF is to be operated flexibly and apart from the activities stated above, other related and essential activities will also be supported (on grant and / or loan basis).

60. The WDF has two components, viz.; Loan and Grant. Two-third of the Fund is provided as loans to the State Governments, at an interest rate of 4.5 % for watershed development and one-third for grant based activities covering promotional efforts, capacity building (implementing micro watershed projects), replication of Indo-German watershed development model (implemented in Maharashtra) in other States etc. The repayment period of loan has been stipulated nine years including grace period of three years. In addition, NABARD is expected to actively make efforts to intensify the credit flow in the developed watersheds through its general resources by providing refinance to the banks for all eligible activities, so that the watershed community could take full advantage of soil and water conservation measures undertaken. The activities under the WDF are being taken up under the guidance of a High Powered Steering committee constituted with representatives from the Ministry of Agriculture, Ministry of Rural Development, Ministry of Finance (Banking Division), representatives of State Governments, NABARD and selected NGOs from different States. The scheme is implemented by NABARD and at the government level, Ministry of Agriculture is the nodal Ministry for this scheme. Total 18 states are involved in the project; however, only 14 states were effectively participating in the programme as on 31st March 2006.

61. Watersheds covering villages with the following physical and socio-economic characteristics are preferred for inclusion under these programmes:

(a) Physical Characteristics

(i) Dry and drought prone villages. In any case the proportion of irrigated area may not exceed the average for the State or 30% which ever is lower.
(ii) Villages with noticeable soil erosion, land degradation, resource depletion or water scarcity problems.
(iii) Villages in the upper part of drainage systems.
(iv) The size of a watershed project should be around 1000 ha. (but not less than 500 ha.).
(v) Well defined watersheds with the village boundaries coinciding to the greatest extent possible with the watershed boundary. As far as possible, Watershed encompassing one village is ideal.
(vi) Villages where the general cropping sequence does not include high water demanding and long duration crops like sugarcane, banana etc. and if such crops are grown in small pockets in the watershed, the villagers should agree that the area under such crops will not be extended during implementation or after completion of the watershed development project.

(b) Socio-economic characteristics

(i) Predominantly poor villages.
(ii) High proportion of SC/ST in the total population.
(iii) There should not be much difference in the size of the land holdings.
(iv) Villages with a known history of coming together for common causes.
(v) Villages that have shown concern for resource conservation.
(vi) Villages with alternative sources of employment must not be selected as the past experience indicates that the programme in such areas would not pick up.
(vii) Villages that are willing to commit themselves to the following conditionalties:

- to ban clear felling of trees,
- to ban free grazing and in treated areas for protecting vegetation,
- to reduce the livestock population if in excess, and maintain the same at the carrying capacity of the watershed (number which can be supported by the watershed).
- To ban cultivation of water intensive crops like sugarcane and banana or at least not to increase the area under such crops from the present position,
- To contribute initially four days of "shramdan" on watershed treatment works by the entire village community and later, once selected for the programme to contribute by way of "shramdan" or otherwise 16% of the unskilled labour costs of the project and also to collect such contribution EQUITABLY (impartially and in a just manner) from the village community. The landless and poor single parent households are excluded from such a contribution,
- Promote equity for women and poor through preferential allocation of usufruct rights in common lands.
- To start and contribute to a Watershed Maintenance Fund, from the second or third year onwards to maintain and upgrade the treatments and assets created under the project, at a rate of Rs.100/- per land owning families.
- To take all such steps as a re necessary for achieving and maintaining a sustainable production system,
- To constitute, at the village level, a body called the Village Watershed Committee (VWC) which would have to be registered during the implementation phase within 6 months of the commencement of the work, so that it can undertake responsibility for maintenance of all the valuable assets created and generated by the project.

62. State Governments willing to execute a Memorandum of Understanding (MOU) to avail loan out of the fund and agree to furnish a mandate in favour of Reserve Bank of India (RBI) / letter of undertaking for repayment of principle and payment of interests with NABARD shall be eligible to participate in the Programme. Based on the criteria for selection of watersheds, so far 18 States (Andhra Pradesh, Bihar,

Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, Uttaranchal and West Bengal) have been identified eligible to participate under WDF programme.

63. The budget announcement of Finance Minister (1999-2000) envisaged coverage of 100 districts in three years. The districts were to be selected in consultation with the concerned State Government. For selection of districts, preference is to be given where the percentage of irrigation is less than 30%, where there is a concentration of SC/ST population and where the extent of rainfed farming and potential for watershed development is large. Priority is to be given to those districts having the lowest proportion of irrigated area in the State, subject to the availability of basic ingredients needed for successful implementation of Watershed Development Projects.

64. To enable the village community to have first hand experience of watershed development and to demonstrate their commitment for implementing a watershed project, they should be willing to :

(i) Visit other developed watersheds (exposure visits)
(ii) Appoint selected village youth and key persons and sending them for specific training programmes.
(iii) Prepare and implement a demonstration or pilot project for a small area of the watershed of about 50-100 ha.

65. The nodal agencies of the State Government may implement watershed development projects through NGOs which are funded out of WDF loan. Even if the Project Facilitating Agency (PFA) is other than NGO the same criteria could be utilized with necessary modifications. The following shall be the criteria for selection of NGOs.

(i) Reputation and financial management capacity – Three years Annual reports of the PFA shall be submitted (IV Project Sanctioning Committee meeting held on 26 March 2004).
(ii) Method of operation and rapport with people and local government agencies.
(iii) Perspective on watershed development.
(iv) Nature of projects handled in the past.
(v) Technical and managerial capability.
(vi) Sensitivity towards group action /conflict resolution and equity for poor and women.
(vii) Ability to motivate the community for providing ‘Shramdan’ in the village where they propose to work.

66. The PFA should have been active in the area for a significant period before proposing a watershed project for the area. PFAs and watershed communities willing to implement a watershed project, if selected, have to go through a Proofing Stage and meet the qualifying criteria before they undertake a large scale project.

67. Out of 18 identified States under the WDF programme as on 31.03.2006 only 8 States (Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh & West Bengal) implemented loan component of the programme, whereas 14 States (Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal) are implementing grant component. A total number of 417 projects (369 under loan and 58 under grant component) were sanctioned under Capacity Building Phase (CBT) with a grant assistance of Rs.21.02 Crores and covering an area of 39062 ha upto 31st March, 2006. These projects are expected to ultimately cover about 4.04 lakh ha area once they enter into full implementation phase. A total number of 237 projects (208 under loan and 29 under grant component) were sanctioned a grant assistance of Rs.226.63 lakhs for preparation of project Feasibility Report (FR) upto 31st March, 2006. 140 projects have graduated into Full Implementation Phase (FIP) which include 115 loan projects with a loan assistance of Rs.5621.66 lakhs and 25 grant projects with a grant assistance of 1128.15 lakhs upto 31st March, 2006.

Externally Aided Projects (EAPs)

68. In addition to above mentioned programmes, the Ministry of Agriculture is also servicing externally aided watershed development projects for the development of degraded and rainfed areas since 1983. Many of the projects have been completed and at present there are 5 on-going Externally aided Projects. These programmes lay special emphasis on components like natural resource management, livestock development, infrastructure and institutional development etc. Under the Externally aided projects an area of 1.33 million ha. was covered at a cost of Rs. 2039.81 crores till the end of IX Plan. In the first four years of the X Plan an area of 0.38 million ha. has been treated by incurring an expenditure of Rs. 1527.54 crores through various projects. Thus about 1.71 m. ha. area have been developed at an expenditure of Rs. 3567.35 crore up to March 2006.

Programmes of Ministry of Rural Development

Drought Prone Area Programme (DPAP)

69. Drought Prone Areas Programme (DPAP) is the earliest area development programme launched by the Central Government in 1973-74 to tackle the special problems faced by those fragile areas, which are constantly affected by severe drought conditions. These areas are characterized by large human and cattle populations which are continuously putting heavy pressure on the already degraded natural resources for food, fodder and fuel. The major problems are continuous depletion of vegetative cover, increase in soil erosion and fall in g round water levels due to continuous exploitation without any effort to recharge the underground aquifers. Based on the recommendations of the Hanumantha Rao Committee (1994), the Programme has been under implementation on watershed basis since 1995. The

responsibility for planning, execution and maintaining the watersheds is entrusted to local people organizations specially constituted for the purpose.

70. The basic objective of the programme is to minimize the adverse impacts of drought on the production of crops and livestock and productivity of land, water and human resources thereby ultimately leading to the drought proofing of the affected areas. The programme aims at promoting overall economic development and improving the socio-economic condition of the resource poor and disadvantaged sections inhabiting the programme areas through creation, widening and equitable distribution of the resource base and increased employment opportunities. The objectives of the programme are being addressed in general by taking up development works through watershed approach for land development, water resource development and afforestation / pasture development. The recent impact studies sponsored by the Ministry have revealed that with the implementation of watershed projects under Drought Prone Areas Programme, the overall productivity of land and the water table have increased and there has been a significant impact in checking soil erosion by water and wind. The programme has also helped in overall economic development in the project areas.

71. The Drought Prone Areas Programme was in operation in 627 blocks of 96 districts in 13 States during 1994-95. On the recommendation of the Hanumatha Rao Committee, 384 new blocks were brought into the purview of this programme and 64 were transferred from DPAP to DDP. Consequently, coverage of the programme was extended to 947 blocks of 164 districts in 13 States. With the reorganization of States, districts and blocks, at present the programme is under implementation in 972 blocks of 182 districts in 16 States. The States where DPAP is under implementation along with the number of Districts, Blocks and area are indicated in the table below:-

Table-II Area of operation of DPAP

Sl.No.	States	No. of Districts	No. of Blocks	Area in Sq. Kms.
1.	Andhra Pradesh	11	94	99218
2.	Bihar	6	30	9533
3.	Chhattisgarh	8	29	21801
4.	Gujarat	14	67	43938
5.	Himachal Pradesh	3	10	3319
6.	Jammu & Kashmir	2	22	14705
7.	Jharkhand	14	100	34843
8.	Karnataka	15	81	84332
9.	Madhya Pradesh	23	105	89101
10.	Maharashtra	25	149	194473
11.	Orissa	8	47	26178
12.	Rajasthan	11	32	31969
13.	Tamil Nadu	16	80	29416
14.	Uttar Pradesh	15	60	35698

15.	Uttaranchal	7	30	15796
16.	West Bengal	4	36	11594
	Total	182	972	745914

72. Till March 1999 the funds were shared on 50 : 50 basis between the Central Government and the State Governments. However, with effect from 1st April 1999, the funding is shared on 75 : 25 basis between the Centre and State Government. For completion of ongoing projects that were sanctioned prior to April, 1999, the old funding pattern continued. The projects of 500 ha. are sanctioned under the programme. Until March, 2000 following cost norms were adopted under DPAP for various eco-systems.

Ecosystem Type	**Unit Cost (Rs./Ha.)**	**Project Cost (Rs. In lakhs)**
Semi-Arid Region	4,000	20.00
Dry-Sub-Humid Region	3,000	15.00
Dry Sub-Humid (Hill) Region	4,000	20.00
KBK districts of Orissa	5,000	25.00

73. However, with effect from 1.04.2000, uniform cost norms @ Rs.6000/- per ha. have been introduced. These norms are applicable to projects sanctioned during and after 2000-2001. In respect of earlier projects sanctioned up to 1999-2000, the pre-revised cost norms are applicable.

74. Since inception, an area of 121.77 lakh ha. have been covered at a cost of 4482.50 Crores. In the first four years of the X Plan, the progress is shown as below:

Year	Area covered(lakh Ha.)	Expenditure(Rs. in Crore)
2002-03	12.39	249.99
2003-04	12.675	294.80
2004-05	12.75	299.99
2005-06	15.00	352.98
Total	**52.815**	**1197.76**

Desert Development Programme (DDP)

75. The Desert Development Programme (DDP) was started both in hot desert areas of Rajasthan, Gujarat and Haryana and the cold deserts of Jammu & Kashmir and Himachal Pradesh in 1977-78. From 1995-96, the coverage has been extended to a few more districts in Andhra Pradesh and Karnataka. In hot sandy desert areas, sand dune stabilization and shelterbelt plantations were given greater weightage. On the other hand, in cold desert areas, since rainfall is negligible, crop cultivation and afforestation were taken up only through assured irrigation. In these areas, the main activity was water resources development by construction of channels for diversion of water flow from glaciers and springs to the fields and lift irrigation works in the valleys.

76. A Technical Committee reviewed the programme in 1994-95. The main reason identified by the Committee for below satisfactory results under the programme was that, area development was not taken up on watershed basis and the involvement of the local people was virtually non-existent, both in planning and execution of the programme. Besides inadequacy of funds, non-availability of trained personnel and taking up of too many activities, which were neither properly integrated nor necessarily related to the objectives of the programme, were also identified as contributory factors towards reducing the impact of the programme. Based on the recommendations of the Committee, new Blocks / Districts were included under the programme. Comprehensive Guidelines for Watershed Development commonly applicable to different area development programmes were issued in October, 1994 and made applicable with effect from 1.4.1995. Subsequently, based upon the feedback received from the various stakeholders, revised guidelines were circulated in September, 2001. These guidelines are applicable for projects sanctioned during 2000-2001 and thereafter.

77. Rajasthan has distinct problems because of large tracts of Hot Arid (Sandy) areas. In view of the problem of sand dune stabilization in ten districts of this State, special projects are under implementation under DDP since 1999-2000 for combating desertification by way of shelterbelt plantation, sand dune fixation and silvi pasture development. These ten districts are Barner, Bikaner, Churu, Jaisalmer, Jalore, Jhunjhunu, Jodhpur, Nagaur, pali and Sikar.

78. The programme has been conceived as a long-term measure for restoration of ecological balance by conserving, developing and harnessing land, water, livestock and human resources. It seeks to promote the economic development of the village community and improve the economic conditions of the resource poor and disadvantaged sections of society in the rural areas. The major objectives of the programme are as under :-

- To mitigate the adverse effects of desertification and adverse climatic conditions on crops, human and livestock population and combating desertification.
- To restore ecological balance by harnessing, conserving and developing natural resources i.e. land, water, vegetative cover and raising land productivity.
- To implement developmental works through the watershed approach, for land development, water resources development and afforestation / pasture development.

79. The Desert Development Programme was in operation in 131 blocks of 21 districts in 5 States upto 1994-95. On the recommendations of the Hanumantha Rao Committee, 32 new blocks were brought within the purview of the programme and 64 blocks were transferred from DPAP. Consequently, coverage of the programme was extended to 227 blocks of the country w.e.f. 1.4.1995. With the reorganization of districts and blocks, the programme is under implementation in 235 blocks of 40 districts in 7 States. The States where DDP is under implementation along with the number of blocks and area are indicated in the table below :-

Table -III Area of operation of DDP

Sl. No.	State	No. of Districts	Number of Blocks	Area in Sq. Kms.
1.	Andhra Pradesh	1	16	19136
2.	Gujarat	6	52	55424
3.	Haryana	7	45	20542
4.	Himachal Pradesh	2	3	35107
5.	Jammu & Kashmir	2	12	96701
6.	Karnataka	6	22	32295
7.	Rajasthan	16	85	198744
	Total	40	235	457949

80. The DDP is a Centrally Sponsored Programme and funds are directly released to DRDA/ ZPs for implementation of the programme. Up to 31.03.99, Central share for different types of project area based on the nature of ecosystem was as under :-

Type of Ecosystem	**Central share**
Hot Arid (Non-Sandy) Areas	75%
Hot Arid (Sandy) Areas	100%
Cold Arid Areas	100%

81. With effect from 1.4.1999, the programme is being funded on the basis of 75:25 for the watershed projects sanctioned on or after 1.4.99. However, projects sanctioned prior to 31.3.99 would continue to be funded on the old pattern. Further, up to 1999-2000, the project cost was Rs. 22.5 lakh per project in respect of Hot Arid (non-sandy) areas and Rs 25 lakh in respect of other areas. However, this has been enhanced to a uniform rate of Rs. 30 lakh per project and this revised rate is applicable for the projects sanctioned on or after 1.4.2000. The projects sanctioned before 31.3.2000 would continue to be implemented on old cost norms.

82. Since inception, an area of 67.38 lakh ha. have been covered at an expenditure of Rs. 1679.88 Crores. In the first four years of the X Plan, the progress is shown as below:

Year	Area covered(lakh Ha.)	Expenditure(Rs. in Crore)
2002-03	8.01	185.00
2003-04	7.81	214.80
2004-05	8.00	214.90
2005-06	10.00	267.80
Total	**33.82**	**882.50**

Integrated Wasteland Development Programme (IWDP)

83. Integrated Wastelands Development Programme(IWDP), a Centrally Sponsored Programme, has been under implementation since 1989-90. From 1st April 1995, the programme is being implemented through watershed approach under the

Common Guidelines for Watershed Development. The development of wastelands and degraded lands under the programme is expected to promote the generation of employment in the rural areas besides enhancing the participitation of the people at all stages – leading to sustainable development of land and equitable sharing of the benefits. The IWDP envisages the development of non-forest wastelands in the country. The basic approach in implementation of this programme has been modified from 1.04.1995 when the Guidelines for Wasteland Development through watershed approach came into force. Since then, projects for development of wastelands on micro-watershed basis are being sanctioned. From 1999-2000, new IWDP projects are prioritized for sanction in consultation with the State Governments. The project proposals have to be prepared by Zila Panchayats, District Rural Development Agencies and the same are submitted to the Department through the State government concerned for consideration of a Project sanctioning Committee headed by the Additional Secretary in the Department of Land Resources. The Projects have to be implemented over a period of five years.

84. The programme is aimed at integrated development of wastelands/degraded lands based on village / micro watershed plans. The programme aims at fulfillment of the following objectives:-

- Developing wastelands/degraded lands on watershed basis keeping in view the capacity of land, site conditions and local needs.
- Promoting the overall economic development and improving the socio-economic condition of the poor and disadvantaged sections inhabiting the programme areas.
- Restoring ecological balance by harnessing, conserving and developing natural resources i.e., land, water and vegetative cover.
- Encouraging village community for:
  - Sustained community action for the operation and maintenance of assets created and further development of potential of the natural resources in the watershed.
  - Simple, easy and affordable technological solutions and institutional arrangements that make use of, and build upon, local technical knowledge and available materials.
- Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village.

85. The projects under the programme are generally sanctioned in the Blocks not covered by DDP and DPAP. At present, the projects under the programme are being implemented in 443 districts of the country. The revised Guidelines prescribe a greater role for Panchayati Raj Institutions (PRIs) , Self Help Groups (SHGs) and User Groups (UGs), particularly the landless, the Scheduled Castes (SCs) & Scheduled Tribes (STs) and other backward classes, in watershed projects.

86. Prior to 31.03.2000, watershed development projects under the programme were sanctioned at a cost norm of Rs.4000 per hectare. These were funded entirely by the Central Government. The cost norm has since been revised to Rs.6000 per

hectare for the projects sanctioned after 1.4.2000. The funding of the new projects would be shared between the Centre and States in the ratio of Rs. 5500 per ha. and Rs. 500 per ha., respectively. However, the old projects sanctioned up to 31.3.2000 would continue to be funded entirely by the Central Government.

87. Since inception, a total of 1382 projects were implemented covering an area of 84.57 lakh ha. by incurring an expenditure of Rs. 1953.15 Crores. In the first four years of the X Plan, the progress is shown as below:

Year	No. of Projects	Area covered(lakh Ha.)	Expenditure(Rs.in Crore)
2002-03	49	3.365	207.96
2003-04	190	10.07	307.52
2004-05	221	11.18	334.42
2005-06	497	22.62	486.74
Total	**957**	**47.22**	**1336.64**

Externally Aided Projects (EAPs)

88. In addition to above mentioned programmes, the Ministry of Rural Development is also servicing externally aided watershed development projects for the development of degraded and waste land areas. Many of the projects have been completed and at present there are few on-going Externally aided Projects. These programmes lay special emphasis on components like natural resource management, livestock development, infrastructure and institutional development etc. Under the Externally aided projects an area of 0.14 million ha. was covered at a cost of Rs. 18.39 crores till the end of IX Plan. In the first four years of the X Plan an area of 0.26 million ha. has been treated by incurring an expenditure of Rs. 194.28 crores through various projects. Thus about 0.40 m. ha. area have been developed at an expenditure of Rs. 212.67 crore up to March 2006.

Programmes of Planning Commission:

89. The Planning Commission of India started two schemes, viz.; the Hill Areas Development Programme (HADP) and Western Ghats Development Programme (WGDP) from the Fifth Five Year Plan in designated Hill Areas. Under these programmes, Special Central Assistance is given to the designated Hill Areas in order to supplement the efforts of the State Governments in the development of these ecologically fragile areas.

90. Identification of areas under HADP was done by a Committee of the National Development Council (NDC) in the year 1965, while for the WGDP, it was recommended by a High Level Committee set up for this purpose in the year 1972. The areas identified under HADP and the WGDP were:

(a) Two Hill Districts of Assam – North Chachar and Karbi Anglong
(b) Major parts of Darjeeling District of West Bengal
(c) Nilgiri District of Tamil Nadu; and

(d) 159 Talukas of Western Ghats in Maharashtra (62 Talukas), Karnataka (40 Talukas), Tamil Nadu (25 Talukas), Kerala (29 Taluka) and Goa (3 Taluka). However, presently, the WGDP programme is under implementation in 171 talukas of Western Ghats viz. Maharashtra (63 taluka), Karnataka (40 talukas), Kerala (32 talukas), Tamil Nadu (33 talukas) and Goa (3 talukas).

Hill Area Development Programme (HADP) :

91. The objectives and focus of the programmes under HADP have been changing over each five year plan within a broad framework of strategy and approach since its inception in the V Plan. In the V Five Year Plan, programmes were mainly beneficiary oriented. In the VI Plan, although the emphasis shifted to eco development, it retain the general form and shape of the programme as that of the normal State Plan with the same sectoral approach. During the VII Plan, however, the emphasis was laid upon eco development, eco preservation and eco restoration. In the VIII Plan, the programme focused on community involvement and management of land and water resources. The activities during this plan targeted on the following aspects:-

(i) To reduce pressure on forest resources
(ii) Afforestation on denuded forest lands.
(iii) To provide adequate and safe drinking water.
(iv) Improvement of health facilities.
(v) Evolving appropriate land use pattern.
(vi) Development of horticulture and plantation crops.
(vii) Livestock improvement.

92. During the IX Plan, the objectives of the programme outlined as eco preservation and eco restoration. Activities were undertaken for conservation of bio-desk diversity and rejuvenation of hill ecology. Emphasis was laid upon the traditional knowledge. The strategy was based on the two-pronged approach, viz. the Sub Plan Approach and the Integrated Watershed Approach.

Western Ghat Development Programme (WGDP)

93. During the V Five Year Plan, the main objective of the WGDP Programme was to promote horticulture, plantation, afforestation, minor irrigation, animal husbandry and tourism. Accordingly, activities addressing to these sectors were taken up under this programme. During the VI Plan, an emphasis was made to promote beneficiary oriented and infrastructure development activities. During this period, the Watershed Development Programmes were also taken up on a pilot basis. During the VII and VIII Five Year Plan, the approach remain the same with a focus on the integrated development on compact watershed basis.

94. The activities involved under WGDP programme are:

(i) Identification and delineation of macro and micro watersheds in all the

WGDP areas.

(ii) Prioritization of watersheds
(iii) Preliminary baseline survey of the identified watersheds
(iv) Preparation of an integrated development plan of each watersheds
(v) Making necessary administrative and institutional arrangements.

95. The WGDP Programme operates on the following principles:-

(i) Maintenance of ecological balance
(ii) Conservation of genetic diversity
(iii) Restoring the ecological damage caused by human interference
(iv) Creation of awareness among the people and educating them on the far-reaching implications of ecological degradation and securing their active participation for the eco-development schemes.

96. Special Central Assistance is made available under the Hill Areas Development Programme for the designated hill areas / designated talukas of the Western Ghats on 90 : 10 basis, i.e., 90 per cent grant and 10 per cent loan. This Special Central Assistance is appropriated between the desgingated hill districts and the Western Ghat talukas in the ratio of 84 : 16 . The inter se distribution of SCA amongst the designated hill districts / talukas is based on area and population as per 1981 census. In the case of the Hill Areas Development, equal weightage is given to both these criteria while under the Westernghats Development Programme, area is given weightage of 75 per cent and population 25 per cent.

97. The HADP and WGDP programmes include a host of activities prescribed for integrated development of watersheds. Some important relevant activities like soil conservation, agriculture, afforestation, fuel & fodder wood development, minor irrigation, animal husbandry and sericulture occupy a central stage, although an overall area development approach was initially followed under these two programmes.

98. As mentioned in the previous para, the HADP and WGDP schemes started initially on an area development approach. However, from the VII Plan a mix of watershed and area development approaches were followed in implementation of these schemes. The schemes are taken up under the state plan. Although a host of activities included under watershed approach had been performed under these schemes, yet area coverage details for these activities in different states in successive plan periods are not available. Therefore it is not possible to include the physical achievements in this report.

99. During the X Five Year Plan upto 31st December, 2005, an amount of Rs. 366.26 crores has been spent under HADP. Similarly, an expenditure of Rs. 246.16 crores has been incurred under WGDP. The year wise details of expenditure in the first four years of the X Plan under HADP & WGDP are as below:-

Year	**HADP**	**WGDP**
2002-03	95.09	61.73

2003-04	94.36	63.38
2004-05	95.73	64.01
2005-06	81.08	57.04
(Upto 31.12.2005)		
Total	**366.26**	**246.16**

Programmes of Ministry of Environment & Forests:

100. The Ministry of Environment & Forests is also implementing programmes for natural resource management. Although administrative boundaries of forest areas are not coterminous with watershed boundaries, the basic principles of watershed management are followed to the extent possible. Most of these programmes aims afforestation in watershed areas under the National Afforestation Programme. The pre-cursor to the National Afforestation Programme was the Samanavit Gram Vanikaran Samridhi Yojana (SDGVSY) launched in 2000-01 as a pilot scheme. 47 pilot projects were launched during IX Plan involving 1843 Joint Forest Management Committees (JFMCs) and covering 71068 ha. of degraded forest at a total cost of Rs. 47.53 Crores. During the X Plan the scheme was up-scaled to National Afforestation Programme by merging the four major afforestation schemes of the IX Plan. 715 Forest Development Agencies (FDA) projects involving 23750 JFMCs and 9.24 lakh ha. area have been identified for treatment with an approved outlay of Rs. 1205 crores.

Impact Assessment of Watershed Programmes

101. In order to assess the performance of various ongoing projects / programmes of watershed and land reclamation, evaluation studies have been conducted by ICAR Institutes, State Agriculture Universities, National Remote Sensing Agency, Agro-Economic Research Centres, Indian Institutes of Management and independent agencies like Agriculture Finance Corporation, Institute of Development and Communication, Institute of Economic Growth, Development Center for Alternative Policies etc. The results of these studies support that the implementation of the programme has been effective for natural resource conservation by increasing the productivity of the land, increasing additional area under agriculture, employment generation and social upliftment of beneficiaries living in rural areas.

A. Findings of Impact Assessment Studies of Watershed Programmes of Ministry of Agriculture:

102. The evaluation studies conducted in 109 watersheds developed under NWDPRA programme of DAC during the VIII Plan, by different agencies in the States of Karnataka, Rajasthan, Maharashtra, Andhra Pradesh, Assam, UP, Haryana, Orissa, MP, Tamilnadu, Gujarat, Kerala, Sikkim have been published in “Compendium of Impact Evaluation Studies of the National Watershed Development Project for Rainfed Areas” by Tata Energy Research Institute, New Delhi. Results of these evaluation studies are summarized below :-

- Increase in crop yield ranging from 7 to 80 %.
- Increase in cropping intensity from 47 to 100%.
- Reduction in sediment loss varying from 50 to 95 %.
- Increase in groundwater recharge ranging from 0.8 meter to 7 meter.
- Significant increase in family income through diversified farming systems, viz., agro-forestry, dry-land horticulture, livestock development and household production activities in the treated watersheds.

103. Further, evaluation studies in respect of 89 watersheds of IX Plan were conducted by ISRO, Bangalore, IIM, Lucknow, IIM, Bangalore, Brahamaputra Board, Regional Centres of Central Soil and Water Conservation Research and Training Institute (CSWTRI), Dehradun and ICAR Research Complex for North Eastern Region. The findings of these evaluation studies suggest :-

- Increase in crop yield ranging from 15 to 220 % in respect of major crops, viz; paddy and wheat and more than 35 % in respect of pulses.
- Increase in cropping intensity from ranging from 8 to 60 %.
- Reduction in sediment loss varying from 3 to 80 %.
- Increase in groundwater recharge ranging from 0.6 to 10 mt.
- Significant increase in family income through diversified farming systems; viz; agro-forestry, dry-land horticulture, livestock development and household production activities in the treated watersheds.
- The agro-forestry and horticulture plantations raised under the scheme have shown survival percentage ranging from 25 to 75 %. There has been increase in bio-mass production varying from 2.39 to 58 %.
- Large number of water harvesting structures were created under the programme.

104. A total of 145 watersheds covered under RVP & FPR Scheme of DAC have been evaluated by various agencies during the period 1986 to 2000. A summary of evaluation studies are given below:

- Yield of agricultural crops has increased. The variation of increase is very high, ranging from 10% to 76%.
- Increase of cropping intensity varying from 80% to 115% has been observed.
- The sediment yield at watershed level has reduced ranging from 17% to 94%.
- The flood peaks at the end of watersheds has reduced to 36%.
- The soil conservation measure has increased the groundwater re-charge. The increase in groundwater table ranges from 0.5 to 2 meter.
- The soil conservation measures have helped in employment generation in rural areas.

105. The evaluation study under WDPSCA of selected three watersheds of Nagaland was conducted by NERIWALM, Tezpur, Assam. AFC Bombay conducted the evaluation study of selected two watersheds of Nagaland & one watershed of Tripura. Another study was under taken by National Productivity Council (NPC), New

Delhi for selected watersheds of the Nagaland and Tripura. As such, so far, the programme of two States, namely, Nagaland & Trpura has been evaluated & major impacts reported are:

- Significant decrease (30%) in shifting cultivation area due to adoption of permanent/ settled cultivation has been noticed.
- About 27% Jhumias have abandoned Jhum practice
- Jhum area per family has been reduced from 0.84 ha to 0.56 ha
- Sustainable increase in productivity of agricultural crops, horticultural crops, livestock, inland fisheries, etc. was observed. In case of Paddy cultivation 13% increase in level of productivity was reported.
- Increase in overall income by 25% of the Jhumia family as compared to pre-project was reported.
- Increase in cropping intensity by 40 % was observed.
- Active participation and contribution of the watershed community in completion of all the planned works/activities for development of the watershed was effective and very useful in after care of assets created.
- The new institutional set up *viz* Watershed Association / Panchayats has helped in promoting participatory approach during project period and even beyond project period.

106. The evaluation studies conducted for the area reclaimed under RAS in selected districts of Haryana and Uttar Pradesh by Central Soil Salinity Research Institute, Karnal, Haryana, has indicated following impacts :

- pH of reclaimed soil decreased from 9.4 – 10.5 to 8.9 – 9.2
- increased organic carbon from 0.15 to 0.38%
- increased paddy yield from 19-41 Q/ha.
- 76% increase in income of farming families in the reclaimed areas
- enhancement in land values, average crop yield and cropping intensity; and
- created additional employment for the farmers in rural areas itself.

B. Findings of Impact Assessment Studies of Watershed Programmes of Ministry of Rural Development

107. Impact evaluation of programmes of Department of Land Resources, Ministry of Rural Development have been carried out by various agencies. The Energy Research Institute (TERI) prepared a compendium in the year 2004, which summarizes the major impacts due to the interventions caused by the Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and the Integrated Wastelands Development Programme(IWDP) in selected sample watersheds over the years. The studies have shown Impact on land, water and biomass in terms of following parameters.

- *Land use:* Overall improvement in land use was reported from most of the states following the implementation of the WDP. Increase in the net sown area,

gross cropped area, and area sown more than once was report from most of the states.

- *Irrigation:* The number of irrigation options was enhanced in all the areas where watershed projects were undertaken. This was especially the case in most of the states.
- *Availability of fuelwood and fodder***:** Fuelwood and fodder availability increased, especially in the areas under the IWDP, where considerable attention was paid to wasteland development and catchment area treatment. Most of the states reported positive changes in the availability of both fuelwood and fodder.
- *Livestock Development :* While some states reported changes in the actual numbers of livestock owned, there was a marked preference for improved breeds after the project. Some states also reported the emergence of fishery potential following the development of tanks and other was bodies.

108. Some of the impacts observed in relation to crops and socio-economic aspects are:

- *Cropping pattern:* Several states reported changes in their cropping pattern from one to two crop annually. This was directly attributed to the availability of irrigation water in the dry season. Some states reported the adoption of improved crop varieties.

- *Crop yield:* Only a few states have recorded pre- and post-project yields for dominant crops in the annual cropping cycle. Where data has been available, an increase in yields has been reported.
- *Income and employment generation:* Several states reported an increase in agriculture-related employment opportunities among beneficiaries and in other sectors for non-beneficiaries. These included trade, dairy, poultry, masonry, etc. Physical works carried out under the WDP provided varying numbers of man-days of work in nearly all states. Changes in household income levels varied from none at all in some states to over 50% compared to pre-project levels in other states.

109. The studies also reveal that under watershed programmes the Capacity building and people's participation have been strengthened in terms of following areas:

- *Institutional arrangements:* All states reported having established institutional arrangements to undertaken the WDP. Watershed Development Advisory Committees were set up at the district level in all the watershed districts. It was preferred that government departments acted as PIAs and a range of line departments including forest, agriculture, animal husbandry, soil conservation, planning, revenue, rural development, and minor irrigation assisted in project implementation. In some states, NGOs were also used as PIAs.
- *People's participation:* User groups/self-help groups were set up only in some states. Similarly WCs and Was also were established in most watershed areas but some areas were still left out. This was attributed in some states to the lack of familiarity of government agencies in dealing with social and institutional issues without adequate orientation and training. In other states, the non-

availability of NGOs also hampered the efforts at engaging with the people in a meaningful way.

- *Capacity building:* All the states, implementing watershed programmes have reported investments in capacity building at various levels including the levels of beneficiaries, watershed community and watershed association members and project implementing agencies. In some states, this has resulted into positive outcomes. In others, it was felt that the quality of training received as well as the frequency of the training programmes need further improvement. Mostly state agriculture departments and universities and, in some cases, NGOs were also engaged in delivering capacity building component of programmes.

110. The salient findings of impact assessment studies reveals :-

- There has been an overall improvement in land use.
- There has been increase in the net sown area, gross cropped area and area sown more than once.
- Number of irrigation options enhanced in all the areas where watershed projects were taken.
- The fuelwood and fodder availability has increased, especially in the areas where emphasis has been laid on catchment's area treatment.
- The actual number of livestock has increased and there was a marked preference for improved breed. In many states the fishery potential has increased.
- There has been changes in the cropping pattern from one to two crops annually. This was directly attributable to the availability of water in the dry season. In some regions adoption of improved crop varieties was observed in the studies.
- There has been increase in agriculture related employment opportunities, among beneficiaries and in other sectors for non-beneficiaries. These included trade, dairy, poultry, masonary etc. Changes in household income levels were noticed as high as 50%.
- The institutional arrangement got strengthened.
- Peoples' participation through slow in the beginning got a momentum in course of time.
- In all project areas capacity building was at various levels.

C. Mid Term Assessment/ observations of Planning Commission on Watershed Programmes of Tenth Plan:

111. The Planning Commission of India have reviewed implementation of the watershed development programmes in rainfed areas and have made the following observations in their Mid-Term Assessment of the 10th Five Year Plan.

112. Rain-fed areas constitute about 60 per cent of net sown area and are characterized by low levels of productivity and low input use. The bulk of India's rural poor lives in rain-fed regions and face high variability of rainfall, resulting in wide

variation and instability in yields. For sustainable development of these areas, the watershed development approach has been adopted and given high priority for several years. Evaluation studies show several benefits of watershed development approach, the important ones are:

- increase in water level and recharge of ground water aquifers;
- reduction in soil erosion;
- increase in cropping intensity;
- change in cropping pattern leading to higher value crops;
- increase in crop productivity;
- rise in overall bio-mass in the watershed;
- increase in employment; and
- reduction in rural and urban migration.

113. Expenditure on the several schemes for watershed development has been stepped up in 2004-05. There is also a major focus of productive works under the new National Food for Work Programme, already launched in the poorest 150 districts and to be converted into an Employment Guarantee scheme.

114. However, while expanding the pace and scope of watershed development, much greater attention needs to be paid on why past efforts have delivered less than promised. Some watersheds are poorly designed. Most do not reach full potential in terms of agricultural production except under initiative and supervision of a few non-government organizations(NGOs). In many cases, watersheds have not been properly maintained because community involvement waned after the initial development stage. In any case, community involvement in watershed planning and design has typically been low; and distributional problems are persistent, arising from existing inequalities in land distribution or because of ill-defined rights and encroachment.

115. Some of these problems arise because watershed development is capacity-intensive and inherently slow. In addition, there are too many agencies of the Central and state governments implementing watershed schemes. This makes a coordinated approach towards prioritized planning and implementation rather difficult. A more structured and monitorable system with much greater community participation is widely regarded as the principal reason why efforts towards watershed development do not yield better and desired results. It is important for the planned distributional outcomes to be equitable and widely acceptable in order to ensure that there is a sense of ownership and participation on the part of the community at large both in implementation and maintenance of the water retention structures. It is necessary, in this context, to collect and collate information on successful experiences in designing and implementing watershed projects so that these can be replicated elsewhere in the country.

116. The National Common Minimum Programme(NCMP) has envisaged that the Government will introduce a special programme for dryland farming in the arid and semi-arid regions of the country. Since this is eminently amenable to watershed

development approach, it should be conceptualized in a manner so that it can be integrated with the activities and coverage of on-going watershed development programmes of the DAC and the Department of Land Resources in the Ministry of Rural Development.

117. Out of an estimated area of 146 million hectares of degraded land, 55 million hectares is categorized as wastelands. These wastelands and degraded lands are either unutilized or under-utilised. Being a common property resource, individual do not have the right to utilize these lands for any productive purpose. Land under the control of government or panchayats or other para-statal bodies could be parcelled out in viable units and allotted to landless and others, especially the deprived social groups, not only for homestead and kitchen gardening but also for specific purposes such as tree plantation or agro forestry. Distribution of such lands to the landless is actually being planned under two major recent initiatives, namely, the National Mission on Bamboo Technology and Trade Development and the National Mission on Bio-Diesel. The problem, however, is that the landless do not have capital and finance. Organising these people under cooperative structure and leveraging the employment guarantee programme could be a viable solution to the problem. Without resolving this issue, it would be difficult to involve local communities, which is a pre-condition for implementing these programmes successfully.

118. Despite a plethora of schemes and many years of implementation, the physical progress of treatment of degraded land has been rather slow. This should, however, be seen in the light of the overall magnitude of the task and the complexities of the issues involved, apart from the huge amount of funds that is required for the purpose. According to the Working Group on Watershed Development, Rainfed Farming and Natural Resource Management for the Tenth Plan, the total cost of treatment of 88.5 m.ha. of degraded land that would require treatment by the Thirteenth Plan would come to around Rs.72,750 crore to be shared by the Centre, States and the community. The Centre share works out to about Rs.23,600 crore at 1994-95 prices. A detailed plan of action has yet to be chalked out. For this, the different ministries viz. Ministry of Agriculture, Ministry of Rural Development and Ministry of Environment and Forest will have to take up a comprehensive exercise to determine the acreage that can be treated and the financial resources required, under each scheme/programme, in order to meet the above target.

119. There is need to step up public investment, particularly in irrigation / water resources, management / reclamation of waste/degraded lands, and provision of essential infrastructure such as roads, markets and electricity.

120. Some innovative mix of proper utility pricing, community control and provision of subsidies on water conservation techniques is urgently necessary in regions displaying acute water stress, i.e. over-exploited and dark blocks, particularly in low rainfall regions.

D. Meta Analysis of Watershed Development Programmes conducted by International Crop Research Institute for Semi Arid Tropics (ICRISAT)

121. The International Crop Research Institute for Semi Arid Tropics (ICRISAT) conducted a study to assess the performance of watershed programmess by employing meta analysis based on an exhaustive review of 311 case studies on watershed programs in India implemented by various agencies.

122. The report documented the benefits from the watershed programmes by collating information from micro-level studies to give a macro-dimension. The benefits were assessed in terms of efficiency, employment and sustainability. It was noted that the watershed programmes s were contributing in raising income, generating employment and conserving soil and water resources. The analysis show that the benefits of the watershed programmes were more in the poor income regions as compared to higher income regions. Benefits were more in the rainfall regions ranging between 700-1,000 mm. Indicating that for different Agro-eco regions with dryer and wetter regions different watershed management options are needed, the principle of " one size fits all" does not work for watershed management. The study suggested that the watershed program would be a vehicle of development to alleviate poverty by raising farm productivity and generating employment opportunities in marginal and fragile environments.

123. The study revealed that the benefits of watershed programmes were greater where people's participation was higher. The benefit-cost ratio was much more(2.4) in watersheds where people's participation was high in comparison to the watersheds with low people's participation(1.24). Similarly it was observed that the BC ratio was 2.46 in low-income regions as compared to 1.98 in high-income regions. This suggests that Government should accord higher priority to watershed activities in medium and low-income areas. It was noted that people's participation is not only important during the phase of implementation of watershed development activities, but beyond the actual investment phase. In the absence of water users involvement, watershed programmes failed to sustain themselves. The important conditions of people's participation are related to:

(i) demand-driven watershed programs rather than supply-driven ones;
(ii) involvement of all stakeholders (including women and landless laborers) in program implementation and monitoring;
(iii) decentralization of the decision making process;
(iv) involvement of elected representatives and Panchayati Raj Institutions;
(v) commensurate benefits of all stakeholders with their cost; and
(vi) establishing effective linkages of watershed institutions with other institutions, like credit sector, input delivery system, and technology transfer mechanism.

124. Watershed programmes are one of the most important strategies to bring socio-economic change in the rain-fed system. In some of the regions, it has silently revolutionized agriculture and allied sectors through various technological

interventions, particularly soil and water conservation, and crop diversification. For watershed programs, location-specific technologies are available. There is overwhelming policy and political support for these activities; however, there is a lack of appropriate institutional arrangement, suitable technical backstopping and capacity building initiatives for all the stakeholders. This is a major obstacle in attaining the potential benefits of a watershed programme. Earnest efforts to enthuse stakeholders for their voluntary participation would sustain watershed development and bring prosperity in the rain-fed areas for which novel methods, policies and suitable forward and backward linkages need to be delivered.

E. Evaluation of Watershed Programmes by CRIDA (ICAR)

125. The Crop Research Institute for Dryland Areas (CRIDA), an institute of Indian Council of Agricultural Research (ICAR) carried out a study based on SWOT analysis for watersheds in thirty seven locations under different agro-climatic systems covering different implementing agencies. Three types of survey was taken up in the study viz, (i) Rapid reconnaissance survey; (ii) Rapid rural appraisal survey and (iii) Detailed field survey. The selected physical, social and economic parameters were examined under arid, semi-arid and humid agro-climatic situation over the 37 watersheds. The data obtained on the natural resource management and socio-economic issues including crop and milk production were examined in detail. Some of the highlights are as follows:

- The overall operational holding was 3.11 ha in watershed and 2.85 in non-watershed areas. The WDP encouraged the farmers to bring more area (9.0%) under plough.
- With watershed the percent irrigated area increased from 38.2 in non-watershed areas to 52.4 in watershed areas.
- Soil-wise, the increase was more in heavy soils.
- Climate-wise, arid eco-systems acquired greater advances in irrigated area.
- All the socio-economic and other indicators showed marked improvement in watersheds over non-watershed areas. But, the LMF were more benefited in the programme. Evidently, this is because, the programme was land based (@ Rs.4000/ha). So large farmers were more benefited.
- Further, LMF derived greater benefit even from livestock. Stall feeding was adopted more by LMF.
- In respect of participatory approaches, the Government funded programmes of Ministries of Agriculture and Rural Development are relatively poorly placed in comparison with externally aided projects and the programmes of NGOs. and International Agencies were well above the governmental agencies(ICAR, NWDPRA and MoRD). The participation percentage of the primary stakeholders in planning, execution, monitoring and evaluation and maintenance components as per the study is indicated in the Table below;

Agency /Indicators	Participation(%) of the primary stakeholders			
	Planning	Execution	M&E	Maintenance
NWDPRA	75	62	31	22
MoRD	82	75	40	41
ICAR	91	79	16	15
IA	92	90	20	37
NGO	90	86	36	36
Average	86	78	29	30

- Training and capacity building warrant more attention with governmental; agencies.
- In respect of crop production, cereal production was more with small and marginal farmers. In other commodities., the difference between small and marginal farmers and large farmers was not significant.
- The differences in yield of selected crops between watershed and non-watershed areas was generally more. However, in the case of maize, green gram and groundnut, there were no differences.

Crops	Average yield (q/ha)		% increase / decrease
	Watershed	Non-watershed	
Cereals			
Sorghum,	11.2	9.4	19.1
Pearlmillet	12.2	9.4	29.8
Ragi	14.2	10.3	37.9
Maize	22.6	23.0	-1.7
Rice	22.0	20.3	15.0
Wheat	23.5	18.8	25.0
Oilseeds			
Groundnut	10.4	10.6	-1.9
Soyabean	14.2	6.2	129.0
Pulses			
Greengram	8.9	8.9	0.0
Blackgram	8.9	5.9	50.8

- As regards milk production, it was generally more in the watersheds.
- Coming to soil conservation, generally, watershed areas practiced conservation better, evidently, due to the awareness created in the programme. However, they opted more for field leveling and field bunding than contour bunding. The over all improvements in physical parameters in watershed projects in various agro-climatic conditions are:

Parameter / Agro-climate	Arid	Semiarid	Humid
Rise in water table (m)	1.05	1.57	1.38
Reduction in runoff(%)	35.0	33.2	30.5
Reduction in soil erosion(%)	15.0	28.8	25.6

Surface water resources developed (%)	9.0	18.0	20.5
Increase in afforestation(%)	10.0	11.3	21.7
Increase in cropping intensity (%)	6.0	16.0	18.3
Increase in employment	12.5	25.0	20.8

- The LMF practiced soil conservation better than the SMF both in and outside watershed areas.
- What is more inspiring is the feeling of the farmers that the soil conservation should be practiced on a community basis.
- Coming to rainwater harvesting, in-situ harvesting was accepted and practiced by all the farmers, the response being more in watersheds. Of the various practices, summer ploughing and criss-cross ploughing were practiced more by the farmers.
- While considering rain water harvesting through structures, individual structures (farm ponds and wells) were preferred besides cascade of check dams. Incidentally the last would lead to enhanced ground water recharge.
- The rise in groundwater was more in watersheds and large & marginal farmers were more benefited.
- There was increase in irrigated area as pointed out earlier, but the increase in non-water area appeared to be due to over-exploitation of the groundwater.
- By and large, employment generation was more being 7% more with male and 14% more with female workers. In the watersheds, more work was found in the agricultural sector.

Worker	Number of days/ year/ worker	
	Watershed	Non-watershed
Male	224.6	209.8
Female	223.7	194.9

- The average draft(as HP) available in the watershed and non-watershed areas is 1.01 and 1.02 respectively.
- The bullock draft available was 3.41 ha/pair of bullocks in watershed areas while it was 8.17 ha/pair of bullocks, indicating more bullocks in watershed areas. On the other hand, each of the tractors had to cover 50.96 ha in watershed and 45.04 ha in non-watershed area, indicating the better availability of tractor power in non-watershed areas.
- The women in the watershed as well as non-watersheds worked for 12-13 hours a day. However, there was a saving of 18% time in fetching water and fuel for household purposes in the watershed areas.
- When the overall responses were considered, the WDP was well received by the stakeholders. The overall responses of the stakeholders to various parameters / indicators reveals :

Indicator	Watershed (in %)	Non-watershed (in %)
Participation	63.9	20.9
Transparency	59.6	20.2
Socio-economics	58.3	17.3
Knowledge on soil conservation	68.8	48.8
Knowledge on runoff and soil erosion	72.3	57.7
Gully /drainage line treatment	51.5	24.7
Technology of soil & water conservation	42.2	27.0
In-situ rainwater conservation	71.3	33.3
Ex-situ rainwater conservation	57.2	27.8
Irrigation	93.2	43.6
Watershed management	69.4	30.4

- The family budget analysis indicated that on an average Rs.250 more were spent/head/year in watershed areas. Savings were more with watershed areas, average being Rs.34,491 and Rs.14,224 per household per annum respectively in watershed and non-watershed areas.

F. Review of impact assessment by Technical Committee of DoLR

126. The Technical Committee on Watershed Programmes, constituted under the Chairmanship of Shri S. Parthasarathy, has cited various evaluation studies on Watetrshed Programmes of the Ministry of Rural Development, in its report published in 2006. These studies provide indication of the potentials of the watershed programme with respect to drought proofing, agricultural growth, environmental protection, employment generation etc.

127. A study of sixty one IWDP Watershed shows that the mechanical and biological intervention helped in reducing surface runoff by 58% and soil loss to the extent of 52%. The report indicates that on an average 47400 cubic meter of water storage was created for watershed that help in increase of ground water recharge 20 to53%. The crop productivity index was observed to increase by 12-45% in treated watersheds. The report indicates increase in net return from all crops by 63% and there is clear observation of better availability of drinking water in watershed villages. Project succeeded in creating employment opportunities during and even after withdrawal of the project. Overall cost benefit ratio has been estimated at 4.07.

128. The evaluation conducted by the State Water Conservation Mission in Andhra Pradesh of nearly 2000 watersheds indicate rise in water table in about 90% cases despite a fall in the rainfall by about 28%. About 0.17 million ha. of additional area was observed to be brought under cultivation. The rate of migration was observed to be declined by 10-40%. The study indicates improvement in the availability of drinking water as well.

129. The Action Research Unit (TARU) which evaluated the watershed programme of Rajiv Gandhi Mission for Watershed Development in Madhya Pradesh showed that the crop area has been increased in 46 out 58 villages and improvement in groundwater table in all the project villages. Availability of irrigation water was observed to have increased in 38 out of 58 villages. However, the landless household appeared to have been benefited trough direct wage employment where as impact on long-term employment is negligible .

130. The impact evaluation conducted by WASSAN observed that the overall benefit cost ratio in watershed investment varies between 1.10 to 3.78 on which basis the investment payback period was estimated at 2-3 years only.

131. A study of three watersheds under the Indo-German Watershed Project in Ahmed Nagar district of Maharashtra showed an average rise of nearly 300% in the irrigated area and 50% in cropped area.

132. An initial survey of 16 villages in drought affected districts of Gujarat showed that the watershed villages were better placed compared to non watershed villages in terms of water and biomass availability, employment opportunities and out migration. The watershed villages had no shortage of fodder and not dependent on water supply by tankers. Some of the watershed villages were even able to take up Rabi crops which was beyond imagination in the locality. However, after the withdrawal of the project due to successive drought years, the immediate impact got marginalized after three to four years. This suggests for need of a better policy and that more intensive investment is required to consolidate the gains from programmes.

Legal and Administrative Issues influencing performance of Watershed Programmes

133. Implementation of land development programmes under the watershed approach began in India, almost half a century back. The initial thrust in the watershed programmes was on soil and moisture conservation practices. In the course of time, these programmes were mixed with crop diversification technologies to achieve higher production and productivity in rainfed, degraded and dryland areas. Subsequently, involvement of people with these programmes was considered necessary and hence, the participatory approach occupied a central stage in watershed programmes. At a later phase other farming systems, such as, livestock and fishery development, agro-forestry, dry-land horticulture, organic manuring and a host of area specific income generating activities were adopted as integrated components of watershed programmes. These activities, quite often referred as ‘ watershed plus’ are important not only for the success of programmes, but also, for their sustainability. It will be rather appropriate to incorporate more livelihood supporting components in watershed programmes.

134. The National Agriculture Policy (2000) recognizes watershed approach as the principal vehicle of transfer of technology in rainfed areas, which by and large covers the dryland and degraded areas. However, in formulation and execution of watershed

based programmes lot more administrative and legal problems have been experienced. In the subsequent paras some of these issues are dealt.

135. Extent of degraded land in the country, as enumerated by various agencies, varies within wide limits due to different techniques adopted by them. The National Commission of Agriculture in 1976 relied upon the secondary data and estimated 175 million hectare land under different categories of degradation. The Ministry of Agriculture, GOI in its Land Degradation Statistics of States estimated the quantum of degraded land at 174 million hectare. The National Bureau of Soil Survey and Land Use Planning (NBSS – LUP), Nagpur conducted mapping of the country on 1:4.4 million scale and concluded in its report published in 1994, that the total area under degradation is 188 million hectare. In a recent assessment conducted by NBSSLUP in the year 2005 has estimated the total degraded land to the tune of 146.82 million ha. The details of the Statewise breakup of different category of degraded land is given at **Annexure – II.** The Ministry of Agriculture, GOI in its Land Degradation Statistics of States 1994, put the land degradation estimate at 107 million hectare. The National Remote Sensing Agency (NRSA) conducted mapping of the country on 1 : 50,000 scale and assessed the extent of degraded land at 64 million hectare in its report published during 2000. Again, the NRSA has projected the wastelands of India in its report (Wasteland Atlas of India), published in 2005 at 55.27 million hectare. Such a vast difference in the extent of degraded lands / wastelands in the country is posing problem for the planners in preparing programmes for their treatment.

136. The estimation of degraded wastelands should be entrusted to one professionally competent organization by drawing experts from relevant disciplines. The NRSA and NBSSLUP may be considered for a joint assessment of degraded lands in the country.

137. Large number of WSD Programmes of different Central Ministries/Departments are under implementation in different States. These programmes are being implemented under different guidelines of respective schemes. At times, the implementing and the coordinating agencies for these schemes differ. The objectives of the schemes also vary depending on the mandate and area of operation. Such a fragmented approach may defeat the very objectives of scientific management of watersheds in particular and that of natural resource management in general The multiplicity of programmes and agencies operational in an area pose problems of coordination and coherence as well. At the national and state levels also a coordinated approach towards prioritized planning and implementation becomes rather difficult in this scenario and the possibility of overlapping of schemes in a particular area can not be ruled out.

138. The watershed approach has been accepted as a major theme for development of the rainfed / dryland areas with a view to conserving natural resources of water and soil and to mobilize communities for socio-economic upliftment by enhancing people's participation. To ensure appropriate coordination at the national and sate levels and to ensure appropriate implementation and convergence of different programmes, it is necessary that at the state level all are programmes are

coordinated by one single agency and at the national level the programmes are coordinated, supervised and monitored by a national level Authority.

139. The Codification of Watersheds for all the States is yet to be completed in a systematic manner. Although, organizations like; NRSA, NBSS-LUP, AIS & LUS are working in this regard yet, there is a need to integrate the codification process of these organizations. The element of uniformity in the codification also requires uniform procedure. Once, such a codification is completed, it can be superimposed on the treated watersheds to estimate the extent of untreated watersheds. Such an information will be of great value in prioritization of watersheds for perspective planning. Such details may be useful at the district level too, to avoid duplication and overlapping of programmes of different Central Ministries / Departments / Organizations. A "soil to satellite" approach needs to be promoted along with computerization of land records. The Department of Land Resources of Ministry of Rural Development is in the process of having a six layer wasteland mapping on internet with the help of NRSA. This scheme needs to be taken up at the earliest and on a large scale so that there is a clear-cut identification of wastelands at village level which should be known to the village community as well as to the Government agencies for appropriate planning for future.

140. Implementation of watershed/ wasteland programmes in forest lands, quite often witnesses problems posed by the Forest Department in view of Forest Conservation Act, 1980. Although, the common approach to the watershed programmes accepted by the Ministry of Agriculture and Ministry of Rural Development prescribes for development of forest lands in watershed areas, yet, at the field level implementation of watershed projects suffer on this aspect. It is a fact that forests constitute one of the important natural resources which need to be conserved with utmost importance along with the other scarce resources like water and soil. In the watershed areas forest generally constitute the most vulnerable segment of the geo-hydrological unit occupying the ridge section. They contribute the maximum runoff due to higher slope and provides the erosive velocity to the flowing water. Integrated and holistic development in the watershed area can not be possible unless treatment of forest areas are properly addressed with suitable vegetative and mechanical measures. The scientific development of watershed recommends a ridge to valley development approach which signifies the development of forest areas in the upper reaches first. Unfortunately, in India, involvement of forest sector in the watershed programmes has remained limited.

141. Technical sanction of the treatment plans should be given by the Divisional Forest Officer concerned. The programme should as far as possible be implemented by Village Forest Committees existing in that area. If no such Committee exists, their formation may be encouraged, or else the project activities in such watersheds should be taken up by the Forest Department. Village Forest Committees should be treated at par with Watershed Committee. Since Village Forest Committees are registered with the Forest Department of the respective States, there would not be any need for getting them registered under the Societies Registration Act. The Micro-watershed Development Plan for the forest areas should be in conformity with the Forest

Conservation Act. Where a relatively larger proportion of the watershed is covered by forest lands, Forest Department at the district level should be encouraged to take up the work of development as Project Implementation Agency. A forest official should invariably be included as a member of the Watershed Development Team wherever forest land falls within the watershed. The watershed interventions which have immediate bearings on the socio-economic development of the watershed community, may be encouraged as incentives to the activities of forest department for effective convergence and optimum utilization of available resources. Many of the watershed communities depend on forest for their livelihood. Income generating activities based on forest produce need to be encouraged under the watershed programmes for the livelihood support of landless labourers. This will not only motivate communities for preservation and protection of forest resources, but also help in improving the rural economy.

142. The issue of sustainability and convergence of other development programmes needs to be ensured by encouraging incentives linking with the developmental activities. For instance road construction in an area may be linked with the raising of plantation by the community. Similarly, electricity / telephone connections may be provided to those farmers on priority who will resort to drip irrigation. The element of entrusting responsibility is not very focused in most of the development programmes and therefore needs special attention.

143. Ownership Rights in respect of Common Property Resources (CPR) created under watershed development programmes, lead to a conflicting situation. A variety of CPRs are created under various WSD Programmes, such as, Water Bodies, Plantations etc. In the absence of appropriate usufruct rights and appropriate withdrawal strategy, the landless poor and less influential farmers are generally devoid of their use. Each programme should have an appropriate management policy both for the project phase as well post project phase. The withdrawal strategy should address the issue of ownership right in respect of CPRs created under WSD Programmes. Further, in WSD Programmes since inception, user groups may be promoted by incorporating members from all sections of society. This will also address the equity aspect which is other wise missing in watershed programmes.

144. Regulatory mechanism for developed resources under WSD programmes like; water bodies, plantations etc. has not been considered in WSD Programmes. As a result, the benefit of resources created like tapping of ground water by installing tube wells and bore wells etc. goes to the influential members of the watershed community. The withdrawal strategy may look into this aspect so that appropriate regulation for CPRs through social legislation is ensured on a long term basis. This may be done by self imposition by the Watershed Community at large in absence of a good legislation.

145. A uniform institutional mechanism at the level of district and below for implementation of watershed programmes is necessary to avoid duplication of works and for uniformity in implementation. A single agency at the district and the watershed level should be responsible for implementation of watershed programmes irrespective

of programme of different Central Ministries / Department / EAPs etc. A flexible action plan for watershed development should be ready with such agency and as and when a scheme is introduced in that area, the agency may implement the scheme avoiding repetition of area.

146. Research support to watershed projects is essential to derive maximum benefits to the watershed community. Generally, watershed approach is followed in rainfed areas which are typically characterized by low production and productivity. Further, crop diversification, input uses, credit availability is very scarce in these areas. It is, therefore, necessary that the watershed areas should be statutorily linked to professional institution, such as, Krishi Vigyan Kendras (KVKs), State Agricultural Universities (SAUs), ICAR Institutions, State Institutes of Rural Development, State Remote Censing Centre, State Forest Research Department etc. for technical backstopping who will guide appropriately implementation of the programme converging it with other development programmes to maximize benefits to the community.

147. The fund flow mechanism for watershed projects particularly those implemented by Central Ministries / Departments is not appropriately streamlined. Since the natural resource management activities, such as, raising plantation, bunding, construction of water harvesting structures etc. are time bound operations and these are required to be carried well before the onset of monsoon, any delay in release of funds and its availability at the watershed level, defer execution of these activities. As a result, the benefits do not reach in time to the watershed community. Such delays are caused because the sanction of projects / releases from the GOI begins at the commencement of the financial year. The funds are then placed at the disposal of respective State Governments, and they take their own time to release the funds to the implementing agencies. Such delays can be avoided by evolving a mechanism in which administrative approval in respect of projects is accorded before the commencement of the financial year. Fifty per cent of the release of approved projects may be made at the beginning of the financial year to execute operations that are necessary to be carried out before the commencement of monsoon. The remaining amount can be released later on.

Conclusion

148. The critical review of programmes implemented by central ministries / departments reveals that upto IX Plan 28.83 Million Ha. land was developed by incurring an expenditure of Rs. 10441.02 Crores. In the first four years of X Plan i.e from 2002-03 to 2005-06, an area of 16.6 Million Ha. has been developed at a cost of Rs. 6593.90 Crores. The Planning Commission has projected treatment / reclamation of 15 Million Ha. land under watershed development Programme during the X Plan. Since one year of the X Plan is still available, it is expected that the projected target of 15 Million Ha. will be achieved. It is relevant to indicate that towards the end more land treatment is achieved under watershed development programmes. Therefore, in the X Plan the total land developed will be expectedly about 20 million hectare.

149. A reasonably accurate estimation of land required to be treated under watershed development programmes is a pre-requisite for any planning. In the coming years, 4 technologies are required to be used and integrated:

1. Remote sensing
2. Updating of data based on land record / survey records
3. Sample Ground Truthing to verify and reconcile the data obtained from the above two.
4. GIS Application for integrating the data from various sources.

150. The above data may form only the basis for Macro-planning as it may differ from actual area required to be treated at micro level due to scale and sampling intensity used. As the watershed development programmes are executed through the States and the micro-planning is done at local level in the States, acceptance of these estimates in general by the States is essential. The States may, therefore, be involved while finalizing the estimates. The actual area requiring the treatment at the micro-watershed level as received from Detailed project reports may act as a feedback for periodical review and revision in the figures of Macro-planning.

151. Watershed development programmes are mainly aimed at natural resource development with the objective to increase the agriculture productivity and improve rural economy. In the watershed programmes of Ministry of Rural Development, integration of agriculture, horticulture, livestock sector activities is quite often not appropriately made. Similarly the programmes of Ministry of Agriculture are deficient in livelihood and wasteland treatment. As the area of operation for watershed development programmes of Ministry of Agriculture and Ministry of Rural Development differ, these programmes are deprived of integrated holistic development approach. Appropriate convergence of allied activities need to be ensured to avoid such deficiencies in both cases.

152. Though the guidelines for implementation of watershed development programmes provide certain degree of flexibility in the planning, execution and management to achieve the optimal results, yet, such flexibility is not provided in implementation of project. A sub-optimal approach has set in many cases, in a haste to achieve the targets and to complete the work. In such cases, the possibility exists that these projects instead of moving on to a path of conservation, may slide downwards on to a path of degradation leading to a liquidation of resources after the project period is over. The pre-conditions for the take-off and successful completion of the project designed with a fixed period are generally absent from the rural scenario. A detailed preparation of the blue print of the project may also require longer period than that prescribed in the guidelines. The project period of five years, therefore, requires revision and required to be made flexible to accommodate the wide range of socio-economic set-up in the country.

153. The issue of sustainability and convergence of other development programmes needs to be ensured by encouraging incentives linking with the developmental activities. Similarly, the watershed interventions which have immediate bearings on the

socio-economic development of the watershed community, may be encouraged as incentives to the activities of forest department for effective convergence and optimum utilization of available resources. This will not only motivate communities for preservation and protection of forest resources, but also help in improving the rural economy. The element of entrusting responsibility is not very focused in most of the development programmes and therefore needs special attention.

154. Ownership Rights in respect of Common Property Resources (CPR) created under watershed development programmes, lead to a conflicting situation. A variety of CPRs are created under various WSD Programmes, such as, Water Bodies, Plantations etc. In the absence of appropriate usufruct rights and appropriate withdrawal strategy, the landless poor and less influential farmers are generally devoid of their use. The withdrawal strategy should address the issue of ownership right in respect of CPRs created under WSD Programmes. Further, in WSD Programmes since inception, user groups may be promoted by incorporating members from all sections of society. This will also address the equity aspect which is other wise missing in watershed programmes.

155. Equity in distribution of resources generated such as water has not been appropriately addressed. As a result, the benefit of using the surface and ground water by using lifting devices and through tube wells and bore wells etc. goes to the influential members of the watershed community. The management of resource should be made strategically so that its availability to all stake holders is ensured through social legislation on a long term basis.

156. The outcome of the project must ensure watershed stability through contributory approach for each developmental activity. The priorities in purpose while allocating the resources, e.g. water for drinking, for livestock and human consumption gets importance over allocation of water for irrigation. The self-reliance and greater control over resources by the community at the end of the project are required.

157. It has been observed that most of the watershed developed do not reach full potential in terms of agriculture production and are not properly maintained because the community involvement diminishes after the initial development stage. Community involvement in watershed planning and design has typically been low; and distributional problems are persistent, arising from existing inequalities in land distribution or because of ill-defined rights and encroachment. These aspects need to be tackled by greater involvement of community from the planning stage to the execution stage and in the post treatment stages.

158. Promotion of farming system approach has been identified as a thrust area for the Tenth Plan. It has been therefore, recommended that greater investments under watershed development and rain harvesting and natural resources conservation be resorted to. For expansion of watershed development, greater attention is required to obtain full potential in terms of agricultural production and, therefore, promotion of farming systems approach should be made an integral part of the watershed development programme for rainfed areas. Particularly, areas like improvement in crop

production technology, improvement in supply of quality inputs like seeds, fertilizers, machinery, varietals diversification and technology transfer should be included as integral part of the watershed development programmes being implemented by the Ministry of Agriculture. This will ensure full agricultural development in the treated areas under the watershed. Proactive intervention may be required rather than normal extension approach. This approach should be considered as an integral component in the successive Five Year Plans.

159. The wastelands and degraded lands, which are either unutilized or under utilized, should be brought under productive uses by development and distribution of such lands to landless for productive uses for their economic upliftment or some community plantations may be tried.

160. The fund flow mechanism for watershed projects particularly those implemented by Central Ministries / Departments is not appropriately streamlined. Since the natural resource management activities, such as, raising plantation, bunding, construction of water harvesting structures etc. are time bound operations and these are required to be carried well before the onset of monsoon, any delay in release of funds and its availability at the watershed level, defer execution of these activities. As a result, the benefits do not reach in time to the watershed community. Such delays are caused because the sanction of projects / releases from the GOI begins at the commencement of the financial year. The funds are then placed at the disposal of respective State Governments, who take their own time to release the funds to the implementing agencies through various intermediate agencies such as District departments, Zilla Panchayat etc. Such delays can be avoided by evolving a mechanism of direct transfer of funds from state government to the implementing agency either by electronic fund transfer mechanism or direct cheque in the name of implementing agency. The administrative approval in respect of projects may be accorded before the commencement of the financial year to ensure timely release of funds by Central Ministries.

161. Provision of substantial assistance on water conservation techniques in the regions displaying acute water stress, i.e. over-exploited and dark blocks, particularly in low rainfall regions has been advocated. The provision for farm ponds and other rain harvesting structures as well as micro irrigation devices may be considered for such assistance in the rainfed areas. These aspects are not being addressed in the ongoing watershed programmes.

162. The monitoring mechanism for different programmes vary considerably. As a result, at a given point of time, it is not possible to assess the progress of various programmes. Looking into the availability of various new technologies / options available, particularly in the field of Information Technology, a common online monitoring mechanism may be adopted. Such practice has been experimented and found successful in monitoring of externally aided watershed projects. A common Information Monitoring System (IMS) based on GIS software may be designed and adopted by different Central Ministries / Departments / State Governments. In addition, practice of mid term evaluation need to be institutionalized in all watershed

programmes to take appropriate corrective measures during the implementation phase.

163. Performance of watershed interventions varies from one agro-ecological region to other. Quite often when evaluation studies are entrusted to an agency which is not acquainted with the problems and geo-hydrological and socio economic conditions of the region, there remains a gap in corroborating the externalities by the evaluation agency in their assessment. It will be more appropriate to identify a group of agencies of national repute for evaluation works in different agro-ecological regions and all evaluation studies may be conducted through them. This will ensure uniformity in assessment.

164. The present system of evaluation of watershed programmes is not very much elaborate since evaluation is being done on small sample size. Multiplicity of evaluating agencies is also influencing uniformity of evaluation results. There is need to have watershed basis monitoring and evaluation. Agencies like NRSA, ISRO, ICRISAT having adequate infrastructure and professional competence may be considered for entrusting evaluation of programmes on regional / state level using advanced IT and GIS based techniques which may be followed with appropriate ground truthing. In other words, out-come based evaluation needs to be attempted for a district or state.

165. The indicators prescribed for evaluation of different schemes vary depending on the objectives of the scheme. As a result the nature of analysis and conclusions drawn there from also varies. Since watershed approach is common to all the programmes, it is possible to adopt certain important common indicators in such assessments. This will facilitate effective analysis of different programmes and at the national level policies can be refined accordingly.

166. Many programmes for development of rainfed area, wasteland and degraded are being implemented by different Ministries / Departments / Agencies. However, up to date information of these programmes at National / State level, is generally not readily available to users, for different purposes. For easy access as well as sharing of information it is necessary to develop a National Level Portal for all programmes, with easy access to the users.

167. There is need for social audit for all the expenditure incurred in watershed development programmes in the last ten years. For better monitoring and transparency, the progress of watershed works along with expenditure details should be reported and discussed in the Gram Sabha at least twice in a year. This should be made compulsory for all programmes.

168. Multiplicity of programmes and agencies pose problems of coordination and lack of synergy. Watershed development programmes in the rainfed areas need to be suitably strengthened to take care of the existing deficiencies and concerns of rainfed agriculture.

169. The Government of India has recently established a National Rainfed Area Authority (NRAA) with an objective to coordinate and converge programmes in rainfed areas. The Authority although is not an implementing or fund disbursing agency but, is entrusted with the responsibility of effectively converging the various schemes of different Ministries relating to Watershed Development and other aspects of land use and productivity in rainfed areas. This is a step forward in the right direction.

170. The NRAA has been set up as a policy making and monitoring body charged with the role of examining guidelines in various existing schemes. The mandate of the Authority is wider than mere water conservation and it covers all aspects of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches.

171. At the beginning of the X Plan the projected land for treatment / reclamation under watershed development programmes for the XI Plan was stipulated at 20 million hectare. With the kind of performance achieved during the X Plan it is expected that if the resources are appropriately made available, it is possible to accelerate the pace of development of these lands. This seems necessary keeping into consideration the large extent of degraded / wasteland / rainfed areas remaining un treated even after the X Plan. It will be appropriate if the projections for the XI Plan are recast to 38 million hectare which will include development of 36 million hectare land through the programmes of Central Ministries / Departments and remaining 2 million hectare through Public Private Partnership.

CHAPTER – II

RECLAMATION AND EFFICIENT USE OF WASTELANDS / DEGRADED LANDS

Introduction

172. Sustainable management of land resources is essential for livelihood, environmental and socio-economic security of the country. The mounting demographic pressure on land resources for material needs is, however, leading to their degradation in many parts of the country. A great deal of concern is already being voiced by researchers, planners, environmentalists and farmers alike on stagnating crop yields, increasing cost of cultivation, rising and falling water tables, secondary salinization and pollution of soils etc. The continued degradation of land resources is considered an important factor in lowering the total and partial factor productivity of agriculture in the country.

173. Land degradation could be described as the deterioration of soil quality and the partial or entire loss of one or more functions of the soil as a result of one or more degradation processes. There are two principal types of degradation: physical and chemical, which are described below:

174. *Physical Degradation:* Erosion of soil by water and wind is the most serious degradation problem in the Indian context. The analyses of the existing soil loss data indicate that soil erosion takes place at an average rate of 16.33 tonnes per ha. per year totaling 5,334 million tones per year. Nearly 29% of the total eroded soil is permanently lost to the sea; and nearly 10% is deposited in reservoirs, resulting in the reduction of their storage capacity by 1 to 2% annually. The remaining 61% of the eroded soil is transported from one place to another. It has been reported that the soils supporting rainfed agriculture are mainly subject to severe sheet and rill erosion with an annual soil loss of 20 to over 100 tonnes per ha. per year. The northeastern states of India have severe water erosion problem because of prevalent practices of shifting cultivation (Jhuming). In the past, the practice of jhuming had a long fallow cycle of 20 to 30 years. But due to population pressure, the cycle has narrowed to three to six years and thus aggravated erosion and degradation problems.

175. *Chemical Degradation:* Chemical deterioration of soils occurs through a number of processes which amount to the loss of nutrients and/or organic matter and accumulation of salts and/or pollutants.

176. Amongst the soil groups, Alfisols and Ultisols, are prone to chemical deterioration due to nutrient depletion. Several studies have shown that in many regions and in the cultivated areas there is a net negative balance of nutrients and a steady depletion of the organic matter. On the basis of point data it is estimated that about 70% area in the country is deficient in soil organic carbon, having less than 1% organic carbon. Deficiency of phosphorous is widespread in Indian soils with 49.3, 48.8 and 1.9% of soils having low, medium and high P status. There is growing

intensity of sulphur deficiency in 120 districts and micro-nutrient deficiencies such as Zn, Fe, Mn and B in intensively cultivated areas.

177. *Acid Soils*: According to an assessment 16 m. ha of arable land affected by acid soils will need reclamation to enhance the productivity. These soils suffer from deficiencies as well as toxicities of certain nutrients due to which their productivity is very low. There is ample scope to raise the productivity of these soils by applying lime and balanced fertilizers. The application of lining 2 - 4 quintals per ha. in furrows along with balanced fertilizers is quite effective in realizing higher economic yields.

178. *Saline & Alkaline Soils*: It is estimated that a total of 10.1 m ha are suffering from salinity and alkalinity problems including coastal saline soils. While saline soils have excess of neutral soluble salts, that is, chlorides and sulphates of sodium, calcium and magnesium the alkali soils contain appreciable quantities of salts, such as sodium bicarbonate and/or carbonate and high amount of exchangeable sodium in the clay fraction. The salt-affected soils are of wide spread occurrence in the arid, semi-arid and sub humid (dry) zones of the Indo-Gangetic Plains. Alkali soils dominate in areas having mean annual rainfall of more than 600 mm and saline soils are dominant in the arid, semi-arid and coastal regions.

Assessment of Degraded Lands

179. There are various agencies in the country which have assessed the extent of degraded lands under various categories. The estimates by these agencies are at great variance due to differences in approaches and criteria for assessment.

180. *Assessment by ICAR:* The National Bureau of Soil Survey and Land Use Planning, Nagpur, a subordinate organization under the Indian Council Agricultural Research (ICAR) has assessed in 2005 the soil degradation on 1:250,000 scale for the country. The indicators of degradation were water erosion, wind erosion, water logging/flooding, salinity / alkalinity, acidity and compaction etc. As per these estimates, about 146.82 mha (45 percent of total geographical area of the country) is degraded due to different degrading agents (**Annexure II**). The areas suffering due to water erosion, wind erosion, water logging, salinity / alkalinity, acidity and other complex problems were 93.6, 9.4, 14.3, 5.9, 16.0 and 7.4 million ha, respectively. The states suffering due to severe degradation are Mizoram (89%), Himachal Pradesh (75%) and Kerala (67%). Water erosion is quite widespread in the country with sizeable areas in Madhya Pradesh including Chhatisgarh, Andhra Pradesh, Uttar Padesh including Uttranchal, Maharashtra, Karnataka, Jammu & Kashmir, Gujarat and Orissa. The areas under water logging are more in Uttar Pradesh, Kerala, Bihar including Jharkhand and Andhra Pradesh. The large areas under saline / alkaline soils are in Rajasthan, Uttar Pradesh and Maharashtra. The acid soils are more prominent in Madhya Pradesh including Chhatisgarh, Arunachal Pradesh.

181. *Assessment of Wastelands by MoRD*: Ministry of Rural Development had entrusted National Remote Sensing Agency (NRSA), the responsibility for identification of various types of wastelands and their extent in the country. The NRSA

published Wastelands Atlas of India –initially in 2000 and now in 2005, using one time IRS data of the years 1998 and 2003 respectively. For the categorization the wasteland, has been defined as "degraded land which can be brought under vegetative cover with reasonable effort, and which is currently under-utilized and land which is deteriorating for lack of appropriate water and soil management or on account of natural causes. Wastelands can result from inherent/imposed disabilities such as by location, environment, chemical and physical properties of the soil or financial or management constraints". NRSA has used the IRS LISS – III data for generation of wastelands maps/database. On screen visual interpretation technique was followed in wastelands identification from satellite data. The methodology involves interpretation of enlarged satellite false color data (1:50,000 scale) based on image characteristics such as tone colour, texture, pattern, shape, size, location and association to identify and delineate different types of wastelands.Old vector, IRS-LISS-III data of 2003 & ground data information collected were used to prepare wasteland map-2003.

182. As per recent study by NRSA, the total extent of wastelands in the country is 55.27 Mha. compared to 63.85 Mha. published in the year 2000. The details of wastelands category and State-wise are at **Annexures III & IV** respectively. The wastelands have been now classified into 28 categories compared to 13 categories in the year 2000. The land with and without scrub is maximum i.e. 15.4 m. ha., followed by degraded forest covering10.8 mha. The other wastelands i.e. gullied and ravinous lands, salt affected soils, waterlogged areas, shifting cultivation areas, industrial and mining wastelands etc. also need immediate attention for increasing the productivity of these lands.

183. The extent of degraded lands by these agencies were discussed in the first meeting of the Sub Group. It was decided that the assessment of NBSSLUP, Nagpur would be adapted for the purpose as it was more comprehensive covering all the land uses. The NRSA estimated the highly degraded soils (wastelands) which had no vegetative cover. Chemically degraded soils could not be identified by remote sensing technique. However, these soils respond to management and should be included in planning.

184. Reclamation and efficient use of wastelands/ degraded lands such as alkaline ravine and areas effected by shifting cultivation, which require high cost of reclamation are being attempted under different schemes of Government of India. However, the treatment of saline soils, acidic soils and waterlogged areas have been neglected**.** The treatment of Alkaline Soils and Shifting Cultivation areas are covered under the Centrally Sponsored Programme of Ministry of Agriculture and the Planning Commission respectively. For the development of the Ravinous and Saline Soils as well as acidic soils, at present, there is no specific Central Sector/Centrally Sponsored Programme. However, the waterlogged areas in selected commands are being addressed under a Centrally Sponsored Scheme of Command Area Development under MoWR.

Programmes for Development and Efficient Use of Degraded Lands

Reclamation of Alkali Soils (Usar)

185. There is no precise information available about the extent of area, suffering from the alkalinity as mostly it is in the mixed form with Saline Soils. However, according to an estimate, about 3.58 m. ha. suffers from alkalinity in the country. Such soils are largely in 11 States, namely, Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh, as given at **Annexure VI** 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 8.2 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. 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 growth. The technology for reclamation developed by ICAR has been successfully applied largely in the states of Punjab, Haryana and Uttar Pradesh. The reclamation proramme consists of following main components :

(i) Assured irrigation with good quality water;
(ii) On farm development works including land leveling, bunding, deep ploughing, drainage system.
(iii) Application of soil amendments – Gypsum/Pyrites;
(iv) Organic matter – green manuring, organic manures, etc; and
(v) Land management by salt tolerant varieties and keeping under continuous cropping system

186. The present guidelines of Centrally Sponsored Scheme for Reclamation of Alkali Soils envisage isolated and projectised approaches for reclamation of Alkali Soils. In isolated approach, the main components are survey, planning, on farm development and application of gypsum within a unit cost of Rs.11,300 per ha. The projectised approach is comprehensive development of large area affected with high severity of alkalinity for comprehensive 3 years package the unit cost is Rs. 57,300 per ha. However, during X Plan, it was observed that the State Govts. opted only for isolated approach and not the projectised approach. The programme was subsumed under the Macro Management of Agriculture in the year 2000 and subsidy on gypsum was reduced from 75% to 25%. Due to reduction of subsidy implementation of the programme by State Govt. in X Plan reduced drastically in all States. Only few States, namely, Haryana, Gujarat and Tamil Nadu were able to implement the programme by providing additional subsidy of 25%. There is need to consider enhancing subsidy for gypsum, pyrites and other items of community nature to 50%.

187. In view of position explained above, thorough restructuring of the scheme is required and projectised approach of reclamation of alkali soil need to be adopted for reclamation of contiguous large areas affected by alkalinity. The projects in cluster for one district may be prepared and approved based on the location specific requirements. Also, the private and community lands affected by alkalinity should be reclaimed and put to use for the cultivation or under biomass based on its suitability. In case of community lands State Governments should ensure that these lands are allotted or given on lease to the farmers for cultivation so that these reclaimed lands should not revert to alkalinity. Accordingly, the revised cost norms for a combined package of reclamation of Alkali Soils are given at **Annexure -VII.**

188. Up to IX Plan, an area of 5.81 lakh ha. was reclaimed with expenditure of Rs. 76.4 crore. During X Five Year Plan, Rs. 60 crore was allocated to treat 2.00 lakh ha. During X Plan, only about 1.5 lakh ha. is likely to be treated using about Rs. 35 crore as Central share. Therefore, since inception up to X Plan about 6.3 lakh ha is likely to be reclaimed with an expenditure (Central Scheme) of Rs. 111.0 crore. Only Gujarat, Haryana, Karnataka, Punjab, Rajasthan and Tamil Nadu could utilize Central fund for reclamation of alkali soil.

189. *Targets & Outlays for XI Plan:* As large areas of Alkali soil still remains to be reclaimed, it is proposed that an ambitious target should be fixed for XI Plan after making suitable changes in subsidy pattern in the major activities of reclamation as these are the new areas which may be brought under cultivation to enhance the total production. Based on the revised package as given at **Annexure-VII**, the following target and outlays are proposed.

i)	XI Plan target	:	5 lakh ha.
ii)	XI Plan outlay (total)	:	Rs. 1455 crore
iii)	XI Plan Central Share	:	Rs. 550 crore.

Development of Shifting Cultivation Areas

190. Shifting Cultivation known as Jhum cultivation is a traditional form of crop production, practiced on hill slopes and regarded as the first step in transition from food gathering and hunting to food production. Shifting Cultivation involves clearance of forest on sloppy land (usually before December), drying and burning the debris (Mid-February to Mid-March before the onset of the monsoon) and cropping. Initially, when the system of food production emerged, the Jhum cycle was 20 – 30 years but now it has reduced to 3 – 6 years causing serious threat to land degradation and ecological problems.

191. Though there is no precise information about extent of jhum cultivation, mainly due to change of affected area on year to year basis. However, according to the Task Force Report on Shifting Cultivation in India, Ministry of Agriculture (1983), 49.13 lakh ha. (4.9 mha.) is minimum area under shifting Cultivation one time or the other in 11

States of the country. The details are at **Annexure – VIII.** About 4.44 lakh jhumia families are reported to be engaged in the practice of shifting cultivation in 7 States of North-Eastern Regions covering about 1.9 m ha. The area affected by shifting cultivation in Orissa is the maximum i.e. 2.65 m ha. The most recent survey of NRSA in their Waste Land Atlas, 2005 have assessed that 1.876 million ha. land is affected by shifting cultivation. The state wise break up is at **Annexure- IX**.

192. Watershed Development Project in Shifting Cultivation Areas(WDPSCA) programme was launched in 1994-95 in the 7 North-Eastern States, namely, Assam, Arunachal Pradesh, Manipur, Mizoram, Meghalaya, Nagaland and Tripura and continues to be implemented during the X Plan. The broad objectives of the scheme are as follows:

- To protect and develop the hill slopes of jhum areas through different soil and water conservation measures on watershed basis and to reduce further land degradation process.

- To encourage and assist the jhumia families to develop jhum land for productive use with improved cultivation and suitable package of practices leading to settled cultivation practices.

- To improve the socio-economic status of jhumia families through household land based activities.

- To mitigate the ill effects of shifting cultivation by introducing appropriate land use and water management as per capability and improved technologies.

193. In view of the diverse agro-ecological situations and socio-economic setting, the choice of technology will vary from location to location. Such technologies should be in consonance with indigenous land use practices and systems. The various soil conservation measures found to be suitable with respect to soil erosion, moisture conservation and increase in land productive areas. The development component includes treatment of arable and non-arable land with complete drainage line treatment, water harvesting structures, farmponds, horticulture, forestation, silvipasture, crop demonstration, etc. The rehabilitation component includes improvement of land based and household production system depending on the choice of the farmers like piggery, poultry, duckery, fishery, sericulture, basket/rope making, tailoring, carpentry, etc. About 80% of total expenditure is utilized for the components leading to creation of employment in remote rural areas.

194. There are different opinions regarding settled cultivation by jhumia families. The shifting cultivation is a practice, which is very significant for the tribal society and their social relationships, cultural values and mythical beliefs. However, there are traditional systems, namely, Apatani prevailing in Arunachal Pradesh and Zabo system in Nagaland, where tribals have settled mainly due to facilities available such as bench terracing on hills for scientific cultivation, system for run-off collection of rain water and

pisciculture. Another approach is for sustainable jhuming into the process of agricultural development by appropriate management and increasing jhum cycles.

195. *Targets & Outlays for XI Plan*: The unit cost for development of shifting cultivation areas was fixed Rs. 10,000 per ha. in the beginning of X Plan considering the wags and material cost prevailing at that time. As the wages and material cost have increased, the unit cost of shifting development areas for XI Plan is proposed to Rs. 12,000 per ha. Also, it is felt that for settled cultivation of jhumia families, the bench terracing should be allowed so that it could encourage settled cultivation on hill slopes. The targets and allocation for XI Plan are proposed as under:-

Physical target	2.00 lakh ha.
Outlay	Rs. 240 crore

Proposed New Programmes for XI Plan

196. *Saline Soils*: Saline soils contain excess neutral soluble salts, which affects crop growth adversely. These salts include sodium chloride, sodium sulphate, calcium chloride, calcium sulphate magnesium sulphate and magnesium chloride. The saline soils may occur in areas, which have high water table. It also tends to occur in areas of low rainfall i.e. less than 550 mm. It is estimated that saline soils occupy about 4.5 mha. of the total salt affected soil in the country.

197. The coastal saline sandy lands are spread over all along coast lines of India, which is about 6,000 Km. long. These areas are having problems of salinity as well as shifting of sand dunes. This problem, therefore, occurs in various degrees in West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Karnataka, Kerala, Maharashtra and Gujarat.

198. For providing an appropriate type of technology the identification of type and severity of salinity is necessary. It is usually in mixed form ie salinity or salinity mixed with alkalinity. An integrated approach therefore including crop production, fisheries, animal husbandry, forestry, providing improved drainage and harnessing irrigation potential has been suggested. It is desirable to utilize the considerable volume of fresh water available from rainfall to ensure recharge of ground water, flushing of salts and raising of crop/vegetables. 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 upstream areas along the river.

199. Remedial measures suggested by ICAR for treatment of saline soils are as follows:

(i) Survey and Categorisation of the problem areas
(ii) Provision of a complete network of drainage system.
(iii) Ensuring leaching availing of natural rainfall or through special efforts.
(iv) Adopting conjunctive use of canal and ground water resources.

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

200. *Waterlogged Areas:* An area is considered to be waterlogged when the water table rises to an extent that soil pores in the root zone of a crop become saturated, resulting in restriction of the normal circulation of the air, decline in the level of carbon dioxide. The depth of water table which is considered harmful would depend upon the type of crop, types of the soil and the quality of water which may vary from 0 m for rice to about 1.5 m for other crops. The Ministry of Water Resources (MoWR) has identified three categories of waterlogged areas:

(i) Water table with in 2 meters of land surface (due to rise in water table)
(ii) Water table between 2-3 metres below land Surface
(iii) Safe areas Water table below 3 metres of land surface

201. The remedial and development measures for reclamation of waterlogged areas are:

(i) Provision of a complete network of drainage system.
(ii) Ensuring leaching availing of natural rainfall or through special efforts.
(iii) Taking up aquatic and semi-aquatic crops, fishing ponds or those having high water demand. Green manuring crops should also be taken to help in leaching and removal of the salt.
(iv) Adopting measures to promote better drainage and leaching and to reduce erosion and divert run off that cause surface flooding.
(v) The farming system and the measures mentioned above should be integrated with the growing of trees in waterlogged areas such as eucalyptus, willows, poplar and fish culture etc.
(vi) Educating and training farmers in regulated irrigation application.

202. For development of waterlogged areas through surface flooding, surface and sub surface with clear outlets, including pumps, are desirable. Many a time, the possibility to remove excess water by pumping could be economical if linked with production system. In addition, 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 would be economical.

203. *Targets & Outlays for XI Plan:* For development of saline and waterlogged areas (other than command areas, as it is covered under the Centrally Sponsored Scheme of (MoWR). require mainly the drainage system, which involves (i) development of saline and waterlogged areas with surface drainage including bio-drainage and (ii) reclamation with sub-surface drainage. The unit cost of development of these areas with surface drainage is estimated to be Rs. 15,000 per ha. and with sub-surface drainage Rs. 40,000 per ha. (cost norms are prevailing for the reclamation of waterlogged areas in the programmes of MoWR). It is proposed that about 10% of the total drainage system will be sub-surface drainage. Based on above, the target and allocation for XI Plan are below:

XI Plan target	2 lakh ha.
XI Plan outlay	Rs. 350.0 crore

204. *Gullied and Ravine Lands:* Ravines are the most advanced stage of severely eroded wastelands. The concentrated runoff on land surface forms rills. When several rills combine the flow increases and at the points of vertical falls the head cuts occur. These cuts proceed upward and due to combined effect of flow and consequent erosion, rills develop into channels. An extensive network of gullies running more or less parallel to each other and entering into nearby river are called ravine.

205. In India about 39.75 lakh area has been estimated to be affected by ravines. The state-wise break up is as under:

Sl.	Name of State	Area (in lakh ha.)
1.	Uttar Pradesh	12.30
2.	Madhya Pradesh	6.83
3.	Rajasthan	4.52
4.	Gujarat	4.00
5.	Maharashtra	0.20
6.	Punjab	1.20
7.	Bihar	6.00
8.	Tamil Nadu	0.60
9.	West Bengal	1.04
10.	Orissa	1.13
11.	Himalaya foot hills (including H.P. & Assam)	1.93
	Total	**39.75**

206. Ravenous area includes marginal land, shallow ravines, medium ravines and deep ravines. It is estimated that about 37.8% area falls under marginal land, 27.2% area under shallow ravines, 21.3% area under medium ravines and about 13.7% area under deep ravines. As per above category-wise ravenous land is as under:

Sl. No.	Category	Area (lakh ha.)
1.	Marginal land	15.03
2.	Shallow ravines	10.81
3.	Medium ravines	8.47
4.	Deep ravines	5.44
	Total	**39.75**

207. The Integrated Development of the Ravenous areas is proposed to be taken on Watershed Basis and following measures are required to be adopted as per site specific requirement.

208. *Protection of Marginal lands*: Proper protection and treatment of Marginal land would be taken for enhancement of Agricultural Production. Following measure would be taken to treat Marginal land depending upon the site requirement.

a) Contour bunding
b) Peripheral bunding (supported with outlets).
c) Land smoothening leveling with provision of safe water disposal structures.
d) Construction of Farm Ponds.
e) Crop Management Demonstration in the treated areas.
f) Horticulture Development
g) Agro-forestry
h) Pasture Development

209. *Treatment of Shallow Ravines*: Through treatment of shallow ravines additional area could be brought under cultivation. Following measures would be taken for reclaiming shallow ravnines:

a) Leveling/Terracing
b) Construction of grass waterways for safe disposal of run-off
c) Gully Head Control structures (where sudden drop exists and deep gullies started.)
d) Loose Boulder/ Earthen Structures in upper reaches with vegetative support
e) Gully check dams/percolation tanks in lower reaches of the Gully
f) Earthen check dams/percolation tanks in lower reaches of the Gully.
g) Water Harvesting structures/Farm Ponds.
h) Agro-forestry
i) Horticulture
j) Pasture development
k) Afforestation
l) Crop Management Demonstrations in developed areas.

210. Stabilization of Medium Deep Ravines: No work has been proposed in Deep Ravines because of:-

a) Deep ravine areas are not accessible for physical treatment. In most of the places, it would require aerial seedling, which is very expensive
b) Most of the deep ravines are having dense vegetation because these areas are less affected by grazing problem
c) Structural measures if proposed would of high dimensions and expensive.
d) With the treatment of upper reaches the erosion problem in deep ravines can be stabilized to a large extent as the silt load and runoff from upstream aggravates the erosion problem in deep ravines.

211. Apart from the above reclamation work in he area following side development activities could taken up i.e. i) Construction of link road and ii)For Livestock Development under this programme and fodder production demonstrations will be carried out on small plots of farmer's land (0.1 ha.). In reclaimed area crop production demonstration would be carried out under which selected farmers would be provided with high yielding seeds, fertilizers and pesticides. A package of Rs. 1000/- would be given for one demonstration plot of small size (0.1 ha.).

212. A working group was set up under the chairmanship of Secretary, Planning Commission (1983) to formulate special area plan for dacoity prone districts of Uttar Pradesh, Madhya Pradesh and Rajasthan to set out a socio-economic strategy for combating the dacoity problem. This group submitted its report in 1985. The strategy recommended in the report consisted of ravine reclamation and development, roads/bridges construction and rural electrification. In accordance with the recommendation of their working group a ravine reclamation programme was launched during 1987-88. The scheme was titled as "Ravine Reclamation in Dacoity Prone Areas of Uttar Pradesh, Madhya Pradesh and Rajasthan to accelerate their Development (This scheme was subsequently extended to Gujarat during 1989-90. Under this programme, 100% Central assistance was provided to the states and the budget allocations were made available on year to year basis. The main objective of this scheme was to check furthere spread of rvines into the adjoining productive land, restore the deraded ravenous areas and improve their productivity. The main work components of the Scheme consisted of :

(a) Peripheral bunding including construction of masonry oulets for safe disposal of run off and planting of grass, shrubs, trees, etc. to stabilize the bund.
(b) Levelling, smoothening, contour bunding, etc. of table lands to improve their productivity and ensure safe disposal of surface run-off from plot to plot.
(c) Afforestation of medium and deep ravines through manual planting of local tree species as well as grasses, suitable for fodder and fuel.
(d) Reclamation of Shallow ravines for agriculture, horticulture and other productive use.

213. Under this scheme an area of 1.27 lakh hectare was reclaimed in 4 States with assistance of Rs. 61.85 crore was released. In pursuance of the decision taken by the NDC, the Scheme was transferred to the state sector w.e.f. 1991-92.

214. *Target & Outlays for XI Plan:* In consideration of the technology involved, infrastructure available, sustainability of the programme and possibility of allocation of funds, a tentative target of 2 lakh ha. is proposed for development during XI Five Year Plan. The outlays at the rate of Rs. 30,000 per ha for the development of the ravenous lands are given below:-

Physical	:	2 lakh ha.
Financial	:	Rs. 600 crores

215. Development of Ravine lands for productive purpose requires concerted efforts. In India the problem of ravines is concentrated in river basins of Yamuna, Chambal and Mahi in the states of Uttar Pradesh, Madhya Pradesh , Rajasthan and Gujarat . It will be more appropriate that development of shallow and marginal ravines of these states is attempted in a project mode. For which external aid can be sought for financing of the project.

216. *Amelioration and Management of Acid Soil:* The acid soils are Sedimentary in nature belonging to lateritic ferruginous red and other red soil groups. They are developed mainly by the influence of relief, acidic parent material and wet climate. The acid soils are found in the Himalyan region, the eastern and north eastern plains, peninsular India and the coastal plains under varying agro-climatic conditions. About 16 mh, according to an assessment would need reclamation. The statewise extent of acid soils is at annexure IV.

217. The acid soils have poor supply of calcium and magnesium and more concentration of iron and aluminium. The soils, therefore, suffer due to deficiencies of phosphorous, calcium, magnesium, molybdenum and boron and toxicities of aluminium and iron. The soils have low organic carbon and available nitrogen. The productivity, therefore, suffers due to poor availability of nutrients, toxicities of iron and aluminium, poor biological activity of soil and frequent moisture stress.

218. The ICAR have conducted 871 experiments on farmer's field and recommended the package for reclamation of acid soil. It can be managed in two ways viz. either by growing crops suitable for a particular soil pH or by ameliorating the soil though the application of amendment. Pigeon pea, Soyabean, Groundnut, Lentil, Gram, Pea, Cotton, Maize, Sorghum, Wheat, Linseed and Mustard etc. are suitable for acid soils. These crops could be grouped according to their responses to acidity. ICAR has suggested different varieties of suitable crops for acid soils as given below :

Acid response group	**Crops**	**Varieties**
High response group	Soyabean	Bragg, Pb-1, Harosoya
	Pigeon pea	UPAS-120
Medium response group	Gram	K-851, Sonmuge
	Groundnut	Smruti
Low response group	Paddy	Madhukar, Jassuria
	Barley	Azad, K-125
	Bajra	Co-1, Co-2

219. Acidic soils with pH 5.5 – 6.5 can be managed by appropriate agronomic measures. However, moderately acidic soils with pH 5.5 – 4.5 and strongly acidic soils with pH less than 4.5 may need amelioration i.e. treatment with lime and application of fertilizer and suitable cropping system. Liming should be practiced only to neutralize the low magnitude active acidity due to hydrogen and aluminum ions in the soil solution and part of exchange acidity. Liming is not recommended to neutralize the reserve acidity. The application of lime @ 1 / 10^{th} of lime requirement in furrows along with the fertilizers is economical. The lime at the rate of 2-4 q/ha is applied in furrow along with basal dose of fertilizers (50 % of Nitrogen + Full dose of Phosphorous and full dose of Potash) at the time of sowing of crops.

220. According to the NBSSLUP of ICAR, 16 mha. (160 lakh ha.) of acid soils need amelioration / reclamation. ICAR researches have established that the productivity of these soils after reclamation will improve considerably i.e. more than 1 ton per ha./year and therefore, it is proposed that a new programme may be launched in XI Five Year Plan with an ambitious target of 20 lakh ha. The core reclamation agent for the acid soil is lime and Basic slags, a bi product from fertilizer / paper mills. Similar to Alkali Reclamation programme 50% subsidy is proposed on the main reclamation agent and on the community nature of activities. The average cost of reclamation of acid soils is estimated to Rs.8,000/- per ha. as details given at **Annexure-X.**

The following targets & outlays are proposed for XI Five Year Plan.

(i) Target 20 lakh ha.
(ii) Outlays (Total) Rs.1600 crore
(iii) Central Share Rs. 400 crore

Technologies of Re-Generation of Degraded / Wastelands, Watershed Development Programme

221. Systematic research at National Research Centre for Agro-Forestry (NRCAF), Jhansi and its coordinating centre through out the country led development of some of the promising technologies for degraded / Wasteland. Following technologies will be very much useful for Farmers & Nursery men, Orchardists, Horticulture, Pharmaceutical Company, NGO, Plantation companies, Watershed functionaries, Horticulture Department etc.

222. *Hardwickia binata based Agroforestry System* has been found most promising system in rainfed conditions. It includes digging pits of 45 cm^3 size and filling with a mixture of dug out soil plus 5 kg FYM + 10 g malathion / pit prior to the onset of monsoon. One-year-old saplings should be planted at a distance of 10 x 5m at the onset of monsoon season. In case rains are not received after planting, plants should be irrigated at weekly intervals till the plants establish well. The interspaces between trees may be utilized for cultivating soybean and mustard. In this system, considerable yield of soybean (0.78 to 1.02 t ha^{-1} grain) and mustard (0.79 to 1.13 t ha^{-1} grain) could be obtained every year. Besides grain yield from the crop, 3 to 4 t ha^{-1} dry forage can

also be obtained from pruning of Hardwickia trees after 7 years.

223. Anjan (*Hardwickia binata* Roxb.) based agri-silvicultural system has been found successful under irrigated conditions in medium black soils with black gram – mustard crop rotation. Regular pruning up to 75 % tree height reportedly results in hardly 6% reduction in yield of black gram and 8 % in mustard. The pruned material of *H. binata* besides green foliage and fuel wood, yields fiber from bark of pruned twigs to the tune of 292 kg ha^{-1}. The cost benefit analysis of cultivating seasonal crops in the system reckoning the mean for four years indicated that the highest B:C was 2.16 in case of low tree density (200 trees ha^{-1}) as compared to 2.07 in case of crop control.

224. Aonla (*Emblica officinalis*) based agro-forestry system has been found economically viable under rainfed conditions in red soils of Bundelkhand region and similar conditions elsewhere. The aonla variety Kanchan has been identified as most remunerative as it yielded 110 kg fruit $tree^{-1}$ under rainfed conditions at the age of 11^{th} year. With this level of production in marginal lands, planting of aonla at 10 x 6m spacing with 167 plants ha^{-1} can produce 12 to 15 ton yr^{-1} fruits after 10 years of plantation. Apart from fruit yield of aonla, 0.122 to 0.135 t grain yield of intercrop (blackgram) can be obtained from the system. Based on observation of 11 years and extrapolation for another 19 years, an economic analysis was done for 30 years rotation. The aonla based agroforestry system gave a discounted B: C (at 12%) of 3.62 as against a mere 1.10 under pure seasonal mono cropping system. The internal rate of return of Aonla based system worked out to 59 per cent.

225. The following techniques may be adopted to improve the production and ensure quality planting material for Aonla:

i. *In situ* budding technique standardized at the Centre resulted in higher survival of aonla plants in red gravelly marginal soils under rainfed conditions. Growth of plants budded *in-situ* was much better than planting of budded plants.

ii. Bench grafting in aonla was standardized and found highly successful (90%) during 12 to 28^{th} February on bare rooted stocks. Bench grafted plants can be safely stored bare rooted in wet moss grass for 4 days before planting in polythene bags filled with Soil+ FYM mixture and capped with white alkathene cap. The grafts are kept in partial shade and watered regularly till sprouting. Caps are removed after two weeks of scion sprouting in nursery. The bare rooted grafted plants with 4 days storing capacity can be transported in bulk to long distances with negligible cost. The technique ensures availability of ready to plant grafts well in time during early monsoon season.

iii. Vegetative propagation of aonla through cleft grafting was standardized. It was observed that seedlings grown in February-March attain graftable growth within 6 months. August was found to be the best month for grafting giving 85% success. Varietal response to grafting was not significant. Capping of grafts was instrumental in graft success. 23 $\pm$ 2 days capping was found essential. The technique was successfully demonstrated in mango and custard apple also. Further, bench grafting in aonla employing cleft grafting and capping technique in the month of February was standardized for on –time multiplication of plants. Bare rooted grafts can be transported to long distances with fairly good

success.

226. *Grasslands Improvement through Silvipasture:* The NRCAF has demonstrated improved productivity and quality of natural grasslands through the introduction of promising leguminous trees on dry degraded lands successfully. The lands earlier producing only 2-3 t/ha/year biomass are now producing 8-10 t/ha/year high quality biomass.

227. One of the system includes planting of 200 plants of *Albizia amara,* 200 plants of *Dichrostachys cinerea* and 380 plants of *Leuceana leucocephala* were planted in one hectare area. In between two lines of trees. *Chrysopogon fulvus* (a grass) may be planted at a spacing of 100 cm between row to row and 50 cm between plants to plant. The legume component i.e. a mixture of *Stylosanthes scabra* and *S. hamata* can be sown between two rows of grass with a seed rate of 4 kg ha^{-1}.

228. The studies showed a highly significant effect of such improved pastures on small ruminant (sheep and goat). The growth ratio of lambs and kids was found optimum in silvipastoral system. The small ruminants (10 % head along with their off springs upto 6 months) can be maintain through out the year on one hectare silvipastoral system.

229. Thirty-two plus trees of shisham (*Dalbergia sissoo*) were evaluated for straight and fast growth. In progeny trial of plus trees at two locations, two selections (PT –2 and PT-6) were identified which are fast growing (15-20 m^3 ha^{-1} yr^{-1}) and straight both in cultivated and degraded lands. If these varieties are planted in farmer's fields, then there will be less reduction in grain yields of under storey crops under agroforestry system. They are under preliminary stage of commercialization.

230. Neem (*Azadirachta indica*) and Maharukh (*Ailanthus excelsa*) based agrisilviculture systems with arable crops (Clusterbean, cowpea, greengram and til) are the most potential agroforestry systems for this region, which shows improvement in the fertility status of the soil in the form of organic carbon, available N, P and K as well as remunerative returns.

New Technologies Developed by CSWCRTI

231. Central Soil and Water Conservation Research and Training Institute, Dehradun has, over the years, created technologies for development of rainfed and degraded areas through watershed approach. Technologies that were recently developed and proven in actual field conditions by the Institute are briefly described as follows:

232. *Participatory Watershed Management:* A farm pond (260 cum) was dug out in a participatory mode by farmers to harvest sub-surface flow of water. The water was conveyed to agricultural fields through underground pipeline to irrigate 42 ha of land for the first time, benefiting 125 farm families. The cost of the system was recovered in just two years. The technology was replicated in another village and a tank of 352 cum capacity was constructed to harvest sub-surface flow and water was conveyed from the pond to fields through gravity using underground pipeline system. Further, a 4.5 km long pipeline was laid to irrigate 25 ha of land, benefiting 44 farmer families.

233. Total crop production before implementation of the technologies was 806.1 t/annum which increased to 1381.8 t/annum by 2003-04. Increase in production of cereals and millets was 72.4%, while it was just the double (145.3%) for pulses. The contribution of agricultural income to total income was 46.2% before implementation, which rose to 59.3% after implementation. Agricultural income from cereals increased by 120%. During the implementation period, the requirement of cereals increased by 26.8%, while the production increased by 72.4%. As a result, the adopted villages not only became self-sufficient with respect to food grain production, but also had marketable surplus for sale in the local market. The technology is applicable for all category of farmers in the north-western Himalayan region.

234. *Conservation Bench terraces (CBT) system* for 2% slopping land with 3:1 ratio of contribution and receiving area respectively and 20 cm depth of impoundment at the end for maize + cowpea in contributing area and paddy in receiving area during Kharif season followed by wheat + mustard in the entire area in rabi season is recommended for crop cultivation in foothills / valley region of western Himalayas. CBT reduced runoff and soil loss by over 80% and 90% respectively, compared to sloping borders on 2% sloping land. The CBT was about 19% more remunerative than the conventional system in terms of maize equivalent yields in North-Western Himalayan foothills.

235**.** Studies conducted on *contour trenches* revealed that trenches not only trap water but also silt, seed and debris flowing down the slope which consequently results in reduction of peak rate of runoff and volume of runoff by 30%. Degraded forest area in a western Himalayan watershed was trenched in order to facilitate retention of surface run off, trapping of sediment and to assist vegetation establishment. In an area of 28 ha, 3132 trenches of 2 m length, 0.45 m width and 0.45 m depth and 771 pits of various sizes were excavated in Sainji watershed at 20 sites for development of silvipastoral blocks of various trees and grass species.

236. A *landslide area* in north-western Himalayan region, which was severely degraded by mass movement of soil, was stabilized by gabion cross barriers and check dams (9 cross barriers). Gabion structures of 3m x 1m x 1m (length x breadth x height) fabricated with galvanized iron wire of no. 10 gauge with mesh size of 15 cm x 15 cm were constructed. Eight gabion structures (total length 62.5m) costing Rs. 0.59 lakh protected 8 ha of agri-terraced land by holding 2039 tonnes of sediment/debris behind them. The cost of construction of gabion structures was about Rs. 700 per cum. The technology is applicable in the whole hill and mountain agro-ecosystem.

237. A low cost *technology for training of torrents* in which vegetative measures along with engineering structures are being used in combination, for stabilizing the torrents and enhancing the sediment deposition between the spurs and along the bank. The technology consists of filling small stones available near the affected site in *katta* (empty cement bags). These stone filled *kattas* are used in place of large stones and *katta* spurs are improved. Also, earthen guide embankments (2 m high) are

reinforced with vegetation for torrent bank stabilization. Fodder grasses are planted on torrent banks in between spurs to mitigate the fodder scarcity.

238. Gabion wall may be constructed only at locations which are highly vulnerable to torrent damage. At other locations, earthen bunds and vegetative measures may be imposed, which reduce the cost of construction. By installing mechanical and vegetative measures for torrent control, a total of 5 hectars of land adjoining the torrent was reclaimed and the value of land increased from Rs. 175 lakh/ ha to Rs. 6.25 lakh/ ha since the yield from the main crops in the torrent-affected lands were similar to those raised in the fields and there was no fear of loss of life and property by torrents. Hybrid napier, a fodder grass transplanted on slopes facing farmers' fields also stabilized the bund. Other grasses (*munj* and *bhabbar*) planted to stabilize the bunds were also used for making huts and ropes. The gap between the availability and requirement of green fodder reduced while the dry fodder became surplus. The annual agricultural income per hectare increases from Rs. 4,280 to Rs. 16,200 after torrent control. This technology can be applied profitably in torrent affected areas in all hilly regions with seasonal streams to reclaim such land within a period of 3-4 years by protecting from flooding. The reclaimed land can be further utilized for agricultural, horticultural and fodder crop cultivation, resulting in improvement in economy of the farmers.

239. In order to meet the water requirement of the village community for different purposes, four irrigation tanks of 80, 30, 30 and 18 cum capacity were constructed to harness the perennial flow emerging from the oak forest in a north-western Himalayan watershed. The tanks were constructed to store water for lean season when water is required for paddy puddling. For conveyance of the water stored in the tank, 5 cm diameter and 2.1 km km long underground HDPE / GI pipeline system with 25 raisers was laid out. As a consequence of development of the water resources and irrigation conveyance system, the area under assured irrigation in the watershed (41.6 ha) increased from 13.5% to 34.9% and 41 farm families benefited. The project activity proved that it is possible to develop small scale water resources by tapping perennial water sources at suitable locations and conveying the water through suitable low cost methods to agricultural fields. The average cost of developing assured irrigation by this technique is Rs. 16,825/- per hectare. Such water resource development models can be propagated in other regions of the hill and mountain agro-ecosystem to ensure sustained agricultural production.

Conclusion

240. Large extent of various categories of degraded / waste lands are available in the country which can be economically brought under productive use through various proven scientific / technical interventions. The following targets are proposed for development of degraded lands during the XI Plan period.

Sl. No.	Scheme/Programme	Target lakh ha.	Outlay allocation (Rs. in crores)	GOI Share
A. On-Going Programmes				
1.	Reclamation of Alkali Soil	5	1455	550
2.	Watershed Development Project in Shifting Cultivation Areas)	2	240	240
B. New Proposed Programmes for XI Plan				
3.	Reclamation of Saline Soils and development of waterlogged areas	2	350	350
4.	Development of Gullied & Ravine Lands	2	600	600
5.	Amelioration & Management of Acid Soils	20	1600	400
	Total	**31**	**4245**	**2140**

241. It may be made mandatory that Industries who are provided with agricultural or other lands for development projects need to compensate for treatment and full development of equivalent degraded / waste lands to the benefit of the community as is being practiced by the Forest Department where provision exists under Forest (Conservation) Act, 1980 for compensatory afforestation by the user agencies in lieu of forest lands diverted for developmental projects.

242. Looking into the energy crisis in a global scenario, there is expectations that huge global financing will be flowing in the energy sector in the near future. Development of Bio-fuel yielding species be encouraged in dryland farming and in waste / degraded lands through revenue models. Similar importance need also be given to herbal / medicinal / aromatic plantations in these areas which have a great economic potential.

243. There is need for involvement of unemployed educated youth in the process of development of wastelands and degraded lands for achieving the means of livelihood as well as in ensuring their involvement in the mainstream development of the country. A special development model may be designed for the border / coastal districts linked with national security to address both development and security aspects jointly. Such a task of development of the wasteland / degraded land / common property resources, particularly in the border / coastal districts may be assigned to the retired defence/ para military personnel. This will not only enable development of these lands but also provide a vigilance to the border through some special incentives.

244. While planning treatment of a specific category of degraded land / waste land, it is necessary that all available site specific technological options are exhausted. The implementation mechanism should involve latest technologies developed. Further the community involvement from planning stages is necessary for easy adoption of technology.

CHAPTER – III

WATERSHED PLUS ACTIVITIES

Introduction

245. Presently watershed development projects emphasize soil & water conservation related activities. The broad categories of activities taken up in these projects can be grouped as below:

i) Soil & Land management
ii) Water Management
iii) Crop Management
iv) Afforestation
v) Pasture/fodder development

246. It is observed that a comparatively less emphasis is being accorded in these projects for development of allied sectors of rural economy. As watershed approach is expected to achieve overall holistic and integrated development of the watershed community, activities which are deemed equally important for complete & overall development of the watershed community, often referred as 'Watershed Plus' activities, need to be suitably incorporated and converged in the watershed projects.

247. Watershed development activities could be broadly categorized as follows:

a) *Natural Resources Development* : The natural resource development component lays special emphasis on development of natural resources, viz., soil, water, forests including bio-mass etc. Interventions for regeneration & conservation of soil, water, forests and bio-mass of the watershed are therefore attempted through various techniques.
b) *Promotion of Community Based Organizations*: This includes the promotion of various Community Based organizations such as Village Watershed Committees (VWCs), Self Help Groups (SHGs), User Groups (UGs) etc., under a watershed development scheme. These CBOs execute various functions under the watershed scheme and are the direct beneficiaries. The success and sustainability of a watershed project depends to a large extent on these Organizations/ Groups.
c) *Capacity Building of Stake holders*: The capacity building includes training & empowerment of members of watershed community, CBOs, project implementing personnel and other stake holders for proper implementation and execution of watershed programme.

248. Apart from land and water resource development components, a host of activities with an objective to improve production of agriculture, horticulture, livestock, forestry, etc. are performed in the watershed development with an objective to improve income generation potential of the watershed community on a sustainable basis. The important activities pursued are listed below:,

- Agri-based activities like Organic farming
- Dry land horticulture, homestead farming etc.

- Dairy / livestock development
- Inland fisheries
- Bee keeping
- Vegetable cultivation
- Raising of medicinal & aromatic plants
- Micro-irrigation
- Rural energy management
- Non-farm sector activities such as cocoon rearing, spinning, weaving, jaggery making, pottery, carpentry, development of handicrafts etc.
- Small enterprises/income generating activities on farm & forestry based raw materials.

249. It is important to realize that watershed plus activities can go a long way towards providing a base for livelihood support. Particularly in the arid and semi arid zones, where severe drought conditions prevail, such activities can make a difference. Simple development of a watershed may not be sufficient enough incentive for the resource poor, particularly the landless and therefore an alternative approach to the non-farm incomes to provide livelihood to all is essential. Watershed plus activities in areas where landlessness is high, and even in areas where it offers substantial benefit to the rural poor, to ensure livelihood and full employment for all, are required to be taken along with watershed development. This calls for convergence of all developmental activities in watershed areas.

250. At present, watershed development programmes in the country are executed with funding by Central and State Governments, external agencies and NABARD. Beside, some Non Government Organizations are also financially supporting such projects. In most of the watershed projects, though the beneficiaries contribute for some farm oriented activities to the extent of 5 to 10%, the aggregate fund availability through these sources is not adequate to push the programme significantly and accrue the benefits on a sustainable basis. Therefore, watershed plus activities take a back seat. Hence, it is required to determine modalities which will facilitate execution of watershed plus activities. Preparation of a plan by Watershed Committees & funding at concessional rate of interest from a corpus to Watershed Committee for on lending & recovery and by preparing a banking plan of activities involving banks and other credit institutions in financing the watershed plus activities need to be operationalized & piloted in a convincing manner. At the same time convergence of all development programmes is equally important.

251. Livestock is a key component of the household economy in rural India. It is a source of additional income to farming households. About 70 million households in India keep and own livestock. Small and marginal farmers and land less labourers constitute almost two-thirds of these livestock keeping households. Women provide nearly 90% of all labour for livestock management. Water Harvesting structures like percolation tanks, farm ponds may be encouraged which could be used for multipurpose viz. protective irrigation through micro irrigation**,** fish culture. Therefore, a special emphasis should be given for livestock development & fisheries.

252. There should be specific pattern for undertaking cropping & animal husbandry activities depending upon rain fed conditions, for instance, where rainfall is below 500 mm small ruminants should be encouraged, if rainfall varies between 500 to 750

mm a mix of crops & small ruminates and in areas where rainfall varies between 750 to 1250 mm more crops and cattle need to be promoted. If the annual rainfall is more than 1250 mm a combination of crops, cattle and fisheries is expected to yield better returns. These aspects need to be suitably incorporated in the watershed plans so as to address the watershed plus component in an integrated manner.

253. The management & regulation of use of ground water is an important component in watershed development programmes. While regulation to this effect through legislative measures may pose operational difficulties the VWC/CBO may devise & adopt self regulation to make the implementation process smooth & feasible. This will ensure optimum utilization of the created water resource. The management & regulation of use of ground water can therefore be attributed as a watershed plus activity.

254. Watershed development is envisaged as providing the basis for seeking systematic solutions by way of enhancing the production base in the rural economy on a sustainable basis. Therefore, sustainability needs to be incorporated in following forms:

- Sustainable use of the renewable water resource
- Sustaining productivity of agricultural and common lands (including low-input low-impact agricultural practices), and
- Ensuring sustainability of downstream agro-ecosystems

255. The livelihoods can be grouped into two categories, namely non-land based livelihoods (which are also called as micro-enterprises) and (ii) land-based livelihoods (which include not only agriculture and horticulture but also livestock, sericulture, fisheries, etc.). In the past, much of the attention was paid towards non-land based livelihoods (by giving financial support for inputs as well as new infrastructure) so that new members could initiate these livelihoods. Sustainability of existing land based livelihoods directly depends upon sustainable development of natural resources namely land, water, perennial biomass, etc. Hence under watershed programme, enhancement of productivity of above livelihoods is now getting greater attention so that it helps not only in better participation of the families concerned but also in achieving overall objectives of the programme. Practically all the innovative watershed projects (under the present study) included this as an important objective of the programme.

256. So far, major efforts focused on development of natural resources; and very little attention was paid towards management of developed natural resources. Most of the gains made in recharging of groundwater table are nullified because of indiscriminate digging of bore wells. Likewise perennial biomass in common land could not sustain in majority of the cases due to unauthorized grazing/ felling of trees. Social regulation against over-exploitation of CPR is the crucial requirement for achieving sustainable management of developed natural resources (particularly the CPR). This requires greater commitment from the community in order to facilitate the above regulatory mechanism. Further, this effort needs to be supported with proper policy instruments in favour of resource poor families. Based upon available information in other innovative watershed projects the following recommendations are made:

- Social regulation on digging of new bore wells in the watershed area
- Promotion of community oriented bore wells (exclusively for resource poor families and for only low water requiring crops)
- Ban on pumping of surface water collected at the water harvesting structures designed for recharging of groundwater
- Converting the traditional irrigation tanks into percolation tanks after making adequate provision for those families who do not own wells but who had access to irrigation water in its original command area through surface flow
- Regulated extraction of groundwater from bore wells in such a way that the owner of the bore well uses a part of the quantity allocated for him/ her and the rest of the water is shared (on nominal payment) with other families whose bore wells dried out

257. The following Watershed Plus Strategy may be effective for integrated and holistic development of rainfed areas / degraded lands / wastelands.

- *Development of agriculture*
· Establishment of seed bank with federation of SHGs for production and marketing of improved varieties and hybrids (evolved under public sector)
· Focus on organic farming (on a limited scale)
· Control of pest through IPM/ non-pesticidal methods (on a large scale)

- *Development of horticulture*
· Plantation of orchard crops in new areas for improving water use efficiency
· Adoption of organic farming practices (on a large scale)
· Enhancing the area under vegetable crops (for improving water use efficiency as well as creating employment opportunity for women members)

- *Development of livestock*
· Upgrading the breed of large ruminants through community managed artificial insemination as well as natural insemination units.
· Upgrading the breed of small ruminants through community managed natural insemination unit.
· Management of diseases of livestock through community managed livestock para-workers
· Improving the fodder base through cultivation of improved varieties of non-leguminous and leguminous fodder crops under irrigated condition
· Processing and collective marketing of produce

- *Development of fisheries*
· Improving the sustainability of fishery cooperatives by organizing general body members into a number of small size SHGs and reconstituting the office bearers of executive committees by bringing representatives from mature SHGs
· Introducing composite fish-cum-prawn culture with different varieties of fish (suitable for different depths of pond water)
· Improving other technological inputs (through release of juveniles / fingerlings in situations where filling of water in pond is delayed; enhancement of standing water in the tank by desilting the bed area; local production of fingerlings in smaller ponds supported by borewell irrigation; management of

disease and predators through appropriate practices before filling of water in tank as well as during rainy season, etc.

- Collective marketing of fish to distant places by executive committee of the cooperative society; and also self-marketing of fish in local markets by women members of the cooperative society
- Development of mutual trust between executive committee and general body members through adoption of transparent systems in financial transactions
- Learning initial financial management system through adoption of SHG concept
- Learning improved financial management system through partnership with experienced lending organization .

258**.** *Role of Institutional credit for Watershed Plus Activities***:** The development of watersheds will create scope for a number of economic activities leading to a increase in credit absorption capacity of the watershed villages. The involvement of the banking system should be from inception & there should be a separate credit plan for watershed villages. Watershed projects will improve the credit absorption capacity. Consequently, the credit requirement of these farmers may be separately assessed and credit cards issued based on the credit requirement consistent with cash inflows/out flows.

259. *Financing of CBO for watershed plus activities:* Watershed development projects promote a number of Community Based Organizations like SHGs, federation of SHGs, Village Watershed Committees, User Groups etc.. These CBOs need to play a greater role in further development of watersheds on sustainable basis. Bankers need to leverage the services of these CBOs for financing and monitoring the income generating activities. The village level watershed committees can be clustered to form associations/federations/farmers' cooperatives in the light of reducing subsidies, increasing globalization and proposed carbon credits. The credit requirements of the members can also be adequately met by linking federations/associations to financial institutions. The federation/association can help the members in exploiting the existing market potential by collectively marketing the produce in the market at competitive prices. The federations/associations can promote custom hiring and seed bank. The bulk produce would be a profitable venture for the Agri-companies for purchase of produce on mutually beneficial terms. Besides this the association/federation could involve in value addition of the produce.

260*. Livelihood support for land less, women and other weaker sections*: The major beneficiaries of watershed projects are the land owners of the watershed. There is a need to recognise the rights of landless, women and weaker sections. In this regard special emphasis should be given for income generating activities of these people. The survey number wise planning with peoples involvement in IGWDP & WDF projects has ensured participation of the people in planning & implementation of the project. The survey number wise treatment plan should be made compulsory in all the programmes. Special emphasis may be given for land less, women and other weaker sections in case watershed plus & income generating activities. The usufruct rights on common lands may be given to the landless, women & weaker sections. The display of treatment map & activity wise expenditure done in public places will ensure transparency.

261. *Insurance Products for watersheds*: The need for having a comprehensive insurance cover for crop/livestock/assets created is considered as risk mitigation measure with a view to ensure that farmers are able to reap full benefits of watershed practices. Keeping this in view, the group felt that till such time products are available & the individual farmers become capable to buy these products, the insurance companies could be requested to come out with suitable insurance products to cover productivity of the watershed as a whole & benefits of such products could be availed by the watershed committees.

Conclusion

262. Watershed plus phase needs to be recognized as a third phase in watershed project planning and implementation in all the schemes. Components for watershed plus activities may be identified by the implementing agencies in association with the village community and the resources there for may be mobilized. Special emphasis may given for livestock development & fisheries in watershed plus activities. Monitoring and evaluation arrangements may be inbuilt in watershed project planning stage itself for watershed plus phase also.

263. Credit institutions may be involved in watershed activities right from the initial phase. Separate credit plans may be prepared for watershed plus activities by bankers & watershed committees. CBOs like SHGs, VWCs may be leveraged for credit disbursement and monitoring. A comprehensive insurance cover for crop/livestock/assets created as risk mitigation measure to reap full benefits of watershed practices is needed.

264. A separate corpus may be created for lending to farmers in the watershed at concessional rate of interest. Maintenance Fund may also be created out of the voluntary contributions and the same may be credit linked for financing income generating & production oriented activities.

265. Special emphasis may be given for land less, women, and other weaker sections in case of watershed plus & income generating activities. Usufruct rights for common, revenue and forest land within the watershed area may be given to landless, women groups and weaker sections. All other development programmes may be converged with watershed projects for holistic development of watersheds.

267. The village level watershed committees be clustered to form associations / federations / farmers' cooperatives. This will facilitate easy access of credit from financial institutions, inputs, value addition/processing & marketing etc.

CHAPTER - IV

PUBLIC PRIVATE PARTNERSHIP IN WATERSHED DEVELOPMENT PROGRAMMES

Introduction

268. Public-Private Partnership (PPP) is a mode of implementing Government programmes / schemes in partnership with the private sector. The term private in PPP encompasses all non-government agencies such as the corporate sector, voluntary organizations, self-help groups, partnership firms, individuals and community based organizations. PPP, moreover, subsumes all the objectives of the service being provided earlier by the government and is not intended to compromise on them. Essentially, the shift in emphasis is from delivering services directly, to service management and coordination.

269. The PPP addresses following critical aspects

- Responsibility: PPP involves full retention of responsibility by the government for providing the service.
- Ownership: PPP may continue to retain the legal ownership of assets by the government (public) sector.
- Nature of Service: Under PPP the nature and scope of service is contractually determined between the two parties.
- Risk & Reward: Under PPP, *risk and rewards are* shared between the government (public) and the private sector.

270. Potential benefits expected from PPP are summarized below;

- Cost effectiveness - since selection of the developer / service provider depends on competition or some bench marking, the project is generally more cost effective than before.
- Higher Productivity - by linking payments to performance, productivity gains may be expected within the programme / project.
- Accelerated Delivery - since the contracts generally have incentive and penalty clauses vis-à-vis implementation of capital projects / programmes *this leads to accelerated delivery of projects*
- Clear Customer Focus – the shift in focus from service inputs to outputs create the scope for innovation in service delivery and enhances customer satisfaction.
- Enhanced Social Service- social services to the mentally ill, disabled children and delinquents etc. require a great deal of commitment than sheer professionalism. In such cases it is Community Voluntary Organization (VOs) with dedicated volunteers who alone can provide the requisite relief.

- Recovery of User Charges – innovative decisions can be taken with greater flexibility on account of decentralization. Wherever possibilities of recovering user charges exist, these can be imposed in harmony with local conditions.

Watershed Development (WSD) programmes and PPP

271. In the rainfed , degraded and dry land regions, erratic rainfall distribution with critical dry spells, pedological problems, over exploitation of ground water resource without adequate recharge mechanism, poor credit availability, inappropriate mechanization, low input usage, absence of adequate capacities of the community etc. and absence of linkages with the rest of the economy have been recognized as important reasons for lack of sustainability of the programmes. Soil erosion, run off water, inadequate retention of moisture etc. are factors that adversely affect production in rainfed regions. The uncertainty of productivity and production adversely affect the socio-economic status of people. Due to poor socio-economic conditions, inappropriate communication facilities, under developed market infrastructure, non-availability of credit support, lack of storage and processing facilities etc. are some of the factors that adversely affect both the production and diversification. Therefore transformation of the rainfed farming systems into a more sustainable and productivity system with linkages with the economy as a whole is as one of the major challenge before Indian agriculture.

272. The Government of India has accorded highest priority to the holistic and sustainable development of rainfed areas through the integrated watershed development approach. The watershed approach represents the principle vehicle for transfer of rainfed agricultural technology. Watershed is a community approach and involves one and many villages in large areas, both arable and non-arable, various categories of land holdings and farmers whose action could influence each other's interests. That treatment of these areas therefore, require special attention. An integrated approach involving development of diversified farm production systems, livestock, protective irrigation, micro-irrigation and livelihood support systems is necessary for sustainable development in these areas. In the process, in-situ soil moisture conservation, land development and promotion of suitable cropping pattern are developed. Emphasis, therefore, needs to be laid on development of processing, storage, marketing infrastructure facilities to maximize benefits to the Watershed Community - a majority of which consists of small and marginal farmers.

273. Despite large numbers of watershed development schemes of various central Ministries and Departments the investments made by the Government Sector in rainfed areas are insufficient compared to the magnitude of these areas. As a result, the pace of development of these areas is reasonably slow and the returns on the investments made so far are sub-optimal despite number of watershed development programmes. Implementation of these programmes through the Government machinery can be further strengthened through PPP intervention to maximize the

benefits. Through PPP the economic returns can be accelerated and maximised in the watershed areas.

274. A review of the ongoing watershed development programmes reveal that at present, watershed development programmes in India aims at physical development as well as to improve the production and productivity of rainfed areas and wastelands. With the present pace of development of these areas, it may take another 20-30 years for treatment of balance dryland / rainfed / degraded lands in the country since the investments are being made mainly by the Government sector and the same are not sufficient. Therefore a new approach focusing on PPP is urgently required to augment resource flows into these areas and also improve the efficiency of implementation. However, to attract the Private sector investments, the Government must ensure a favourable atmosphere for creating infrastructures like road, electricity etc.

275. The Meta Analysis study compiled by ICRISAT has covered the findings of evaluation studies conducted by various organizations. Based on an exhaustive review of 311 case studies on watershed programme in India, the study attempted to document efficiency, equity and sustainability, analysis. It was noted that the mean benefit-cost ratio of watershed programme in the country was quite modest at 2.14. The internal rate of return was 22 percent, which is comparable with many other rural development programmes. The watershed programs generated enormous employment opportunities, augmented irrigated area and cropping intensity and conserved soil and water resources. The performance of the watershed programme was at the best in areas that targeted the low and medium income groups, which was jointly implemented by the state and central government, and where there was effective people's participation and a rainfall ranging between 700-1,000 mm. The study concluded that the watershed programme is silently rejuvenating and revolutionizing rain-fed areas. Lack of appropriate institutional support is impeding the tapping of potential benefits associated with these programs and this gap can be fulfilled to some extent through PPP.

276. In the ongoing watershed programmes, besides land resource development there is an inherent focus on rainwater conservation and water harvesting technologies for their effective use in the development process. Involvement of PPP in these programmes however can help in maximizing the benefits.

277. Unfortunately, there is low public and private investment in the rainfed regions, owing to the sub-optimal returns. The credit institutions such as Banks, cooperatives etc. have, so far, shown little response for development of rainfed regions. Involvement of private sector (Corporate) in watershed development programmes may therefore give impetus to credit institutions to participate in watershed programmes.

Suggestions for better PPP in Watershed Development activities

278. In the present scenario the Public Private Partnership in watershed development programmes is not only indispensable but also the need of the hour. The Government should create an enabling frame work for involvement of Private Sector in

watershed development programmes. With more inputs and active coordination between corporate, NGOs and the government sector, infrastructural gaps can be minimized. This will also be a move towards crop diversification. However, there is a need for developing comprehensive models that encompasses modern technologies of soil and water conservation with forward and backward linkages for watershed community on Agro-Ecological Region basis. Further, to improvise the ongoing programmes following measures have been identified of importance;

279. *Encouragement of Contract Farming by inviting corporate* : Through Contract Farming, Corporate can enable farmers to avail-

- High quality seeds, planting materials, and other agricultural inputs based on soil analysis plus other agricultural practices
- Assured market through buy back of produce
- Sorting and grading units and warehouse /cold storage facilities
- Processing units near the farm gate for value addition
- Extension services

280. *Promotion of Micro-Irrigation through PPP*

- Private Sector connectivity through contract farming will encourage farmers to use drip and sprinkler irrigation
- Micro-irrigation must be an integral part of watershed management and to promote tax Incentives in following forms may help;
    - No taxes on the micro-irrigation systems
    - Duty free import of raw materials for micro-irrigation systems
- Adequate Pricing of Water and user charges for efficient utilization of water in these areas will help in soil and water conservation.

281. Private Sector involvement in watershed development programmes may be incorporated in following areas;

- In consolidation of fragmented supplies in watershed areas
- In introducing best practices for production, processing and marketing.
- Investments in processing sector particularly in production centers
- By establishing market access and linkages
- By investing in information & communication technologies for effective monitoring and evaluation of programmes as well as for extension services.
- By strengthening rural insurance for assets created under watershed development programmes
- For making farmer as an integral part of the supply chain
- Focus on areas where the Government capacity to implement is weak and proactive involvement of Corporate in those areas
- Research & Development & Extension support (Technical back-stopping) with the help of Corporates, NGOs etc.

- Creation of a Consortium of all stakeholders including corporates

282. An area-wise approach to encourage Private Sector Investment in Watershed Development Programmes will be more appropriate rather than a uniform approach, since the magnitude of problem varies in semi-arid and arid area. The suggested approaches for these two categories are:

283. In semi-arid regions, the mean annual rainfall varies from 500 to 1000 mm and drought conditions prevail over 40 to 60% of the year either due to deficit in seasonal rainfall during the main cropping season or due to inadequate soil-moisture availability during the period of prolonged dry spells between successful rainfall. The private sector requires incentive to involve in these areas. The following tax incentive should be considered inviting Corporates participation involved in watershed development programmes:

- Weighted deduction at the rate of 150 % of the investment of private sector for Watershed Development Programmes should be treated as deduction of expenditure as in case of R&D
- Grant five year corporate tax holiday
- Bank lending under the priority sector targets

284. The arid regions In India, witness more frequent drought .In these regions mean annual rainfall is generally less than 500 mm.. The private sector needs higher incentive to involve in these areas. The following tax incentive should be allowed for Corporates involved in watershed development programmes:

- Weighted deduction at the rate of 200 % of the investment of private sector for Watershed Development Programmes should be treated as deduction of expenditure as in case of R&D
- Grant ten year corporate tax holiday
- Bank lending under the priority sector targets

285. Incentives such as tax relaxation to corporate may help in encouraging the private sector participation in watershed development programmes and therefore needs to be adopted.

Proposed Collaboration of PPP in WSD programmes

286. The government may collaborate with the private developer / service provider in any of the following ways:

- *as a funding agency*: providing grant / capital / asset support to the private sector engaged in provision of public service, on a contractual / non-contractual basis

- *as a buyer*: buying services on a long term basis

- *as a coordinator*: specifying various sectors / forums in which participation by the private sector would be welcome.

287. The funding pattern and collaboration between the public sector and the private sector could take any one of the following forms:

- Public funding with private service delivery and private management
- Public as well as private funding with private service delivery and private management
- Public as well as private funding with public / private service delivery and public / private / joint management
- Private funding with private service delivery and private management

288. The 'contract' mirrors the basic objective of the programmes / project, the tenure of agreement, the funding pattern and of sharing of risks and responsibilities. The need to define the contract vary precisely, therefore, becomes paramount under PPP. Projects / programmes under PPP may, however, broadly be classified under three heads namely (i) service contract (ii) operation & maintenance (management) contract and (iii) capital projects, with operations & maintenance contract.

289. *Selection of Service Provider*: The transparency in selection is an essential feature for PPP. The selection of the Developer or service Provider may be done in any of the following three ways:

i) *Competitive Bidding* involves a well publicized and a well-designed bid process to ascertain financial, technical and managerial capabilities of the service provider or the developer. The final selection of the developer / service provider depends upon one or a combination of the following:

1. lowest capital cost of the project
2. lowest operation and maintenance cost
3. lowest bid in terms of the present value of user fees
4. lowest present value of payment from government
5. highest equity premium
6. highest upfront fee
7. highest revenue share to the government and or
8. shortest concession period.

ii) The Swiss Challenge approach refers to *suo-motu* proposals being received from the private participant by the government. The private sector thus provides

1. All details regarding its technical, financial and managerial capabilities
2. All details regarding technical, financial and commercial viability of the project / programmes
3. All details regarding expectation of government support / concessions.

4. The Government may examine the proposal and if the proposal belongs to the declared policy of priorities, then it may invite competing counter proposals from others (in the spirit of 'Swiss Challenge" approach) giving adequate notice. In the vent of a better proposal being received, the original proponent is given the opportunity to modify the original proposal. Finally, the better of the two is awarded the project / programme for execution.

iii) Competitive negotiation (direct or indirect) is considered a variant of competitive bidding. The government thus specifies the service objective and invites proposals through advertisements. The government then negotiates / finalize the contract with the selected bidders. Negotiations may, however, be 'simple' (direct) or 'complex' (indirect). In the second case, the government negotiates through a 'master contractor' / mother NGO. In other words, contracts for (public) services are contracted out and the master contractor handles all dealings with sub-contractors / franchisees. While the government reviews the works of the master contractor through its monitors (officials) who may visit the site of programme implementation and meet the beneficiaries, the master contractor may monitor the programme (run by sub-contractors) through collecting information from the beneficiaries selected randomly, based on questionnaires / interviews.

290. Payment to the private sector can be made through contractual payments, grants-in-aid, and right to levy user charges for the asset created (leased in). Contractual payments may be in the form of advance payment, progress payment, final payment, annuities and guarantees for receivables etc. Grants-in-aid, in turn, can take different forms such as a block grant, capital grant, matching grant, institutional support, etc.

291. It is quite often thought that the job is over with the signing / finalizing the 'contract'. Payments have to be, however, linked to performance, which in turn requires monitoring. Involvement of third party / independent agencies for monitoring appears to be preferable as they leave the government hassle free over the project and minimize government control. *A certain percentage of the cost of the project needs to be, therefore, earmarked for contract farming. The government and the developer / service* provider could mutually decide the third party. The third party involvement could be further supplemented with provision for adjudication by the (higher) judiciary.

Suggested model for PPP

292. Based on the guiding principles outlined by the Planning Commission, a PPP Model for Watershed development has been suggested, which is as under;

- *Objectives & Functions*: To improve the productivity of land by appropriate water and soil conservation, water augmentation measures through

participatory processes. To also enhance sustainable development of livelihoods in the watershed and adjoining areas.

- *Clients*: Department of Agriculture & Cooperation / Ministry of Rural Development / Ministry of Environment & Forests / Planning Commission.
- *Contract Structure*: Public Funding, Private Funding and Public – Private Management.
- *Selection Criteria*: Competitive bidding / negotiations.
- *Payment mechanism / Financing*: To be decided as per terms of contract.
- *Penalties / Incentives*: In accordance with the MoU / Contract signed between partners.
- *Monitoring*: Monitoring may be taken up by the client or this can be out-sourced to a third party.

Conclusions

293. For exploring effective mechanism for PPP, adequate infrastructure like roads, electricity and other means of communication need be provided through Government schemes / programmes to attract private investment in watershed programmes and also to create proper linkages and an access to the market for better returns to the watershed community. Higher public investment through other government schemes aimed at creating adequate infrastructural linkages would be critical to invite the flow of private investment. This will require better coordination of all watershed development schemes at national / state / district level to ensure synergy among the programmes.

294. There is a need for delivery of skill development in Watershed Development as a part of the policy frame work, it was also considered that assistance from corporate / NGO sector in this regard may be obtained.

295. For involving Private / Corporate / NGOs in watershed development programmes, appropriate policy reforms will be required urgently. Such reforms must ensure the accountability of both the Government and the private partners in watershed development programme. The procedure followed in the Watershed Development Fund (WDF) scheme implemented by NABARD and Ministry of Agriculture prescribes signing of a Memorandum of Understanding (MoU), which is working effectively. A similar procedure can be adopted in respect of other watershed programmes intended to be covered under PPP mode.

296. Government should provide benefit of other schemes in watershed area to the private sector. In particular benefits of schemes like seed processing plants, dal-mills, food processing units, packing units, storage units and other agriculture related industries may be given to those private entrepreneurs who are willing to proactively associate in natural resource management activities. If involvement of private sector is taken up, a decentralized model facilitating value addition at farmers level and further processing at industrial level will be more useful. Public-Private Partnership should be farmer centric. It should be ensured that at any circumstances farmers should not loose.

297. It may be considered to make mandatory that Industries which are provided with agricultural or other lands for development projects need to compensate for treatment and full development of equivalent degraded / waste lands else where. Such a practice is prevalent in the Forestry sector where a provision exists under Forest (Conservation) Act, 1980 for compensatory afforestation by the user agencies in lieu of forest lands diverted for developmental projects. Similar conditions may also be adopted in case of diversion of agricultural land for urbanization, or other developmental activities. A state level Agriculture Land Development Fund may be created to accumulate the compensatory fund. This fund can be used for subsequent development of degraded land for productive purposes. This will take care of the two important aspects. First the shrinking of agricultural land may be arrested, and secondly the degraded lands will be developed fast and put to economic use

298. Looking into the energy crisis in a global scenario, there are expectations that huge global financing will be flowing in the energy sector in the near future. Involvement of private sector for development of wastelands / degraded lands for raising bio-fuel yielding species be encouraged. Wastelands / degraded lands may be allotted to Private Sectors / Industrialists / Companies to develop such land for Bio-diesel on commercial basis. Similar approaches may also be made for herbal / medicinal / aromatic plantations in these areas which have a great economic potential.

299. Under the watershed development projects a lot of common property resources are developed. After the project is over maintenance of these assets is neglected due to want of appropriate mechanism and financial support. Development of a revenue model involving the watershed community and the private sector may ensure sustenance of these assets.

300. In the XI Five Year Plan, the PPP may be initiated. For this a target of 2 million hectare is suggested. However, before preparing and implementing the schemes involving PPP, it will be appropriate to take into account the site and sector specific considerations and different alternatives should be explored.

CHAPTER – V

INSTITUTIONAL MECHANISM AT NATIONAL, STATE , DISTRICT AND WATERSHED LEVELS

Introduction

301. National Agriculture Policy (2000) accords abiding importance to the development of rainfed areas, degraded and waste lands. But rainfed farming continues to be critical for meeting the livelihood needs of a vast majority of small, marginal and tribal farmers in such areas of the country. The benefit of development of new technologies related to crops, resource management, livestock, and fisheries have not filtered down amongst farmers in rainfed areas to the desired extent. Although during the past ten years more than 30 million hectare land belonging to rainfed, dryland and degraded categories has been treated under different schemes, yet the out come / impact has not been captured in the national agricultural production, productivity, income and equity indicators.

302. At present watershed / wasteland development programmes of different Central Ministries / Departments are being implemented by the states as per the guidelines prescribed for respective programmes. There is no uniformity with regard to the institutional mechanism, thus the general apprehensions of duplication of work in the same watershed prevails. Further as there are different actors for implementation, it is difficult to trace out such duplication even at the State and the District levels. Lack of interdepartmental coordination, particularly at the field level, makes it difficult to find such duplications over a period of time. This also makes a coordinated approach towards prioritized planning and implementation rather difficult. Lack of structured and monitorable system with much greater community participation is the principal reason why efforts towards watershed development have not yielded desired results.

303. Various evaluation studies and technical reports reveal that most of the watershed developed do not reach full potential in terms of agriculture production and are not properly maintained because the community involvement diminishes after the initial development stage. Community involvement in watershed planning and design has typically been low; and distributional problems are persistent, arising from existing inequalities in land distribution or because of ill-defined rights and encroachment. These aspects need to be tackled by greater involvement of community from the planning stage to the execution stage and in the post treatment stages. Appropriate withdrawal strategy to address the issue sustainability need to be adopted for optimal utility of the assets developed.

Existing Institutional Mechanism in the watershed programmes of GOI

Programmes of Ministry of Agriculture

304. The Ministry of Agriculture is implementing the Programmes, viz., NWDPRA, RVP & FPR, RAS under the Macro Management Mode since November, 2000. The programme of Watershed Development Project in Shifting Cultivation Areas (WDPSCA) is a 100 % additional central assistance scheme of Planning Commission.

305. The procedure followed for implementation of the programmes involves approval of annual work plan of the State by the DAC. The sanctioned amount is released to the State Government as per the approved programme on installment basis. The State Agricultural Department seeks the financial sanction of funds from the State Finance Department and then, transfers the funds to the respective implementing departments / agencies which in turn, releases the fund to the project implementing agencies / watershed committees.

306. The State level Coordination Committee (SLCC) decides the work plan, requirement of fund and monitors the programme from time to time. At the district level also, the programmes are reviewed by the Committee headed by the District Collector.

307. At the execution level the Project Implementation Agency (PIA) implements the scheme in accordance with the prescribed guidelines for the programme.. The PIA reports the periodic performance to the District level committee who consolidates the reports received from all concerned PIAs and transmits the same to the State level committee/ nodal department. The state nodal departments report programme performance to the GOI.

308. Following constraints have been experienced in implementation of programmes of Ministry of Agriculture.

- At the State and the District levels, periodic review of the programmes is not taken up timely. As a result, corrective actions, if any, are not attended promptly.
- In the existing institutional mechanism, the members of State Level Committee / District Level Committee are entrusted with lot of other responsibilities which prohibits them attending the business of Watershed related programmes and putting concerted efforts to these programmes.
- The procedure of fund flow is very cumbersome and it takes considerable time to reach the funds to the field level after its release by the GOI. Such a procedure has been followed because under the Macro Management Mode Scheme, the Centre and State Governments are jointly collaborating in funding and also the central share is both in terms of grant and the loan.
- Since most of the watershed related activities are season bound, such delays hamper timely execution of works.

Programmes of Ministry of Rural Development

309. The implementation of DPAP, DDP and IWDP schemes of Department of Land Resources, Ministry of Rural Development at the field level is carried out through District Rural Development Agencies (DRDA).

310. The projects are prepared by the concerned district DRDA and submitted to the State Level Committee which after scrutiny forwards the same to the GOI. The projects are approved by the DoLR (MoRD) and sanctions are communicated, and funds are released directly in favour of DRDA.

311. The State Level Committee reviews the implementation status of projects from time to time. At the district level, the District Collector also reviews the projects periodically.

312. Following constraints have been experienced in implementation of programmes of Ministry of Rural Development.

- The DRDA is entrusted with a host of rural development programmes, it is experienced that due attention is not being paid to the watershed / wasteland development programmes.
- The performance reporting mechanism for the existing programmes is rather slow, which prohibits timely corrective measures, whenever necessary.
- Since large number of projects are required to be approved and sanctioned at the level of GOI, considerable time is lost in accord of approval and sanctions. This also causes some delay in release of funds.

Recommendations of Parthasarathy Committee:

313. A Technical Committee on Watershed programmes in India was constituted by the Department of Land Resources, Ministry of Rural Development, under the Chairmanship of Sri S. Parthasarathy to review watershed programmes and suggest measures for their improvement. The Parthasarathy Committee in its report published in 2006, has analyzed the existing institutional aspect in watershed programmes and recommended some reforms including setting up a National Authority for Sustainable Development of Rainfed Areas (NASDORA).

314. A two tier governance and management structure has been envisaged in the case of NASDORA. A Governing Body, consisting of a competitively selected professional as CEO, one representative each from MoRD, MoA and MoEF, three competitively selected whole time professional representing the functions of operations, finance and human and intuitional development, and two eminent members from civil society has been suggested. The second tier proposed is the Apex Rainfed Area Stake Holders Council to provide overall policy support and guidance to the Governing Body.

315. At the State level, it has been suggested that the State Government will set up Boards in line with the NASDORA. At the district level, a separate dedicated body i.e, District Watershed Development Agency(DWDA) has been proposed to oversee the implementation of the watershed programmes. This body will be headed by a fulltime CEO and it will be monitored by the District Collector and the Zilla Parisad. The CEO of DWDA, in turn, will constitute a District Watershed Management Team (DWMT) comprising of professionals competitively selected from the open market. They would represent various disciplines involved in running Watershed Programme including inter-alia soil and water conservation, agriculture science, veterinary science/ animal husbandry, social work, hydrogeology, life sciences, management and accounts. The DWMT will identify the remaining untreated milli-watersheds in the districts ranging from a minimum of 4000 to a maximum of 10000 ha. Each Milli Watershed will consist of one or more Micro-watersheds. A Milli Watershed Council (MWC) will consist of nominated members (one man and one woman, at least one of whom should be SC/ST) from each Village Watershed Committee (VWC) with in the milli watershed. The MWC will also include representative of local MLA, WDT, Janpad (Block) Panchayat, Forest department and also all the Gram Panchayat Presidents / Sarpanches / Pradhans) within the milli-watershed. It is an Advisory body that will give overall direction to the programme. It will also help resolve conflicts that may arise across watersheds. It will monitor and review progress and carry out social audits of the programme. The VWC will be the ultimate implementing agency at the village level. It will be a committee of the Gram Panchayat that will be elected at a meeting of the Gram Sabha. The VWC will be answerable to and work under the control of the Gram Sabha.

Village Level Watershed Development Approach.

316. The economic development and advancement of the country, in various fields can not be thought of without considering villages as units for development. As per the 2001 Census, in India, the rural masses constitute more than 70% of total population. There are more than 6.38 lakh villages. Since Independence a lot of emphasis has been paid to the rural development programmes.

317. Watershed approach aims at holistic and integrated development on a sustainable basis. Watersheds programmes focus on development of land and other natural resources in a manner so as to ensure increase in the production and productivity, maintain ecological stability and develop community organizations.

318. All watershed programmes may be designed in a manner so that the rural people, particularly the farming community, derive maximum benefits. It can be said without doubt that the main stakeholders in watershed development programmes are mostly the villagers. Without active participation of the villagers no watershed programme can succeed in real term.

319. Although, our villages occupy the central stage as per the watershed approach, but in practice, the villages are not being considered as the planning unit for various

programmes. The conventional concept of geo-hydrological boundaries is being followed in watershed planning. Moreover, the concept of developing a fixed area of 500 Ha under a specific project leaves many important areas within the watershed from treatment. Particularly, the areas situated at the higher reaches and forest lands are ignored while prioritizing the treatment plan through participatory rural appraisal techniques. As a result the task of full treatment of the watershed remains unaccomplished and whatever treatments are taken up their sustainability remains threatened.

320. In order to maximize benefits of treatment from watersheds a change in approach, i.e., by adopting villages as planning units for watershed development programmes may be considered in the XI Plan by all Central Ministries/Departments.

321. For holistic and effective development of village and to drive the best outcome from a watershed project, it is essential that the detailed planning should be based on geo-hydrological unit of watershed but the execution to be made on the basis of a village development plan drawn out of the detailed plan of the watershed. Participatory Rural Appraisal is the key for assessing the requirements of a village and the priority matrix ranking should be the tool for design of activities. Separate Village Development Committee(VDC) for each village of the watershed may be formed and the Secretary of each VDC should be the member of Watershed Committee.

322. It is expected that with the modification in the existing institutional mechanism and by adopting a village level watershed development approach appropriate cooperation of the watershed community may be ensured. This will make implementation process more effective and at the same time the watershed community will receive maximum benefits out of Government programmes.

The WADI Experience

323. A specific programme covering over 50,000 families spread over the States of Gujarat, Maharashtra, Karnataka, Rajasthan and Uttar Pradesh for development of orchard on degraded lands, locally known as 'Wadi', has been found quite successful particularly in Tribal areas. This programme included women empowerment, community health, drinking water supply, hygiene, sanitation and capacity building. under this programme the participating families were encouraged to establish drought tolerant fruit crops such as mango, cashew, Indian gooseberry, tamarind, custard apple and ber etc., on their marginal or wastelands covering 0.4 to 1.0 ha. The inter-space was used for cultivating arable crops grown by them earlier. Hardy shrubs and trees useful for fodder, fuel, timber and herbal medicines were established on the field bunds and borders while some thorny species were planted on the outer boundaries which served the dual purpose of live hedge and wind break mostly in areas affected by wind erosion.

324. After the inception of Wadi Programme the sloppy terrains, accelerating soil erosion and floods have been converted into terraces of orchards. Fruit trees have

enabled the families to earn regular income. Efficient field bunding has promoted soil and water conservation. Migration has now become a thing of the past. Instead, many families have built houses in their orchards to spend more time in the field and regular presence of the farmers in their fields has helped them to enhance their crop yields. With plenty of trees growing on their field bunds, the villagers do not have to cut wood in forests anymore, resulting in the conservation of forest resources.

325. The success of the Wadi programme provoked villagers in the surrounding regions towards horticultural development. As the trees start bearing, a family with 0.4 ha land under orchard is able to earn a net annual income of about Rs.20,000-25,000 after 4-5 years. To sustain their interest and ensure food security during this gestation period, supplementary income from intercrops, sale of fruit and forestry plants, vermi-composing, mushroom production, sericulture, production and processing of medicinal plants and establishment of micro-enterprises is critical. The success of Wadi programme may therefore be replicated as an activity under watershed programmes.

National Rainfed Area Authority(NRAA):

326. Recently the Government of India has constituted an expert body to provide the much-needed knowledge inputs regarding systematic up-gradation and management of country's dryland and rainfed agriculture. The Authority will serve as a Policy making and monitoring body charged with the role of examining guidelines in various existing schemes and in the formulation of new schemes including all externally aided projects in this area. The NRAA although not required to be an implementing or fund disbursing agency is expected to effectively converge the various schemes in different Ministries relating to watershed development and other aspects of land use and productivity. Its mandate has been kept wider than mere water conservation and covering all aspects of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches. The NRAA would especially focus on issues pertaining to landless and marginal farmers, who constitute the large majority of inhabitants of rainfed areas. The mandate of NRAA includes;

1) To prepare a perspective plan, outlining the national strategy and road map for holistic and sustainable development of rainfed farming areas.
2) To evolve common guidelines for all schemes of different Ministries including EAPs for development of Rainfed / Dry land Farming systems.
3) To coordinate and bring convergence within and among agricultural and wasteland development programmes being implemented in rainfed areas of the country.
4) To identify rainfed areas in different States which need priority attention and prepare watershed development programmes for integrated natural resource management in consultation with States, focusing on multi dimensional crop, livestock, horticulture, agri-pasture integrated systems and programmes for landless farming communities.
5) To identify gaps in input supply, credit availability, dissemination of appropriate technology and other requirements relevant for rainfed areas.

6) Guide the implementing agencies on priority setting and monitor the specific interventions required.
7) To develop plans/ programmes for capacity building of Centre / State Government functionaries in rainfed areas.
8) To suggest modalities to strengthen National and State Level Institutions concerned with Rainfed/Dryland areas, and establish institutional linkages with prioritized watersheds.
9) Monitor disbursement of rural credit/ insurance cover/ safety net programmes developed for rainfed areas.
10) Set the research agenda including a critical appraisal of on-going programmes and promote diffusion of required knowledge for integrated farming in rainfed areas to district and lower level authorities.
11) To evaluate the effectiveness of completed watersheds and concurrent evaluation of on-going programmes.

Structure of NRAA

327. The NRAA have a two-tier structure. The first tier is a Governing Board that will provide necessary leadership and appropriate coordination in implementation of programmes. The second tier is the Executive Committee consisting of technical experts and representatives from stake holder Ministries. The Executive Committee would be headed by a full time CEO who will be a recognized expert on the subject and will also have five other full time technical experts. It would have the flexibility to co-opt additional technical experts as required and with the approval of the Governing Board. The structures of the Governing Board and the Executive Committee of NRAA are as follows:

Governing Board

1. Minister of Agriculture - Chairman
2. Minister of Rural Development – Co-chairman
3. Minister of Water Resources - Member
4. Minister of Environment & Forests - Member
5. Member, Agriculture, Planning Commission - Member
6. Secretary, Department of Agriculture & Cooperation - Member
7. Secretary, DARE - Member
8. Secretary, Ministry of Rural Development – Member
9. Secretary,Ministry of Water Resources - Member
10. Secretary, Ministry of Environment & Forest - Member
11. Secretary,Ministry of Panchayati Raj - Member
12. Chairman, NABARD (National Bank for Agriculture & Rural Development) - Member
13. One Farmer Representative/ Organization (To be nominated by Ministry of Agriculture) Member
14. CEO, (National Rainfed Area Authority) - Member Secretary

Executive Committee

1. Chief Executive Officer, National Rainfed Area Authority
2. Five Eminent Experts in the field of
   (i) Water Management
   (ii) Agriculture/Horticulture
   (iii) Animal Husbandry & Fisheries.
   (iv) Forestry
   (v) Watershed Development
3. One representative each from Ministry of Rural Development, Ministry of Agriculture, Ministry of Environment & Forests, Ministry of Water Resources, Ministry of Panchayati Raj.
4. Advisor, Planning Commission
5. Director, Central Arid Zone Research Institute (CAZRI), Jodhpur.
6. Director, Central Research Institute for Dryland Agriculture(CRIDA), Hyderabad
7. Subject Matter Specialists

328. The NRAA is expected to provide the much needed knowledge inputs for the up gradation and management of country's, dryland and rainfed agriculture. Besides, it will bring about convergence and synergy among the numerous ongoing programmes and will advise, guide and monitor their implementation as its mandate will cover all aspects of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches. It would also focus on issues pertaining to landless and marginal farmers as they constitute the large majority of inhabitants of rainfed areas. However, each participating Ministry will be responsible for implementation of its line programmes after clearance from NRAA, based on the common guidelines.

Issues and Suggestions for improvement in Institutional Mechanism

329. Though at the National Level it has been decided to establish NRAA, it is necessary to have appropriate vertical linkages of this apex body with the state, district and watershed levels for proper execution of policies and programmes.

330. At the state level there shall be one single nodal agency accountable for implementation of watershed policies and programmes. Such agency shall receive instructions and guidance from the NRAA. It is necessary that the existing State Level Steering Committees of different programmes / schemes of Government of India, should be amalgamated to make them more focused, accountable and cohesive taking into account all Watershed Development Programmes. In some states watershed programmes are being implemented in a mission mode through a dedicated department / directorate. This model may be replicated else where.

331. For better coordination and effective implementation of programmes, the State level Watershed Committee may be headed by the Chief Secretary / Agriculture

Production Commissioner with Secretaries, in charge of various Departments involved in implementation of Watershed Programmes and expert in the field of watershed development from SAUs / ICAR institutions, as members. This committee will also monitor periodically the progress of various programmes / schemes.

332. At the District level too, a District Watershed Committee should approve and oversee all watershed programmes of different Ministries/ Departments. This will require amalgamation of existing District level watershed committees constituted for different schemes of Government of India. Such a Committee may be constituted under the Chairmanship of the Head of Zila Panchayat / Parishad with representatives of concerned line departments, representatives from local agricultural research institutions, at least two local NGOs working in the field of watershed development and two gram panchayat representatives, nominated by the District Collector as members.

333. The District Committee may identify Micro Watersheds in which programmes / schemes of different Ministries / Departments will be taken. Such identification shall be made on the basis of a detailed work plan of the sub catchment for treatment of selected watershed villages as per the respective guidelines prescribed for the specific programme / scheme.

334. The District Committee may formulate the overall and annual watershed development plan of the district and submit to the State Level Committee. However, the individual projects under the identified programmes / schemes are to be decided by the district committee. This Committee will also be responsible for monitoring of schemes from time to time and submit its reports along with suggestions and recommendations to the State Committee and to Government of India.

335. At the watershed level, a Watershed committee headed by a Chairman to be elected by the Gram Sabha with members from implementing agency, Watershed Development Team, representatives from User Groups and Self Help Groups may be constituted to execute the programmes. At this level adequate representation to SC, ST landless laborers and women may be ensured. For better monitoring and transparency, the progress of watershed works along with expenditure details should be reported and discussed in the Gram Sabha at least twice in a year. Such an arrangement may fulfill the constitutional obligation of entrusting development of watersheds to the Panchayats.

336. An important element of long term sustainability is to forge linkages of watershed institutions with permanent institutions in the area, particularly the Panchayat Raj Institutions (PRI). Since PRIs are in varying degrees of administrative effectiveness in the States, the latter are likely to follow different mechanisms for linkages between the watershed institutions and the PRIs. Wherever possible Panchayats should be encouraged to become Project Implementation Agencies. Elsewhere linkages should be forged between the Panchayats and the watershed committee by nominating one member of the village Panchayat as member of the

WC, or declaring Watershed Committee as a sub-committee of the Land Management Committee under the Panchayat Raj Act.

337. A series of Participatory Rural Appraisal (PRA) exercises need to be taken up before project planning in the identified watershed village. Techniques like participatory mapping, transact survey, matrix ranking, timeline, seasonality, etc. may be adopted to gather first hand information. The PRA exercises should initially provide data regarding details of land, water and human resources, soil types, severity of erosion, problem-soils, rainfall, ground water levels, surface runoff, drainage lines, pasture land, forest species, grazing ground, fuel fodder and economic species, production systems in agriculture, horticulture, livestock, animal husbandry, village industries besides the socio economic realities such as demographic details, social and wealth ranking, migration, literacy village crafts, skills, employment opportunities, etc.

338. After obtaining the above information, the PRA maps/ visuals should be used for participatory analysis of existing status, utilization pattern and status of natural resources. The maps and visuals emerging out of above exercise may then be used for analyzing problems, reasons for the problems and possible solutions as understood by the community. The output from such an analysis would provide a basis for providing alternate options to address the problem. The choice of interventions should however rest with the community. It is however important that the concepts of sustainability, equity, gender, eco friendliness, etc. are also kept in view (besides the cost effectiveness, convenience, etc.) while making the final choice of options for implementation.

339. Democratic decentralization in decision making, transparency in transactions, mobilization of community at the village level, direct funding to the community, emphasis on “Government” participation in “Community’s” plans, contributory approach to empower the community, building upon indigenous innovations, initiatives and ideas; equity for resource-poor families and empowerment of women, moving away from subsidy oriented development to self-reliant development, convergence of activities, schemes of government and non- governmental organizations etc. are the key elements of involvement of community in implementation of watershed programmes. Involvement of community is therefore very crucial in the project planning stage. The implementation of programmes, monitoring and post project maintenance are also required to be entrusted to the community to address the sustainability aspect. The government departments will however be required to exercise the facilitating role of guiding, supervising and providing the technical advice to the community organizations for successful implementation of programmes.

340. The modalities for smooth flow of funds at the watershed level may be revisited by respective Central Government Ministries/Departments to ensure a quick and timely flow of funds up to the field level so as to ensure completion of all activities envisaged in the work plan in a time bound manner.

341. The current level of R & D Support available under different schemes is not adequate to meet the location specific requirements of the watershed programmes. Identification of Specific Research Organization / Institution to cater the needs of different Agro Ecological Zones has been attempted but a more intense approach addressing the need of individual watershed is yet to be streamlined. Each watershed in which an ongoing Programme is under implementation should be provided with necessary support by an identified institution such as, KVK, SAU, ICAR Centre, Agriculture College, ICRISAT etc for effective technical back stopping.

342. The sustainability of the treatments in most of the watershed programmes remains a matter of concern in the absence of an appropriate with-drawl strategy. This aspect needs to be elaborated in the guidelines of each of the scheme as watershed plus component. The withdrawl strategy should specify the procedure for maintenance of assets created under watershed schemes. On termination of the project these assets should be handed over to the concerned line departments and/or the local Panchayati Raj Institutions. The withdrawal strategy should also address the procedure for utilization of corpus funds / watershed development funds/ revolving funds created during the project phase, for the post project maintenance of structures, and resources developed under the project and their sustainable utilization by the watershed community. Utilization of fund for further development of watershed areas may be taken up by the Watershed Committee with the consent of Gram Sabha. Scope may be provided to enrich this fund by generating additional incomes on a regular basis, exploring incomes through created productivity in common property resources. The resources developed may be entrusted for maintenance to the established institutions / organizations in the watershed area. The capacity of the village level institutions should be developed to take care of the maintenance aspects as well as to achieve the economic benefits in a sustained manner. The line departments should continue providing technical support and supervision even after completion of project.

343. New technologies of remote sensing, information technology are required to be promoted along with computerization of land records. Application of Remote Sensing and GIS need to be strengthened to bring periodic land use and degraded land status to guide the watershed planning and development process in the watershed villages. This will also help in effective convergence of other developmental activities as well as appropriate use of the corpus / revolving fund in the post project phase including impact evaluation and outcome analysis.

CHAPTER –VI

CONCLUSIONS AND RECOMMENDATIONS

Introduction

Government of India has accorded high priority to the development of rainfed areas, degraded and waste lands for increasing the agricultural production to sustain the food requirement of the growing population. Still, rainfed farming continues to be critical for meeting the livelihood needs of a vast majority of small, marginal and tribal farmers. The new technologies have not filtered down amongst farmers in rainfed areas to the desired extent. Although during the past ten years more substantial area belonging to these categories has been developed under different schemes, yet the out come has not been reflected in the national agricultural production, productivity, income and equity indicators. This indicates some deficiencies in the implementation process of these programmes and therefore calls for improvement in implementation strategy. Apart from the implementation strategy, there are other areas which require strengthening and more thinking. These include amelioration of problem soils like alkaline, acidic, saline and ravines, the enrichment of watershed programmes as such to include the basic provisions of some critical inputs and transfer of technology, watershed plus activities to keep the watershed community on a sustained growth path, consolidating and sustaining the benefits of the watershed project, involvement of multi stake holders to achieve a win-win situation for all segments of the watershed community with or without outside public or private agencies which also become a stakeholder in the developmental process. The suggestions and recommendations of the Working Group with respect to these and other important aspects are given in the subsequent paras.

Review of Programme

1. Out of 328.7 million hectare of geographical area of India, 142 million hectares is net cultivated area. Of this, about 57 million hectare (40%) is irrigated and the remaining 85 million ha (60%) is rainfed. The entire 69 million ha. of forest land is essentially rainfed with a large scope for enhancing its productivity and complementarities to arable land for reducing pressure on utilizable resources.

2. As per recent (2005) study conducted by National Bureau of Soil Survey and Land Use Planning, (NBSS&LUP), Nagpur, an ICAR Institute, a total of 146.82 million ha. area is reported to be degraded. This indicates land affected by water erosion (93.68 million ha.), wind erosion (9.48 million ha.), water logging/flooding (14.30 million ha.), salinity/alkalinity (5.94 million ha.), soil acidity (16.04 million ha.) and complex problems(7.38 million ha.). The details of area suffering from various kinds of land degradation are given at **Annexure-II**. The Waste Land Atlas prepared by National Remote Sensing Agency, Hyderabad, in

2005, for the Ministry of Rural Development , however indicates that only 55.27 million hectare land falls under various categories of wastelands. The category wise and State wise details are given at **Annexure-III & IV** respectively.

3. The Working Group on Watershed Development, Rainfed Farming and Natural Resource Management for the Tenth Plan constituted by the Planning Commission had assessed that 88.5 million ha. degraded wasteland including rainfed areas would need development. The Working Group report envisaged to cover the entire 88.5 million ha. land in four successive Five Year Plans, commencing from the Tenth Plan up to the Thirteenth Plan at an estimated cost of Rs 72,750 crore (at 1994 prices). Cost sharing ratio between the Center, States and People/ Community in each Plan was also suggested. The details are given at **Annexure-V.** Approximately, 20.00 million ha. area is likely to be developed during the Tenth Plan period and therefore, about 68.50 million ha of area will require development after the Tenth Five Year Plan.

4. Various Central Ministries and Departments are implementing programmes for the development of degraded lands and rainfed areas, on watershed basis. Ministry of Agriculture is implementing schemes namely, National Watershed Development Project for Rainfed Areas (NWDPRA), Soil Conservation for Enhancing the Productivity of Degraded Lands in the Catchments of River Valley Project & Flood Prone River (RVP & FPR)**,** Watershed Development Project for Shifting Cultivation Areas (WDPSCA), Reclamation of Alkali Soil (RAS), Watershed Development Fund (WDF). The Ministry of Rural Development is implementing schemes of Drought Prone Area Programme (DPAP), Desert Development Programme (DDP) and Integrated Wasteland Development Programme (IWDP). Both the Ministries of Agriculture and Rural Development are also implementing some externally aided watershed development projects. The Ministry of Environment & Forest is implementing the National Afforestation Programme which is based on the principles of watershed management. The Planning Commission of India is also implementing two schemes, viz.; the Hill Areas Development Programme (HADP) and Western Ghats Development Programme (WGDP) from the Fifth Five Year Plan in designated Hill Areas. Under these programmes, Special Central Assistance is given to the designated Hill Areas in order to supplement the efforts of the State Governments in the development of these ecologically fragile areas. The scheme wise physical and financial achievements of watershed programmes of MoA, DoLR and MoEF up to the end of the Ninth Five Year Plan and in the first four years of the Tenth Plan (2002-03 to 2005-06) are given below.

(Area in Lakh ha and Expenditure in Rs.Crore)

Sl.	Ministry/ Scheme and year of start	Progress up to IX Plan		Progress in X Plan (first 4 years) (2002-06)		Total since inception up to March, 2006	
		Area	Expr.	Area	Expr.	Area	Expr.
(A) **Ministry of Agriculture (Department of Agriculture & Cooperation)**							
1.	NWDPRA (1990-91)	69.79	1877.74	15.80	793.82	85.59	2671.56
2.	RVP & FPR (1962 & 81)	54.88	1516.26	7.63	521.48	62.51	2037.74
3.	WDPSCA (1974-75)	2.58	166.27	0.95	89.31	3.53	255.58
4.	RAS (1985-86)	5.81	76.39	1.06	29.55	6.87	105.94
5.	WDF (1999-2000)	-	-	0.39	21.02	0.39	21.02
6.	EAPs	13.35	2039.81	3.80	1527.54	17.15	3567.35
Sub Total		**146.41**	**5676.47**	**29.63**	**2982.72**	**176.04**	**8659.19**
(B) **Ministry of Rural Development (Department of Land resources) ***							
1.	DPAP (1973-74)	68.95	3284.74	52.82	1197.76	121.77	4482.50
2.	DDP (1977-78)	33.56	797.38	33.82	882.50	67.38	1679.88
3.	IWDP (1988-89)	37.34	616.51	47.22	1336.64	84.57	1953.15
4	EAP	1.4	18.39	2.57	194.28	3.97	212.67
Sub Total		**141.25**	**4717.02**	**136.43**	**3611.18**	**277.68**	**8328.20**
(C) **Ministry of Environment & Forests**							
1.	NAP (1989-90)	**0.70**	**47.53**	**-**	**-**	**0.70**	**47.53**
TOTAL (A+B+C)		**288.36**	**10441.02**	**166.06**	**6593.90**	**454.42**	**17034.92**

* *Expenditure indicates the amount released and the progress area is the area targeted to be covered under the approved projects.*

5. Evaluation studies of IX Plan watersheds of NWDPRA reveals:

- Increase in crop yield ranging from 15 to 220 % in respect of major crops, viz; paddy and wheat and more than 35 % in respect of pulses.
- Increase in cropping intensity from ranging from 8 to 60 %.
- Reduction in sediment loss varying from 3 to 80 %.
- Increase in groundwater recharge ranging from 0.6 to 10 mt.
- Significant increase in family income through diversified farming systems; viz; agro-forestry, dry-land horticulture, livestock development and household production activities in the treated watersheds.
- The agro-forestry and horticulture plantations raised under the scheme have shown survival percentage ranging from 25 to 75 %. There has been increase in bio-mass production varying from 2.39 to 58 %.

- Large number of water harvesting structures were created under the programme.

6. Evaluation studies of watersheds covered under RVP & FPR indicates:

- Yield of agricultural crops has increased. The variation of increase is very high, ranging from 10% to 76%.
- Increase of cropping intensity varying from 80% to 115% has been observed.
- The sediment yield at watershed level has reduced ranging from 17% to 94%.
- The flood peaks at the end of watersheds has reduced to 36%.
- The soil conservation measure has increased the groundwater re-charge. The increase in groundwater table ranges from 0.5 to 2 meter.
- The soil conservation measures have helped in employment generation in rural areas.

7. Findings of evaluation studies of WDPSCA watersheds indicate:

- Significant decrease (30%) in shifting cultivation area due to adoption of permanent/ settled cultivation has been noticed.
- About 27% Jhumias have abandoned Jhum practice
- Jhum area per family has been reduced from 0.84 ha to 0.56 ha
- Sustainable increase in productivity of agricultural crops, horticultural crops, livestock, inland fisheries, etc. was observed. In case of Paddy cultivation 13% increase in level of productivity was reported.
- Increase in overall income by 25% of the Jhumia family as compared to pre-project was reported.
- Increase in cropping intensity by 40 % was observed.
- Active participation and contribution of the watershed community in completion of all the planned works/activities for development of the watershed was effective and very useful in after care of assets created.
- The new institutional set up *viz* Watershed Association / Panchayats has helped in promoting participatory approach during project period and even beyond project period.

8. Evaluation studies of RAS scheme has shown following impacts:

- pH of reclaimed soil decreased from 9.4 – 10.5 to 8.9 – 9.2
- increased organic carbon from 0.15 to 0.38%
- increased paddy yield from 19-41 Q/ha.
- 76% increase in income of farming families in the reclaimed areas
- enhancement in land values, average crop yield and cropping intensity; and
- created additional employment for the farmers in rural areas itself.

9. The salient findings of impact assessment studies of programmes of Ministry of Rural Development reveals :-

- There has been an overall improvement in land use.
- There has been increase in the net sown area, gross cropped area and area sown more than once.
- Number of irrigation options enhanced in all the areas where watershed projects were taken.
- The fuelwood and fodder availability has increased, especially in the areas where emphasis has been laid on catchment's area treatment.
- The actual number of livestock has increased and there was a marked preference for improved breed. In many states the fishery potential has increased.
- There has been changes in the cropping pattern from one to two crops annually. This was directly attributable to the availability of water in the dry season. In some regions adoption of improved crop varieties was observed in the studies.
- There has been increase in agriculture related employment opportunities, among beneficiaries and in other sectors for non-beneficiaries. These included trade, dairy, poultry, masonary etc. Changes in household income levels were noticed as high as 50%.
- The institutional arrangement got strengthened.
- Peoples' participation through slow in the beginning got a momentum in course of time.
- In all project areas capacity building was at various levels.

10. Rain-fed areas constitute about 60 per cent of net sown area and are characterized by low levels of productivity and low input use. The bulk of India's rural poor lives in rain-fed regions and face high variability of rainfall, resulting in wide variation and instability in yields. For sustainable development of these areas, the watershed development approach has been adopted and given high priority for several years. Evaluation studies show several benefits of watershed development approach, the important ones are:

- increase in water level and recharge of ground water aquifers;
- reduction in soil erosion;
- increase in cropping intensity;
- change in cropping pattern leading to higher value crops;
- increase in crop productivity;
- rise in overall bio-mass in the watershed;
- increase in employment; and
- reduction in rural and urban migration.

11. Expenditure on the several schemes for watershed development has been stepped up in 2004-05. However, while expanding the pace and scope of watershed development, much greater attention needs to be paid on why past

efforts have delivered less than promised. Some watersheds are poorly designed. Most do not reach full potential in terms of agricultural production except under initiative and supervision of a few non-government organizations(NGOs). In many cases, watersheds have not been properly maintained because community involvement waned after the initial development stage. In any case, community involvement in watershed planning and design has typically been low; and distributional problems are persistent, arising from existing inequalities in land distribution or because of ill-defined rights and encroachment. It is important for the planned distributional outcomes to be equitable and widely acceptable in order to ensure that there is a sense of ownership and participation on the part of the community at large both in implementation and maintenance of the water retention structures. It is necessary, in this context, to collect and collate information on successful experiences in designing and implementing watershed projects so that these can be replicated elsewhere in the country.

12. Meta Analysis of Watershed Development Programmes conducted by International Crop Research Institute for Semi Arid Tropics (ICRISAT) documented the benefits from the watershed programmes by collating information from micro-level studies to give a macro-dimension. The benefits were assessed in terms of efficiency, employment and sustainability. It was noted that the watershed programmes s were contributing in raising income, generating employment and conserving soil and water resources. The analysis show that the benefits of the watershed programmes were more in the poor income regions as compared to higher income regions. Benefits were more in the rainfall regions ranging between 700-1,000 mm. Indicating that for different Agro-eco regions with dryer and wetter regions different watershed management options are needed, the principle of " one size fits all" does not work for watershed management. The study suggested that the watershed program would be a vehicle of development to alleviate poverty by raising farm productivity and generating employment opportunities in marginal and fragile environments.

13. The study revealed that the benefits of watershed programmes were greater where people's participation was higher. The benefit-cost ratio was much more(2.4) in watersheds where people's participation was high in comparison to the watersheds with low people's participation(1.24). Similarly it was observed that the BC ratio was 2.46 in low-income regions as compared to 1.98 in high-income regions. This suggests that Government should accord higher priority to watershed activities in medium and low-income areas. It was noted that people's participation is not only important during the phase of implementation of watershed development activities, but beyond the actual investment phase. The important conditions of people's participation are related to:

(i) demand-driven watershed programs rather than supply-driven ones;
(ii) involvement of all stakeholders (including women and landless laborers) in program implementation and monitoring;

(iii) decentralization of the decision making process;
(iv) involvement of elected representatives and Panchayati Raj Institutions;
(v) commensurate benefits of all stakeholders with their cost; and
(vi) establishing effective linkages of watershed institutions with other institutions, like credit sector, input delivery system, and technology transfer mechanism.

14. The estimation of degraded wastelands should be entrusted to one professionally competent organization by drawing experts from relevant disciplines. The NRSA and NBSSLUP may be considered for a joint assessment of degraded lands in the country.

15. The watershed approach has been accepted as a major theme for development of the rainfed / dryland areas with a view to conserving natural resources of water and soil and to mobilize communities for socio-economic upliftment by enhancing people's participation. To ensure appropriate coordination at the national and sate levels and to ensure appropriate implementation and convergence of different programmes, it is necessary that at the state level all are programmes are coordinated by one single agency and at the national level the programmes are coordinated, supervised and monitored by a national level Authority.

16. The Codification of Watersheds for all the States is yet to be completed in a systematic manner. Although, organizations like; NRSA, NBSS-LUP, AIS & LUS are working in this regard yet, there is a need to integrate the codification process of these organizations. The element of uniformity in the codification also requires uniform procedure. A "soil to satellite" approach needs to be promoted along with computerization of land records. The Department of Land Resources of Ministry of Rural Development is in the process of having a six layer wasteland mapping on internet with the help of NRSA. This scheme needs to be taken up at the earliest and on a large scale so that there is a clear-cut identification of wastelands at village level which should be known to the village community as well as to the Government agencies for appropriate planning for future.

17. Implementation of watershed/ wasteland programmes in forest lands, quite often witnesses problems posed by the Forest Department in view of Forest Conservation Act, 1980. The scientific development of watershed recommends a ridge to valley development approach which signifies the development of forest areas in the upper reaches first. Unfortunately, in India, involvement of forest sector in the watershed programmes has remained limited.

18. Technical sanction of the treatment plans should be given by the Divisional Forest Officer concerned. The programme should as far as possible be implemented by Village Forest Committees existing in that area. If no such Committee exists, their formation may be encouraged, or else the project

activities in such watersheds should be taken up by the Forest Department. Village Forest Committees should be treated at par with Watershed Committee.

19. The issue of sustainability and convergence of other development programmes needs to be ensured by encouraging incentives linking with the developmental activities. For instance road construction in an area may be linked with the raising of plantation by the community. Similarly, electricity / telephone connections may be provided to those farmers on priority who will resort to drip irrigation.

20. Ownership Rights in respect of Common Property Resources (CPR) created under watershed development programmes, lead to a conflicting situation. A variety of CPRs are created under various WSD Programmes, such as, Water Bodies, Plantations etc. In the absence of appropriate usufruct rights and appropriate withdrawal strategy, the landless poor and less influential farmers are generally devoid of their use. Each programme should have an appropriate management policy both for the project phase as well post project phase. The withdrawal strategy needs to address the issue of ownership right in respect of CPRs created under WSD Programmes. Further, in WSD Programmes since inception, user groups may be promoted by incorporating members from all sections of society. This will also address the equity aspect which is other wise lacking in watershed programmes.

21. Regulatory mechanism for developed resources under WSD programmes like; water bodies, plantations etc. has not been considered in WSD Programmes. As a result, the benefit of resources created like tapping of ground water by installing tube wells and bore wells etc. goes to the influential members of the watershed community. The withdrawal strategy may look into this aspect so that appropriate regulation for CPRs through social legislation is ensured on a long term basis. This may be done by self imposition by the Watershed Community at large in absence of a good legislation.

22. Research support to watershed projects is essential to derive maximum benefits to the watershed community. Generally, watershed approach is followed in rainfed areas which are typically characterized by low production and productivity. Further, crop diversification, input uses, credit availability is very scarce in these areas. It is, therefore, necessary that the watershed areas should be statutorily linked to professional institution, such as, Krishi Vigyan Kendras (KVKs), State Agricultural Universities (SAUs), ICAR Institutions, State Institutes of Rural Development, State Remote Censing Centre, State Forest Research Department etc. for technical backstopping who will guide appropriately implementation of the programme converging it with other development programmes to maximize benefits to the community.

23. The fund flow mechanism for watershed projects particularly those implemented by Central Ministries / Departments is not appropriately

streamlined. Since the natural resource management activities, such as, raising plantation, bunding, construction of water harvesting structures etc. are time bound operations and these are required to be carried well before the onset of monsoon, any delay in release of funds and its availability at the watershed level, defer execution of these activities. As a result, the benefits do not reach in time to the watershed community. Such delays are caused because the sanction of projects / releases from the GOI begins at the commencement of the financial year. The funds are then placed at the disposal of respective State Governments, and they take their own time to release the funds to the implementing agencies. Such delays can be avoided by evolving a mechanism in which administrative approval in respect of projects is accorded before the commencement of the financial year. Fifty per cent of the release of approved projects may be made at the beginning of the financial year to execute operations that are necessary to be carried out before the commencement of monsoon. The remaining amount can be released later on.

24. A reasonably accurate estimation of land required to be treated under watershed development programmes is a pre-requisite for any planning. In the coming years, 4 technologies are required to be used and integrated:

1. Remote sensing
2. Updating of data based on land record / survey records
3. Sample Ground Truthing to verify and reconcile the data obtained from the above two.
4. GIS Application for integrating the data from various sources.

The data thus arrived however,may form only the basis for Macro-planning as it may differ from actual area required to be treated at micro level due to scale and sampling intensity used. As the watershed development programmes are executed through the States and the micro-planning is done at local level in the States, acceptance of these estimates in general by the States is essential. The States may, therefore, be involved while finalizing the estimates.

25. Though the guidelines for implementation of watershed development programmes provide certain degree of flexibility in the planning, execution and management to achieve the optimal results, yet, such flexibility is not actually seen in the implementation of projects. A sub-optimal approach has set in many cases in a haste to achieve the targets and to complete the work with the budgeted financial support. In such cases, the possibility exists that these projects instead of moving on to a path of conservation, may slide downwards on to a path of degradation leading to a liquidation of resources after the project period is over. The pre-conditions for the take-off and successful completion of the project designed with a fixed period are generally absent from the rural scenario. A detailed preparation of the blue print of the project may also require longer period and higher fund requirement than that of the guidelines. The project period and cost norms require revision and should be made flexible to accommodate the wide range of socio-economic set-up in the country.

26. Equity in distribution of resources generated such as water has not been appropriately addressed. As a result, the benefit of using the surface and ground water by using lifting devices and through tube wells and bore wells etc. goes to the influential members of the watershed community. The management of resource should be made strategically so that its availability to all stake holders is ensured through social legislation on a long term basis or through self-regulation by the community.

27. Promotion of farming system approach has been identified as a thrust area for the Tenth Plan. It has been therefore, recommended that greater investments under watershed development and rain harvesting and natural resources conservation be resorted to. For expansion of watershed development, greater attention is required to obtain full potential in terms of agricultural production and, therefore, promotion of farming systems approach should be made an integral part of the watershed development programme for rainfed areas. Particularly, areas like improvement in crop production technology, improvement in supply of quality inputs like seeds, fertilizers, machinery, varietals diversification and technology transfer should be included as integral part of the watershed development programmes being implemented by the Ministry of Agriculture. This will ensure full agricultural development in the treated areas under the watershed. Proactive intervention may be required rather than normal extension approach. This approach should be considered as an integral component in the successive Five Year Plans.

28. Provision of substantial assistance on water conservation techniques in the regions displaying acute water stress, i.e. over-exploited and dark blocks, particularly in low rainfall regions has been advocated. The provision for farm ponds and other rain harvesting structures as well as micro irrigation devices may be considered for such assistance in the rainfed areas. These aspects are not being addressed in the ongoing watershed programmes.

29. The monitoring mechanism for different programmes vary considerably. As a result, at a given point of time, it is not possible to assess the progress of various programmes. Looking into the availability of various new technologies / options available, particularly in the field of Information Technology, a common online monitoring mechanism may be adopted. A common Information Monitoring System (IMS) based on GIS software may be designed and adopted by different Central Ministries / Departments / State Governments. In addition, practice of mid term evaluation need to be institutionalized in all watershed programmes to take appropriate corrective measures during the implementation phase.

30. The present system of evaluation of watershed programmes is not very much elaborate since evaluation is being done on small sample size. Agencies like NRSA, ISRO, ICRISAT having adequate infrastructure and professional competence may be considered for entrusting evaluation of programmes on

regional / state level using advanced IT and GIS based techniques which may be followed with appropriate ground truthing. In other words, out-come based evaluation needs to be attempted for a district or state.

31. Many programmes for development of rainfed area, wasteland and degraded are being implemented by different Ministries / Departments / Agencies. However, up to date information of these programmes at National / State level, is generally not readily available to users, for different purposes. For easy access as well as sharing of information it is necessary to develop a National Level Portal for all programmes, with easy access to the users.

32. The Government of India has recently established a National Rainfed Area Authority (NRAA) with an objective to coordinate and converge programmes in rainfed areas. The Authority although is not an implementing or fund disbursing agency but, is entrusted with the responsibility of effectively converging the various schemes of different Ministries relating to Watershed Development and other aspects of land use and productivity in rainfed areas. This is a step forward in the right direction.

33. At the beginning of the X Plan the projected land for treatment / reclamation under watershed development programmes for the XI Plan was stipulated at 20 million hectare. With the kind of performance achieved during the X Plan it is expected that if the resources are appropriately made available, it is possible to accelerate the pace of development of these lands. This seems necessary keeping into consideration the large extent of degraded / wasteland / rainfed areas remaining un treated even after the X Plan. It will be appropriate if the projections for the XI Plan are recast to 38 million hectare which will include development of 36 million hectare land through the programmes of Central Ministries / Departments and remaining 2 million hectare through Public Private Partnership.

Land Degradation and Problem Soils

34. Sustainable management of land resources is essential for livelihood, environmental and socio-economic security of the country. The mounting demographic pressure on land resources for material needs is, however, leading to their degradation in many parts of the country. Land degradation could be described as the deterioration of soil quality and the partial or entire loss of one or more functions of the soil as a result of one or more degradation processes. There are two principal types of degradation: physical and chemical.

35. Several studies have shown that in many regions and in the cultivated areas there is a net negative balance of nutrients and a steady depletion of the organic matter. On the basis of point data it is estimated that about 70% area in the country is deficient in soil organic carbon, having less than 1% organic carbon. Deficiency of phosphorous is widespread in Indian soils with 49.3, 48.8 and 1.9% of soils having low, medium and high P status. There is growing

intensity of sulphur deficiency in 120 districts and micro-nutrient deficiencies such as Zn, Fe, Mn and B in intensively cultivated areas.

36. According to an assessment 16 m. ha of arable land affected by acid soils will need reclamation to enhance the productivity. These soils suffer from deficiencies as well as toxicities of certain nutrients due to which their productivity is very low. There is ample scope to raise the productivity of these soils by applying lime and balanced fertilizers. The application of lining 2 - 4 quintals per ha. in furrows along with balanced fertilizers is quite effective in realizing higher economic yields.

37. It is estimated that a total of 10.1 m ha are suffering from salinity and alkalinity problems including coastal saline soils. While saline soils have excess of neutral soluble salts, that is, chlorides and sulphates of sodium, calcium and magnesium the alkali soils contain appreciable quantities of salts, such as sodium bicarbonate and/or carbonate and high amount of exchangeable sodium in the clay fraction. The salt-affected soils are of wide spread occurrence in the arid, semi-arid and sub humid (dry) zones of the Indo-Gangetic Plains. Alkali soils dominate in areas having mean annual rainfall of more than 600 mm and saline soils are dominant in the arid, semi-arid and coastal regions.

38. Reclamation and efficient use of wastelands/ degraded lands such as alkaline ravine and areas effected by shifting cultivation, which require high cost of reclamation are being attempted under different schemes of Government of India. However, the treatment of saline soils, acidic soils and waterlogged areas have been neglected**.**

39. According to an estimate, about 3.58 m. ha. suffers from alkalinity in the country. Such soils are largely in 11 States, namely, Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh, as given at **Annexure VI** 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 8.2 and often exceeding 10) and exchangeable sodium percentage (ESP) is greater than 15. The reclamation proramme consists of following main components :

(i) Assured irrigation with good quality water;
(ii) On farm development works including land leveling, bunding, deep ploughing, drainage system.
(iii) Application of soil amendments – Gypsum/Pyrites;
(iv) Organic matter – green manuring, organic manures, etc; and
(v) Land management by salt tolerant varieties and keeping under continuous cropping system

40. The present guidelines of Centrally Sponsored Scheme for Reclamation of Alkali Soils envisage isolated and projectised approaches for reclamation of Alkali Soils. However, during X Plan, it was observed that the State Govts. opted only for isolated approach and not the projectised approach. The programme

was subsumed under the Macro Management of Agriculture in the year 2000 and subsidy on gypsum was reduced from 75% to 25%. Due to reduction of subsidy implementation of the programme by State Govt. in X Plan reduced drastically in all States. There is need to consider enhancing subsidy for gypsum, pyrites and other items of community nature to 50%. Thorough restructuring of the scheme is required and projectised approach of reclamation of alkali soil need to be adopted for reclamation of contiguous large areas affected by alkalinity. The projects in cluster for one district may be prepared and approved based on the location specific requirements. Also, the private and community lands affected by alkalinity should be reclaimed and put to use for the cultivation or under biomass based on its suitability. In case of community lands State Governments should ensure that these lands are allotted or given on lease to the farmers for cultivation so that these reclaimed lands should not revert to alkalinity. Accordingly, the revised cost norms for a combined package of reclamation of Alkali Soils are given at **Annexure -VII.**

41. As large areas of Alkali soil still remains to be reclaimed, it is proposed that an ambitious target should be fixed for XI Plan after making suitable changes in subsidy pattern in the major activities of reclamation as these are the new areas which may be brought under cultivation to enhance the total production.

42. The most recent survey of NRSA in their Waste Land Atlas, 2005 have assessed that 1.876 million ha. land is affected by shifting cultivation. The state wise break up is at **Annexure- IX**. For development of these areas, Watershed Development Project in Shifting Cultivation Areas(WDPSCA) programme was launched in 1994-95 in the 7 North-Eastern States, namely, Assam, Arunachal Pradesh, Manipur, Mizoram, Meghalaya, Nagaland and Tripura and continues to be implemented during the X Plan. The broad objectives of the scheme is to protect and develop the hill slopes of jhum areas through different soil and water conservation measures on watershed basis and to reduce further land degradation process, encourage and assist the jhumia families to develop jhum land for productive use with improved cultivation and suitable package of practices leading to settled cultivation practices, improve the socio-economic status of jhumia families through household land based activities and to mitigate the ill effects of shifting cultivation by introducing appropriate land use and water management as per capability and improved technologies.

42. The unit cost for development of shifting cultivation areas was fixed Rs. 10,000 per ha. in the beginning of X Plan considering the wags and material cost prevailing at that time. As the wages and material cost have increased, the unit cost of shifting development areas for XI Plan is proposed to Rs. 12,000 per ha. Also, it is felt that for settled cultivation of jhumia families, the bench terracing should be allowed so that it could encourage settled cultivation on hill slopes.

43. Saline soils contain excess neutral soluble salts, which affects crop growth adversely. These salts include sodium chloride, sodium sulphate, calcium

chloride, calcium sulphate magnesium sulphate and magnesium chloride. The saline soils may occur in areas, which have high water table. It also tends to occur in areas of low rainfall i.e. less than 550 mm. It is estimated that saline soils occupy about 4.5 mha. of the total salt affected soil in the country. Remedial measures suggested by ICAR for treatment of saline soils are as follows:

- Survey and Categorisation of the problem areas
- Provision of a complete network of drainage system.
- Ensuring leaching availing of natural rainfall or through special efforts.
- Adopting conjunctive use of canal and ground water resources.
- 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.
- 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.
- The farming system and the measures mentioned above should be integrated with the growing of trees in waterlogged areas such as eucalyptus, willows, poplar and fish culture etc.
- Educating and training farmers in regulated irrigation application

44. As per the estimate made by The National Bureau of Soil Survey and Land Use Planning, Nagpur, about 14.3 m ha land is suffering from water logging / flooding. An area is considered to be waterlogged when the water table rises to an extent that soil pores in the root zone of a crop become saturated, resulting in restriction of the normal circulation of the air, decline in the level of carbon dioxide. The depth of water table which is considered harmful would depend upon the type of crop, types of the soil and the quality of water which may vary from 0 m for rice to about 1.5 m for other crops. The remedial and development measures for reclamation of waterlogged areas are:

(i) Provision of a complete network of drainage system.
(ii) Ensuring leaching availing of natural rainfall or through special efforts.
(iii) Taking up aquatic and semi-aquatic crops, fishing ponds or those having high water demand. Green manuring crops should also be taken to help in leaching and removal of the salt.
(iv) Adopting measures to promote better drainage and leaching and to reduce erosion and divert run off that cause surface flooding.
(v) The farming system and the measures mentioned above should be integrated with the growing of trees in waterlogged areas such as eucalyptus, willows, poplar and fish culture etc.
(vi) Educating and training farmers in regulated irrigation application.

45. In India about 3.98 m ha area has been estimated to be affected by ravines which is mainly concentrated in river basins of Yamuna, Chambal and Mahi in the states of Uttar Pradesh, Madhya Pradesh , Rajasthan and Gujarat Ravines are the most advanced stage of severely eroded wastelands. The

concentrated runoff on land surface forms rills. When several rills combine the flow increases and at the points of vertical falls the head cuts occur. These cuts proceed upward and due to combined effect of flow and consequent erosion, rills develop into channels. An extensive network of gullies running more or less parallel to each other and entering into nearby river are called ravine. Development of Ravine lands for productive purpose requires concerted efforts. Development of shallow and marginal ravines is proposed in a project mode for the marginal lands and shallow ravines. Proper protection and treatment of Marginal land would help in enhancement of Agricultural Production and appropriate treatment of shallow ravines would bring additional area under cultivation. A target of 2 lakh ha. is proposed for development during XI Five Year Plan at an estimated cost of Rs. 600 crores for which external aid can be sought for financing of the project.

46. According to the NBSSLUP of ICAR, 16 mha. (160 lakh ha.) of acid soils need amelioration / reclamation. ICAR researches have established that the productivity of these soils after reclamation will improve considerably i.e. more than 1 ton per ha./year Acidic soils with pH 5.5 – 6.5 can be managed by appropriate agronomic measures. However, moderately acidic soils with pH 5.5 – 4.5 and strongly acidic soils with pH less than 4.5 may need amelioration i.e. treatment with lime and application of fertilizer and suitable cropping system. Liming should be practiced only to neutralize the low magnitude active acidity due to hydrogen and aluminum ions in the soil solution and part of exchange acidity. It is proposed that a new programme may be launched in XI Five Year Plan with an ambitious target of 20 lakh ha at an estimated cost of Rs. 1600 crore (Central share Rs. 400 crore). The core reclamation agent for the acid soil is lime and basic slags, a bi-product from fertilizer / paper mills. Similar to Alkali Reclamation programme 50% subsidy is proposed on the main reclamation agent and on the community nature of activities. The average cost of reclamation of acid soils is estimated to Rs.8,000/- per ha. as details given at **Annexure-X.**

47. Large extent of various categories of degraded / waste lands are available in the country which can be economically brought under productive use through various proven scientific / technical interventions. The following targets are proposed for development of degraded lands during the XI Plan period.

Sl. No	Scheme / Programme	Target lakh ha.	Outlay (Rs. in crores)	GOI Share (Rs. in Crores)
A. On-Going Programmes				
1.	Reclamation of Alkali Soil	5	1455	550
2.	Watershed Development Project in Shifting Cultivation Areas)	2	240	240
B. New Proposed Programmes for XI Plan				
3.	Reclamation of Saline Soils and development of waterlogged areas	2	350	350

4.	Development of Gullied & Ravine Lands	2	600	600
5.	Amelioration & Management of Acid Soils	20	1600	400
	Total	**31**	**4245**	**2140**

48. Efforts may be made not to allow diversion of productive agricultural land for industrialization or urbanization. In case of extreme national need, it may be made mandatory that Industries who are provided with agricultural or other lands for development projects should compensate for treatment and full development of equivalent degraded / waste lands else where. Such a practice is prevalent in the Forestry sector where a provision exists under Forest (Conservation) Act, 1980 for compensatory afforestation by the user agencies in lieu of forest lands diverted for development projects. Similar practice may be adopted in case of diversion of agricultural land for urbanization, industrialization, or other developmental activities. A state level Agricultural Land Development Fund may be created to accumulate such compensatory funds. State Land Use Boards should be strengthened to monitor this process. This fund can be used for subsequent development of degraded land for productive purposes.

49. Looking into the energy crisis in a global scenario, there is expectations that huge global financing will be flowing in the energy sector in the near future. Development of Bio-fuel yielding species be encouraged in dryland farming and in waste / degraded lands through revenue models. Similar importance needs also be given to herbal / medicinal / aromatic plantations in these areas which have a great economic potential.

50. While planning treatment of a specific category of degraded land / waste land, it is necessary that all available site specific technological options are exhausted. The implementation mechanism should involve latest technologies developed. Further the community involvement from planning stages is necessary for easy adoption of technology.

Watershed Plus Activities

51. It is observed that a comparatively less emphasis is being accorded in watershed projects for development of allied sectors of rural economy. As watershed approach is expected to achieve overall holistic and integrated development of the watershed community, activities which are deemed equally important for complete & overall development of the watershed community, often referred as 'Watershed Plus' activities, need to be suitably incorporated and converged in the watershed projects.

52. Livestock is a key component of the household economy in rural India. It is a source of additional income to farming households. About 70 million households in India keep and own livestock. Small and marginal farmers and land less labourers constitute almost two-thirds of these livestock keeping

households. Women provide nearly 90% of all labour for livestock management. Water Harvesting structures like percolation tanks, farm ponds may be encouraged which could be used for multipurpose viz. protective irrigation through micro irrigation**,** fish culture. Therefore, a special emphasis should be given for livestock development & fisheries.

53. There should be specific pattern for undertaking cropping & animal husbandry activities depending upon rain fed conditions, for instance, where rainfall is below 500 mm small ruminants should be encouraged, if rainfall varies between 500 to 750 mm a mix of crops & small ruminates and in areas where rainfall varies between 750 to 1250 mm more crops and cattle need to be promoted. If the annual rainfall is more than 1250 mm a combination of crops, cattle and fisheries is expected to yield better returns. These aspects need to be suitably incorporated in the watershed plans so as to address the watershed plus component in an integrated manner.

54. The following Watershed Plus Strategy may be effective for integrated and holistic development of rainfed areas / degraded lands / wastelands.

- *Development of agriculture*
- Establishment of seed bank with federation of SHGs for production and marketing of improved varieties and hybrids (evolved under public sector)
- Focus on organic farming (on a limited scale)
- Control of pest through IPM/ non-pesticidal methods (on a large scale)

- *Development of horticulture*
- Plantation of orchard crops in new areas for improving water use efficiency
- Adoption of organic farming practices (on a large scale)
- Enhancing the area under vegetable crops (for improving water use efficiency as well as creating employment opportunity for women members)

- *Development of livestock*
- Upgrading the breed of large ruminants through community managed artificial insemination as well as natural insemination units.
- Upgrading the breed of small ruminants through community managed natural insemination unit.
- Management of diseases of livestock through community managed livestock para-workers
- Improving the fodder base through cultivation of improved varieties of non-leguminous and leguminous fodder crops under irrigated condition
- Processing and collective marketing of produce

- *Development of fisheries*

· Improving the sustainability of fishery cooperatives by organizing general body members into a number of small size SHGs and reconstituting the office bearers of executive committees by bringing representatives from mature SHGs
· Introducing composite fish-cum-prawn culture with different varieties of fish (suitable for different depths of pond water)
· Improving other technological inputs (through release of juveniles / fingerlings in situations where filling of water in pond is delayed; enhancement of standing water in the tank by desilting the bed area; local production of fingerlings in smaller ponds supported by borewell irrigation; management of disease and predators through appropriate practices before filling of water in tank as well as during rainy season, etc.
· Collective marketing of fish to distant places by executive committee of the cooperative society; and also self-marketing of fish in local markets by women members of the cooperative society
· Development of mutual trust between executive committee and general body members through adoption of transparent systems in financial transactions
· Learning initial financial management system through adoption of SHG concept
· Learning improved financial management system through partnership with experienced lending organization .

55. The development of watersheds will create scope for a number of economic activities leading to a increase in credit absorption capacity of the watershed villages. The involvement of the banking system should be from inception & there should be a separate credit plan for watershed villages. Watershed projects will improve the credit absorption capacity. Consequently, the credit requirement of these farmers may be separately assessed and credit cards issued based on the credit requirement consistent with cash inflows/out flows.

56. Watershed plus phase needs to be recognized as a third phase in watershed project planning and implementation in all the schemes. Components for watershed plus activities may be identified by the implementing agencies in association with the village community and the resources there for may be mobilized. Special emphasis may given for livestock development & fisheries in watershed plus activities. Monitoring and evaluation arrangements may be inbuilt in watershed project planning stage itself for watershed plus phase also.

57. Credit institutions may be involved in watershed activities right from the initial phase. Separate credit plans may be prepared for watershed plus activities by bankers & watershed committees. CBOs like SHGs, VWCs may be leveraged for credit disbursement and monitoring. A comprehensive insurance cover for

crop/livestock/assets created as risk mitigation measure to reap full benefits of watershed practices is needed.

58. A separate corpus may be created for lending to farmers in the watershed at concessional rate of interest. Maintenance Fund may also be created out of the voluntary contributions and the same may be credit linked for financing income generating & production oriented activities.

59. Special emphasis may be given for land less, women, and other weaker sections in case of watershed plus & income generating activities. Usufruct rights for common, revenue and forest land within the watershed area may be given to landless, women groups and weaker sections. All other development programmes may be converged with watershed projects for holistic development of watersheds.

60. The village level watershed committees be clustered to form associations / federations / farmers' cooperatives. This will facilitate easy access of credit from financial institutions, inputs, value addition/processing & marketing etc.

Public-Private Partnership (PPP)

61. Public-Private Partnership (PPP) is a mode of implementing Government programmes / schemes in partnership with the private sector. The PPP addresses following critical aspects

- Responsibility: PPP involves full retention of responsibility by the government for providing the service.
- Ownership: PPP may continue to retain the legal ownership of assets by the government (public) sector.
- Nature of Service: Under PPP the nature and scope of service is contractually determined between the two parties.
- Risk & Reward: Under PPP, *risk and rewards are* shared between the government (public) and the private sector.

62. Potential benefits expected from PPP are summarized below;

- Cost effectiveness - since selection of the developer / service provider depends on competition or some bench marking, the project is generally more cost effective than before.
- Higher Productivity - by linking payments to performance, productivity gains may be expected within the programme / project.
- Accelerated Delivery - since the contracts generally have incentive and penalty clauses vis-à-vis implementation of capital projects / programmes *this leads to accelerated delivery of projects*
- Clear Customer Focus – the shift in focus from service inputs to outputs create the scope for innovation in service delivery and enhances customer satisfaction.

- Enhanced Social Service- social services to the mentally ill, disabled children and delinquents etc. require a great deal of commitment than sheer professionalism. In such cases it is Community Voluntary Organization (VOs) with dedicated volunteers who alone can provide the requisite relief.
- Recovery of User Charges – innovative decisions can be taken with greater flexibility on account of decentralization. Wherever possibilities of recovering user charges exist, these can be imposed in harmony with local conditions.

63. A review of the ongoing watershed development programmes reveal that at present, watershed development programmes in India aims at physical development as well as to improve the production and productivity of rainfed areas and wastelands. With the present pace of development of these areas, it may take another 20-30 years for treatment of balance dryland / rainfed / degraded lands in the country since the investments are being made mainly by the Government sector and the same are not sufficient. Therefore a new approach focusing on PPP is urgently required to augment resource flows into these areas and also improve the efficiency of implementation. However, to attract the Private sector investments, the Government must ensure a favourable atmosphere for creating infrastructures like road, electricity etc.

64. Unfortunately, there is low public and private investment in the rainfed regions, owing to the sub-optimal returns. The credit institutions such as Banks, cooperatives etc. have, so far, shown little response for development of rainfed regions. Involvement of private sector (Corporate) in watershed development programmes may therefore give impetus to credit institutions to participate in watershed programmes.

65. In the present scenario the Public Private Partnership in watershed development programmes is not only indispensable but also the need of the hour. The Government should create an enabling frame work for involvement of Private Sector in watershed development programmes. With more inputs and active coordination between corporate, NGOs and the government sector, infrastructural gaps can be minimized.

66. Private Sector involvement in watershed development programmes may be incorporated in following areas;

- In consolidation of fragmented supplies in watershed areas
- In introducing best practices for production, processing and marketing.
- Investments in processing sector particularly in production centers
- By establishing market access and linkages
- By investing in information & communication technologies for effective monitoring and evaluation of programmes as well as for extension services.

- By strengthening rural insurance for assets created under watershed development programmes
- For making farmer as an integral part of the supply chain
- Focus on areas where the Government capacity to implement is weak and proactive involvement of Corporate in those areas
- Research & Development & Extension support (Technical back-stopping) with the help of Corporates, NGOs etc.
- Creation of a Consortium of all stakeholders including corporates

67. In semi-arid regions, the following tax incentive should be considered inviting Corporates participation involved in watershed development programmes:

- Weighted deduction at the rate of 150 % of the investment of private sector for Watershed Development Programmes should be treated as deduction of expenditure as in case of R&D
- Grant five year corporate tax holiday
- Bank lending under the priority sector targets

68. In the arid regions In India, the following tax incentive should be allowed for Corporates involved in watershed development programmes:

- Weighted deduction at the rate of 200 % of the investment of private sector for Watershed Development Programmes should be treated as deduction of expenditure as in case of R&D
- Grant ten year corporate tax holiday
- Bank lending under the priority sector targets

69. The government may collaborate with the private developer / service provider in any of the following ways:

- *as a funding agency*: providing grant / capital / asset support to the private sector engaged in provision of public service, on a contractual / non-contractual basis
- *as a buyer*: buying services on a long term basis
- *as a coordinator*: specifying various sectors / forums in which participation by the private sector would be welcome.

70. The funding pattern and collaboration between the public sector and the private sector could take any one of the following forms:

- Public funding with private service delivery and private management
- Public as well as private funding with private service delivery and private management

- Public as well as private funding with public / private service delivery and public / private / joint management
- Private funding with private service delivery and private management

71. The transparency in selection is an essential feature for PPP. The selection of the Developer or service Provider may be done in any of the following three ways viz., Competitive Bidding, Swiss Challenge Approach and Competitive Negotiation.

72. For exploring effective mechanism for PPP, adequate infrastructure like roads, electricity and other means of communication need be provided through Government schemes / programmes to attract private investment in watershed programmes and also to create proper linkages and an access to the market for better returns to the watershed community. Higher public investment through other government schemes aimed at creating adequate infrastructural linkages would be critical to invite the flow of private investment. This will require better coordination of all watershed development schemes at national / state / district level to ensure synergy among the programmes.

73. There is a need for delivery of skill development in Watershed Development as a part of the policy frame work, it was also considered that assistance from corporate / NGO sector in this regard may be obtained.

74. For involving Private / Corporate / NGOs in watershed development programmes, appropriate policy reforms will be required urgently. Such reforms must ensure the accountability of both the Government and the private partners in watershed development programme. The procedure followed in the Watershed Development Fund (WDF) scheme implemented by NABARD and Ministry of Agriculture prescribes signing of a Memorandum of Understanding (MoU), which is working effectively. A similar procedure can be adopted in respect of other watershed programmes intended to be covered under PPP mode.

75. Government should provide benefit of other schemes in watershed area to the private sector. In particular benefits of schemes like seed processing plants, dal-mills, food processing units, packing units, storage units and other agriculture related industries may be given to those private entrepreneurs who are willing to proactively associate in natural resource management activities. If involvement of private sector is taken up, a decentralized model facilitating value addition at farmers level and further processing at industrial level will be more useful. Public-Private Partnership should be farmer centric. It should be ensured that at in circumstances farmers should loose.

76. Under the watershed development projects a lot of common property resources are developed. After the project is over maintenance of these assets is neglected due to want of appropriate mechanism and financial support.

Development of a revenue model involving the watershed community and the private sector may ensure sustenance of these assets.

77. In the XI Five Year Plan, the PPP may be initiated. For this a target of 2 million hectare is suggested. However, before preparing and implementing the schemes involving PPP, it will be appropriate to take into account the site and sector specific considerations and different alternatives should be explored.

Institutional Arrangements

78. Following constraints have been experienced in implementation of programmes of Ministry of Agriculture.

- At the State and the District levels, periodic review of the programmes is not taken up timely. As a result, corrective actions, if any, are not attended promptly.
- In the existing institutional mechanism, the members of State Level Committee / District Level Committee are entrusted with lot of other responsibilities which prohibits them attending the business of Watershed related programmes and putting concerted efforts to these programmes.
- The procedure of fund flow is very cumbersome and it takes considerable time to reach the funds to the field level after its release by the GOI. Such a procedure has been followed because under the Macro Management Mode Scheme, the Centre and State Governments are jointly collaborating in funding and also the central share is both in terms of grant and the loan.
- Since most of the watershed related activities are season bound, such delays hamper timely execution of works.

79. Following constraints have been experienced in implementation of programmes of Ministry of Rural Development.

- The DRDA is entrusted with a host of rural development programmes, it is experienced that due attention is not being paid to the watershed / wasteland development programmes.
- The performance reporting mechanism for the existing programmes is rather slow, which prohibits timely corrective measures, whenever necessary.
- Since large number of projects are required to be approved and sanctioned at the level of GOI, considerable time is lost in accord of approval and sanctions. This also causes some delay in release of funds.

80. Although, our villages occupy the central stage as per the watershed approach, but in practice, the villages are not being considered as the planning unit for various programmes. The conventional concept of geo-hydrological boundaries is being followed in watershed planning. Moreover, the concept of

developing a fixed area of 500 Ha under a specific project leaves many important areas within the watershed from treatment. Particularly, the areas situated at the higher reaches and forest lands are ignored while prioritizing the treatment plan through participatory rural appraisal techniques. As a result the task of full treatment of the watershed remains unaccomplished and whatever treatments are taken up their sustainability remains threatened. In order to maximize benefits of treatment from watersheds a change in approach, i.e., by adopting villages as planning units for watershed development programmes may be considered in the XI Plan by all Central Ministries/Departments.

81. Participatory Rural Appraisal is the key for assessing the requirements of a village and the priority matrix ranking should be the tool for design of activities. Separate Village Development Committee(VDC) for each village of the watershed may be formed and the Secretary of each VDC should be the member of Watershed Committee.

82. Recently the Government of India has constituted an expert body to provide the much-needed knowledge inputs regarding systematic up-gradation and management of country's dryland and rainfed agriculture. The Authority will serve as a Policy making and monitoring body charged with the role of examining guidelines in various existing schemes and in the formulation of new schemes including all externally aided projects in this area. The NRAA although not required to be an implementing or fund disbursing agency is expected to effectively converge the various schemes in different Ministries relating to watershed development and other aspects of land use and productivity. The NRAA have a two-tier structure. The first tier is a Governing Board that will provide necessary leadership and appropriate coordination in implementation of programmes. The second tier is the Executive Committee consisting of technical experts and representatives from stake holder Ministries.

83. Though at the National Level it has been decided to establish NRAA, it is necessary to have appropriate vertical linkages of this apex body with the state, district and watershed levels for proper execution of policies and programmes.

84. At the state level there shall be one single nodal agency accountable for implementation of watershed policies and programmes. Such agency shall receive instructions and guidance from the NRAA. It is necessary that the existing State Level Steering Committees of different programmes / schemes of Government of India, should be amalgamated to make them more focused, accountable and cohesive taking into account all Watershed Development Programmes. In some states watershed programmes are being implemented in a mission mode through a dedicated department / directorate. This model may be replicated else where.

85. At the District level too, a District Watershed Committee should approve and oversee all watershed programmes of different Ministries/ Departments.

This will require amalgamation of existing District level watershed committees constituted for different schemes of Government of India. Such a Committee may be constituted under the Chairmanship of the Head of Zila Panchayat / Parishad with representatives of concerned line departments, representatives from local agricultural research institutions, at least two local NGOs working in the field of watershed development and two gram panchayat representatives, nominated by the District Collector as members.

86. The District Committee may formulate the overall and annual watershed development plan of the district and submit to the State Level Committee. However, the individual projects under the identified programmes / schemes are to be decided by the district committee. This Committee will also be responsible for monitoring of schemes from time to time and submit its reports along with suggestions and recommendations to the State Committee and to Government of India.

87. At the watershed level, a Watershed committee headed by a Chairman to be elected by the Gram Sabha with members from implementing agency, Watershed Development Team, representatives from User Groups and Self Help Groups may be constituted to execute the programmes. At this level adequate representation to SC, ST landless laborers and women may be ensured. For better monitoring and transparency, the progress of watershed works along with expenditure details should be reported and discussed in the Gram Sabha at least twice in a year. Such an arrangement may fulfill the constitutional obligation of entrusting development of watersheds to the Panchayats.

88. An important element of long term sustainability is to forge linkages of watershed institutions with permanent institutions in the area, particularly the Panchayat Raj Institutions (PRI). Since PRIs are in varying degrees of administrative effectiveness in the States, the latter are likely to follow different mechanisms for linkages between the watershed institutions and the PRIs. Wherever possible Panchayats should be encouraged to become Project Implementation Agencies. Elsewhere linkages should be forged between the Panchayats and the watershed committee by nominating one member of the village Panchayat as member of the WC, or declaring Watershed Committee as a sub-committee of the Land Management Committee under the Panchayat Raj Act.

89. The modalities for smooth flow of funds at the watershed level may be revisited by respective Central Government Ministries/Departments to ensure a quick and timely flow of funds up to the field level so as to ensure completion of all activities envisaged in the work plan in a time bound manner. Details of suggestions have been given in para 23 of this chapter.

90. The current level of R & D Support available under different schemes is not adequate to meet the location specific requirements of the watershed

programmes. Identification of Specific Research Organization / Institution to cater the needs of different Agro Ecological Zones has been attempted but a more intense approach addressing the need of individual watershed is yet to be streamlined. Each watershed in which an ongoing Programme is under implementation should be provided with necessary support by an identified institution such as, KVK, SAU, ICAR Centre, Agriculture College, ICRISAT etc for effective technical back stopping.

91. The sustainability of the treatments in most of the watershed programmes remains a matter of concern in the absence of an appropriate with-drawl strategy. This aspect needs to be elaborated in the guidelines of each of the scheme as watershed plus component. The withdrawl strategy should specify the procedure for maintenance of assets created under watershed schemes. On termination of the project these assets should be handed over to the concerned line departments and/or the local Panchayati Raj Institutions. The withdrawal strategy should also address the procedure for utilization of corpus funds / watershed development funds/ revolving funds created during the project phase, for the post project maintenance of structures, and resources developed under the project and their sustainable utilization by the watershed community. Utilization of fund for further development of watershed areas may be taken up by the Watershed Committee with the consent of Gram Sabha. Scope may be provided to enrich this fund by generating additional incomes on a regular basis, exploring incomes through created productivity in common property resources. The resources developed may be entrusted for maintenance to the established institutions / organizations in the watershed area. The capacity of the village level institutions should be developed to take care of the maintenance aspects as well as to achieve the economic benefits in a sustained manner. The line departments should continue providing technical support and supervision even after completion of project.

92. New technologies of remote sensing, information technology are required to be promoted along with computerization of land records. Application of Remote Sensing and GIS need to be strengthened to bring periodic land use and degraded land status to guide the watershed planning and development process in the watershed villages.

New Initiatives and General Recommendations:

93. Reasons for non achievement of productivity to the desired extent from the rainfed areas are mainly loss of soil nutrient and poor response of agriculture on fertilizers. Application of soil nutrients and application of fertilizers based on soil analysis may help in increasing the agriculture production in dryland areas. The farmers must know the fertility status of his land to adopt appropriate cropping practices along with required dose of fertilizers and micro-nutrients suitable for his land to ensure better productivity. Soil health card has proved a great success in the State of Gujarat and this practice can be extended to other

parts of the country. For this, Soil Health Cards for all individual farm lands need to be prepared. To achieve this huge target, science schools/colleges, agriculture colleges, APMC centers, KVKs, NGOs, private sectors etc. existing in the blocks / villages having laboratory facilities may be associated for soil analysis works and for issuance of these cards at local level. Such a measure will require provision of infrastructural and training support through a commercial model of self sustaining nature. Periodic assessment and advices may also be provided to the farmers by such laboratories on a regular basis. Testing of soils must include micro nutrient analysis.

94. Improvement of the fertility of degraded lands to ensure higher agricultural productivity needs to be emphasized as the agricultural growth in the country can now be achieved through development of dryland agriculture. It is thus necessary to initiate awareness in the rural children right from the primary stage. For educating and bringing awareness at school level “dryland agriculture” be included in the school / college syllabus. There is need for involvement of media, TV, mass campaigning, mobile exhibition etc. for bringing awareness and educating people on the success stories of dryland agriculture on a large scale. Special sponsored programmes may be taken up by Mass media (Doordarshan, All India Radio etc.) for dryland agriculture for the benefit of farmers.

95. Watershed development programmes are mainly aimed at natural resource development with the objective to increase the agriculture productivity and improve rural economy. In the watershed programmes of Ministry of Rural Development, integration of agriculture, horticulture, livestock sector activities is quite often not appropriately made. Similarly the programmes of Ministry of Agriculture are deficient in livelihood and wasteland treatment. As the area of operation for watershed development programmes of Ministry of Agriculture and Ministry of Rural Development differ, these programmes are deprived of integrated holistic development approach. Appropriate convergence of allied activities need to be ensured to avoid such deficiencies in both cases.

96. There is need for involvement of unemployed educated youth in the process of development of wastelands and degraded lands. This will help them in achieving the means of livelihood as well as in ensuring their involvement in the mainstream development of the country. A special development model may be designed for the border / coastal districts linked with national security to address both development and security aspects jointly. Such a task of development of the wasteland / degraded land / common property resources, particularly in the border / coastal districts may be assigned to the retired defence/ para-military personnel. This will not only enable development of these lands but also provide vigilance to the border through such special incentive.

97. Specific projects / packages may be designed for development of grass lands and fodder banks to take care of the livestock feed in States which are affected by frequent drought and consequent calamities. There is need for

specific strategy and revenue models may be thought of for this purpose for different climatic regions.

98. There is need for social audit for all the expenditure incurred in watershed development programmes in the last ten years. For better monitoring and transparency, the progress of watershed works along with expenditure details should be reported and discussed in the Gram Sabha at least twice in a year. This should be made compulsory for all programmes.

99. Apart from Watershed Development Programmes, a host of other development Schemes of Central and State Governments operate in many watersheds. But, convergence of these schemes is absolutely missing; as a result, the benefits cannot be maximized. The watershed development approach aims at integrated development, particularly with regard to the natural resource management aspects as well as community development. The watershed development activity may therefore, be considered as the entry point to all other allied developmental schemes. Since a perfect integrated holistic development of the region requires a large chunk of resources and it is difficult to achieve all the requirements of the area from the watershed based schemes alone, convergence of other schemes may contribute significantly in the overall development as well as in pooling the resources. Therefore, all allied sector programmes like NREG, Horticulture Mission; Bamboo Mission etc need to be pooled at the district level to generate substantial resources to make the watershed programmes more impact oriented.

100. Capacity building and training, are not being given desired importance during implementation of watershed programmes. This should be well designed at the planning phase and imparted before execution of watershed related activities. The training module should also include post project maintenance aspects to address the sustainability aspect. At the National, State and District level suitable training institutions, resource centers and experts should be identified and engaged for imparting trainings. Detailed training calendars, training manuals on various aspects of watershed development need to be prepared keeping into consideration site specific and scheme specific requirements. It is necessary that the capacity building should commence from the planning phase itself and should continue even in the post project phase.

101. In most of the watershed programmes of the Ministry of Agriculture and Rural Development the size of micro watersheds adopted for treatment has been fixed at 500 Ha. But, in practice, the actual size of many watersheds is much more than 500 Ha. Therefore, the treatment of entire watershed remains unattended and some vulnerable sections of watershed remain uncovered under a scheme. Further, many watershed cover more than one revenue villages and due to fixed size of treatable area, the benefit remains confined to the influential village only. It is necessary to treat the entire watershed as per scientific definition under a scheme. Therefore, the planning and design of the watershed

should be taken on catchment / sub-catchment basis and treatment may be prioritized in cluster at micro-watersheds taking ridge to valley approach in a phased manner and in consideration of the revenue boundaries of villages. This has also been suggested in the Meta Analysis Report of ICRISAT.

102. There exists a provision of cost sharing by the beneficiaries in some of the activities. of watershed programmes. The objective of keeping such provision is to have a sense of belongingness, accountability and responsible partnership of the beneficiary in the programme. There is need to incorporate more such components for further encouraging such sharing for success and sustainability of the programmes.

103. Evaluation studies of WSD programmes by different agencies have indicated that in most cases the big farmers derive direct benefits from the interventions through execution of activities in their own holdings. The small & marginal farmers and land less labourers who constitute the bulk of the watershed community, are generally the passive recipients in terms of employment during execution period. More thrust to livelihood support activities with focus to address the requirements of small farmers, land less labourers and women is required to be incorporated in the guidelines of different programmes. Specific targeted activities for additional income generation or drudgery reduction for landless and women need to be addressed with specific financial provision during the preparation of the watershed plan.

104. For developing a competitive and effective system for watershed based land development, a revenue model based on incentive approach may be initiated. 20 % of the allocation may be kept apart for incentives to be given to States which have done excellent work in development of dry land agriculture / watershed development.

105. More than 50% of the industrial wood is being produced by the farmers and private organizations. All restrictions, permits or licenses may be dispensed with for felling, transporting and marketing of forest produce which is essential for promoting agro-forestry in wasteland development.

106. To encourage plantation it may be made mandatory that for access to the road construction fund of Government, the villagers be encouraged to take up the road side plantation by themselves. Even the contractors / organizations taking up the road construction works may be asked to take up the plantation first if the work is awarded to them. In the urban areas too, the green coverage may be linked to f.s.i (floor space index). There is need for some special incentives for greenery development even in the individual household to encourage plantation by the farmers.

107. Rainwater harvesting may be made mandatory in all private and Government buildings within a specific time frame by amending the building bye-

laws. Such rainwater harvesting was conventionally practiced in Gujarat and it is best demonstrated in the ancestral house of Mahatma Gandhi at Porbandar.

108. Although the country's rainfall, is not evenly distributed, yet, in total it is adequate to meet the water requirement. There are water surplus areas like eastern and southern India and water deficient areas like north-western India. Therefore, river grid development is vital to rationalize the availability of water in the river systems of the country which may help in increasing the agricultural productivity in dryland areas.

Programmes for XI Plan

109. In consideration of proposed increase in the cost norm for treatment and development of specific problem areas, it has been estimated that an amount of Rs. 30595 Crores will be required for development of 36 million ha. Similarly, for development of 2 M Ha land under Public Private Partnership, involvement of Rs. 1500 Crores has been estimated. Various Central Ministries / Departments will be required to finalize their strategy for the XI Plan and prepare their watershed programmes in accordance. The projected treatment / reclamation of land under watershed / degraded land / waste land development programmes and funds requirement for the XI Plan for different schemes are indicated in the following statement.

Sl.	Implementing Department / Ministry	Name of Scheme / Programme	Physical Target (Million Ha)	Financial Requirement (Rs. in Crores)
1	Department of Agriculture & Cooperation, MoA	NWDPRA	4.00	4000
2		RVP & FPR	2.00	2400
3		WDPSCA	0.20	240
4		RAS	0.50	1455
5		WDF	0.40	300
6		EAPs	0.50	750
7		New Schemes i. Reclamation of saline soils and waterlogged areas ii. Development of gullied & ravine lands iii. Amelioration and management of acid soils	 0.20 0.20 2.00	 300 600 1600
		Sub-Total	***10.00***	***11645***
8	Department of Land Resources, MoRD	IWDP	10.0	5200
9		DPAP	10.0	5200
10		DDP	5.0	2600
		Total for XI Plan*		13000
		Committed liabilities of X Plan	-	5200

		Sub- Total	***25.00***	***18200***
11	Planning Commission	HADP & WGDP	***1.00***	***750***
12	PPP		***2.00***	***1500***
Total			***38.00***	***32095***

** 50% fund i.e. Rs. 6500 crores will be mobilized from NREG.*

Appendix-I

No. Q-11050/19/2005-Agri.
Planning Commission
Yojana Bhavan, Sansad Marg

****

New Delhi, dated 9th December, 2005

ORDER

Sub: Constitution of Working Group of the Sub-Committee of the National Development Council (NDC) on Agriculture and Related Issues on Dryland / Rainfed Farming System including Regeneration of Degraded / Waste Land, Watershed Development Programme

In pursuance of the decisions taken in the 1st Meeting of the Sub-Committee of the National Development Council (NDC) on Agriculture and Related Issues held on 04-10-2005, it has been decided with the approval of the Chairman of the Sub-Committee to constitute a **Working Group on Dryland / Rainfed Farming System including Regeneration of Degraded / Waste land, Watershed Development Programme.**

2. The composition of the Working Group is as under :

(i) Chief Minister, Gujarat	- Chairman
(ii) Managing Director, National Dairy Development Board, Anand	- Member
(iii) Vice-Chancellor, Gujarat Agricultural University	– Member
(iv) Sharmishthaben, Jagavat Sadguru Foundation, Dahod	- Member
(v) Dr. K.N. Shelat, Principal Secretary (Agriculture), Government of Gujarat, Gandhinagar	- Member
(vi) Joint Secretary, Department of Land Resources, Ministry of Rural Development, Government of India, New Delhi	- Member
(vii) Managing Director, NABARD, Mumbai	- Member
(i) Director General of Forests, Ministry of Forests and Environment, Government of India	- Member
(ii) Shri Babubhai Narmawala, New Delhi	- Member
(iii)Shri Anil Shah, Chairman, Development Support Centre, Ahmedabad	- Member
(iv) Prof. R.S. Deshpande, Head, ADRT Unit, Institute for Social and Economic Change, Bangalore.	– Member
(v) Dr. S.P. Wani, Principal Scientist, ICRISAT, Hyderabad.	– Member
(vi) Dr. J.S. Samra, DDG, ICAR, Pusa, New Delhi.	- Member
(vii) Dr. R. Nawal Gonde, Director, National Remote Sensing Agency, Hyderabad	– Member

(viii) Dr. K.S. Gajbhiye, Director, national Bureau of Soils Survey and Land Use Planning, Nagpur. – Member
(ix) Dr. Y.S. Ramakrishna, Director, Central Research Institute for Dryland Areas, Hyderabad. – Member
(x) Shri Deep Joshi, Executive Director, Pradhan, New Delhi.
(xi) Shri Mihir Shah, Secretary, Samaj Pragati Sahyog, Bagli, District Dewas.
(xii) Joint Secretary (RFS), Department of Agriculture & Cooperation, Krishi Bhavan, New Delhi.- Member Convener

3. The **Terms of Reference (ToR)** of the Working Group will be as follows :-

(i) Review the on-going Dryland / Rainfed Farming and Wasteland Development Programmes, based on watershed approach, executed by the Central Ministries / Departments. The review may include critical analysis of the programmes and identification of gaps.
(ii) Review the performance and impact of various watershed development programmes in the country including regeneration of degraded / waste land.
(iii) Outline the contours of a "Watershed Plus" strategy that would build on natural resource potential of rainfed / dry farming areas to foster sustainable livelihoods and to integrate livestock husbandry and inland fisheries into this strategy.
(iv) Suggest measures for reclamation and efficient use of waste land such as alkaline lands, ravine lands and seriously degraded lands, which require high cost for their reclamation and identify the role of PRI's and public-private-partnership in securing this objective.
(v) Study the feasibility of public-private-partnership and scope for the investment by private sector in Watershed Development Programmes.
(vi) Delineate the outlines of an institutional mechanism (at all levels) to ensure high quality implementation of Watershed Programmes.
(vii) Suggest measures for enrichment and improvement in the watershed programmes and for ensuring convergence of other development t programmes in rainfed areas where watershed programmes are undertaken.
(viii) Suggest measures / programmes for land resources development in the XI Five Year Plan and requirement of funds and also the area to be covered under the programmes of various Ministries / Departments as well as the State Governments.

4. The Working Group may co-opt any other official / non-official expert / representative of any organization as member (s), if required.

5. The Working Group may examine and address issues which are important but are not specifically spelt out in the ToR. The Working Group may devise its own procedures for conducting its business including meetings.

6. The expenditure of the members on TA / DA in connection with the meetings of the Working Group will be borne by the Ministry / Department / State Government to which they belong. In the case of non-officials, the TA / DA will be borne by the Planning Commission as admissible to the Class-I Officers of the Government of India.

7. The Working Group will submit its Interim Report to the Chairman of the Sub-Committee of the NDC on Agriculture and Related Issues by March, 2006 and Final Report by September, 2006.

Sd/-
(R. Sridharan)
Joint Secretary

To,

1. The Chairman and all the Members of Working Group on Dryland / Raoinfed Farming System including Regeneration of Degraded / Waste Land, Watershed Development Programme (Standard Distribution).
2. The Chairman and all the Members of Sub-Committee of National Development Council on Agriculture & Related Issues (Standard Distribution).

Copy to :

1. Deputy Chairman, Planning Commission.
2. Minister of State (Planning).
3. Members / Member- Secy., Plg.Commission
4. Cabinet Secretary.
5. Secretary to the President of India.
6. Pr.Secretary to the Prime Minister
7. Secretary, D/o Animal Husbandry, Dairying & Fisheries
8. Secretary, D/o Agriculture & Cooperation
9. Secretary, D/o Agriculture Research & Education
10. Secretary, M/o Food Processing Industries.
11. Secretary, D/o Rural Development
12. Secretary, D/o Commerce
13. Secretary, M/o Water Resources.
14. Secretary, D/o Land Resources
15. All Pr. Advisers/Advisers, Plg. Commission.

sd/-
(R. Sridharan)
Joint Secretary

Appendix II

SUMMARY RECORD OF THE FIRST MEETING OF THE WORKING GROUP OF THE SUB-COMMITTEE OF NATIONAL DEVELOPMENT COUNCIL (NDC) ON AGRICULTURE AND RELATED ISSUES ON DRYLAND / RAINFED FARMING SYSTEMS INCLUDING REGENERATION OF DEGRADED / WASTELAND, WATERSHED DEVELOPMENT PROGRAMME

The First Meeting of the Working Group of the Sub-Committee of National Development Council (NDC) on Agriculture and Related Issues on Dryland / Rainfed Farming Systems including Regeneration of Degraded / Wasteland Watershed Development Programme, constituted by the Planning Commission of India, in their Order No.Q-11050 / 19 / 2005 – Agri. Dated 9th January, 2006, was held under the Chairmanship of Shri Narendra Modi, Chief Minister, Gujarat at 1500 Hrs on February 20, 2006 at the Committee Room – One, Block No.1, 4th Floor, New Sachivalaya Complex, Gandhi Nagar,.

2. The list of the participants is appended as *Annexure-I*.

3. Shri Prem Narain, Joint Secretary (RFS), Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India and Member Convener of the Working Group, welcomed the Chairman and all the Members of the Working Group present as well as other participants. It was also informed by him that with the permission of the Chairman of the Working Group Secretary, Agriculture, Govt. of Rajsthan, Secretary, Agriculture, Govt. of Karnataka and Secretary, Rural Development and Water Conservation, Govt. of Maharastra have been co-opted as the Members of the Working Group and accordingly they have been invited to participate in this meeting.

4. A detailed Power Point Presentation highlighting the Terms of Reference of the Working Group, Agricultural Scenario of India, Status of Degraded Lands and Rainfed Farming, Ongoing Watershed Programme of various Central Ministries / Departments of Government of India, Mid-Term Appraisal observations of the Planning Commission on X Plan Watershed Programmes and observations of National Commission of Farmer's Report, was made by Shri Prem Narain, Member Convener.

5. In his opening remarks, the Hon'ble Chief Minister of Gujarat and Chairman of the Working Group stated that for the management of natural resources including degraded lands, drylands and rainfed areas the management of '**Jameen, Jal, Jan aur Jeen**' (i.e., the land, the water, the human resource and the genetic resource) are of crucial importance. The water is capable of changing the scenario in any situation and therefore, its conservation and management should be a people's programme. This has been proved in Gujarat where effective water harvesting, water management and irrigation have yielded promising results in the recent years. There is a need to adopt a scientific approach towards water conservation, water harvesting and its management since the water resource is gradually shrinking. The group may examine

how the scientific developments in the field of genetic engineering and biotechnology can be best incorporated in future planning. He emphasized that the Working Group should evaluate the Terms of Reference set by the Planning Commission along with other relevant issues. The Working group may also look into the reasons for less success of ongoing programmes and recommend appropriate measures addressing those lacunae. The group may make use of all the available reports and examine, compile and utilize them in preparation of the group recommendations. Case studies may be assigned to some Universities and Research Institutions for proper scrutiny and suggestions made thereafter may be suitably incorporated in the planning process. He also suggested that while making recommendations thrust may be given to livelihood supporting activities, such as, livestock management, fisheries, horticulture etc. The wastelands can therefore, be treated and developed for activities such as raising of fodder, horticulture and fisheries. Utilization of sea water for agricultural activity after suitable treatment may also be thought of. There is a need to study the legal system, particularly the legal hurdles, which affect performance of programmes and suggest remedial measures. The issue of sustainability and convergence of other development programmes needs to be ensured by encouraging incentives linking with the developmental activities. For instance road construction in an area may be linked with the raising of plantation by the community. Similarly, electricity connections may be provided to those farmers on priority who will resort to drip irrigation. The element of entrusting responsibility is not very focussed in most of the development programmes and therefore, the Working Group should ensure that development and responsibility are linked in successive programmes.

6. The Chairman also emphasized that the strategy for the XI Plan may be supported with appropriate action plans, in which localized thinking should get prominence. The planning needs to be done in a manner in which village level development is addressed appropriately. Use of modern science and technology tools, particularly the satellite technology, will help in effective planning. Compilation / digitization of scientific researches and documentation of success stories may serve as input for new ideas and therefore, the Working Group should attempt these. Besides, relevant input from experts is also essential. It is, therefore, necessary that the issue may be opened for wide discussion. Further, relevant experiences of other countries may also be examined. The Chairman suggested that a cyber debate through internet may be resorted by the Working Group, so that, sharing of experience will help in formulating an appropriate strategy for the XI Plan. He also emphasized that the development of agriculture should not be looked in isolation. Development of livestock, fodder, inland fishing etc. should be given due regard in the futuristic strategy. Such a strategy has yielded good results in 'Vadi Project' in Gujarat.

7. The Chairman suggested for proper identification of issues and formulation of Task Forces (Sub- Working Groups). These Sub-Working Groups may deal specific ToRs and other relevant issues. Based on the experiences and the professional skills of the members, it will be possible to draw specific action plans on various issues.

Members of the Working Group and the participants narrated their experiences about the implementation of watershed development programmes across the country with which they have been associated directly or indirectly and gave valuable suggestions and observations, especially, with regard to sustainability, participatory approach, equity and gender issues and other administrative and legal issues associated with watershed / NRM / Dryland / Wasteland programmes. Important observations and suggestions made by the members are summarized as under;

i) Dr. J.S.Samara, DDG,ICAR and WG Member pointed out, impact studies have shown that watershed programmes have helped in improving production and productivity, crop diversification, increase in water table, reduction in sediment loss and improvement in biomass production in rainfed areas. The average family income has increased considerably. However, there is further scope to improve these programmes with convergence of other development programmes. This can be achieved by incorporating more transparency, accountability, professionalism and ensuring people's participation in these programmes.

ii) Shri Anil Shah, Chairman Development Support Center, Ahmedabad and WG Member expressed that to ascertain Institutional development and people's participation in watershed programmes the programmes need not to be imposed on villages rather villagers be involved in implementation and monitoring of these programmes. The NGOs can serve as catalytic agents but good NGOs are not always available. There is need for rating of NGOs in order of professionalism.

iii) Shri Shah also pointed out that the concepts of Joint Forest Management, Watershed Development and Participatory Irrigation Management were introduced in 1980s and 1990s. But, in the X Plan these programmes got a set-back. There is need for strengthening these concepts, which may require restructuring of the existing Government organizations.

iv) Shri Deep Joshi, Executive Director, PRADAN and WG Member expressed that the goal of conservation is well served when people's livelihood is linked with it. There is need to come up with a mechanism which takes into account the outputs and outcomes in the livelihood. A mechanism giving incentive to the people should be evolved. Since large scale micro-diversity is visible even within a village/micro- watershed, no fixed cost norms can address complete treatment of all watersheds. Therefore, a demand driven approach needs to be followed in watershed programmes. Resources from wide range of institutions and linkages with Banks and other financial institutions are essential for convergence of community development programmes including watershed development.

v) Prof. M.C. Varshneya, Vice Chancellor, Anand Agriculture University, expressed that for execution of watershed programmes development of villages on model basis needs to be attempted and success can be replicated in other places. Since rainfed agriculture is characterized by the problems of soil, the soil moisture index, time for crop growth and soil fertility etc., needs to be given thrust in these programmes. A farmer oriented approach towards better crop yield may give better returns. He suggested the idea of village as a development unit. Special problems of hill areas, development of shelter belts in coastal areas as well as checking sea erosion may also be considered by the working group.

vi) Dr. RPS Ahlawat, Vice Chancellor, NAU, Navrasi suggested that every land and every place on as is where is basis should be used. Development of rainfall prediction models is must for rainfed agriculture. Resources should be managed properly.

vii) Prof. B.S. Chundavat, Vice Chancellor, GAU, Dantiwada, expressed that the rainfed / dry land areas needs to be defined properly. The problems of rainfed areas vary from one region to other hence the approach for treatment should be based on regional planning. Unique crops of the region may be promoted in rainfed areas by providing inputs like high quality seeds, fertilizers, crop mechanization etc., A watershed plus strategy requires holistic approach with integration of scientific technologies for proper implementation and monitoring of watershed programmes under a single umbrella. He also suggested that in situ soil moisture conservation is most important attribute for the success of agriculture in rainfed areas. This needs to be addressed adequately in watershed development programmes.

viii) Shri A.N.Tripathi, Joint Secretary, Department of Rural Development and Water Conservation, Govt. of Maharastra suggested that for implementation of watershed development programmes a village should be considered as the unit. As long as village panchayats are not recognized as implementation units full cooperation from the village community can not be ensured. There may be direct funding to village panchayats. There is ample need for adoption of indigenous technologies. Training of volunteers who can coordinate implementation of programmes may be considered.

ix) Shri B.N Sharma, Commissioner Watershed Development, Govt. of Rajasthan observed that people's participation moves well as long as money is available for the programmes and it diminishes after funds are exhausted. This is the basic reason why most of the watershed development programmes are facing the problem of non-sustainability. The futuristic strategy may ensure availability of funds even beyond the

project period. An appropriate legal frame work is essential for successful implementation of watershed programmes. He suggested that for the areas with 600 mm rainfall or less, the farmers should be given incentives for field bunding e.g. his land revenue may be borne by the project itself.

x) Dr. B.K. Kitkani, Vice-Chancellor, Junagadh Agricultural University stated that there is much variation in rainfall in rainfed areas. The rainfall, should, therefore be taken into consideration while preparing programmes for watershed development. Further, pilot projects in districts may be attempted which can be replicated.

xi) Shri P.S. Roy, Deputy Director, NRSA pointed out that the use of information technology is vital for success of any programme. In the watershed development context, it is relevant to know as to how to generate information regarding identification of watersheds, technologies, land use pattern, planning for land resources and soil characteristics etc. and assimilation of these information. A documentation of good success stories and its dissemination may help in chalking out an appropriate strategy. Participation of community models, lab to land programme and implementation of information technology may serve as important tools for futuristic planning.

xii) Smt. Sharmistha Jagawat, Sadguru Foundation and WG Member stressed the need to bring focus on water. Efficient water harvesting for food and fodder security and drinking water needs to be incorporated in all WSD Programmes. Impact of watershed development on education and rural health may be studied. Integration at grass-root and apex level is essential. For ensuring quality of programmes strict monitoring is must. Localized problems can be sorted out by watershed community as has been done in Dahod Watershed Programme.

xiii) Dr. Mihir Shah, Secretary, Samaj Pragati Sahyog, Bagli, Dist. Dewas and WG Member pointed out that economic reforms in corporate sector have taken place but not in rural sector which is represented by watershed. There is a need for watershed reforms as well as for large scale research on public-private partnership. Skill of watershed communities needs to be developed by training and exposure visits. At the district level, generally, the District Collectors function as Chief Executive Officer of all development programmes but they have little time at their disposal to address the watershed development programmes. The CEO for watershed programmes at the district level therefore, may be selected on an open basis where anybody with required qualification, experience, and commitment may be selected. The public investment in agriculture sector is falling and this issue needs to be addressed. Further, there is a need to incorporate the successful experiences abroad like in China and

Israel in our futuristic strategy. A National Rainfed Area Authority as proposed by Government of India, may be established soon with professionals. This Authority should be autonomous and have adequate flexibility in functioning. At the watershed level, the watershed development programmes may be implemented by watershed committees and not by the Secretary of the Panchayat as in the Haryali guidelines. The Employment Guarantee Scheme can be better utilized for watershed works.

After detailed discussions and deliberations, the following decisions were taken :-

1. The Chairman constituted four Sub-Working Groups. Each Sub Working Group was entrusted with the Terms of References and some other issues based on the discussions. The details of Sub-Groups and the task assigned to them are shown in Annexure- II to V.

2. The Working Group approved the co-option of following members :-

    a. Secretary, Department of Rural Development and Water Conservation, Govt. of Maharashtra
    b. Commissioner, Watershed Development, Govt. of Rajasthan
    c. Commissioner, Watershed Development, Govt. of Karnataka
    d. Shri Vivek Bharati, Advisor (National Policy Programme & Projects), FICCI, New Delhi.
    e. Joint Secretary, Ministry of Panchayati Raj, GoI.

3. It was decided that the Sub-Working Groups will meet at the earliest. At least each Sub-Group should organize two meetings and submit its report within two month's time. A senior officer of the RFS and NRM Division of DAC will function as coordinator for each sub group.

4. It was also decided that to avoid repetition of recommendations and for further refinement of the Working Group Report the reports will be shared between Sub Groups, before compilation of the final report. The Group reports may be placed on the internet to get wider access and for incorporating the views and suggestions of all concerned.

5. The Working Group will again meet to discuss the reports of the sub groups and to prepare the final report.

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

Appendix II A

Sub-Group No.1

Terms of Reference for the Sub-Group :

1. Review the ongoing Dryland / Rainfed Farming and Watershed Development Programme based on watershed approach, executed by the Central Ministries / Departments.
2. Review the performance and impact of various watershed development programmes in the country including regeneration of degraded / waste land.
3. Delineate the outlines of an institutional mechanism (at all levels) to ensure high quality implementation of Watershed Programmes.
4. Suggest measures / programmes for land resources development in the XI Five Year Plan and requirement of funds and also the area to be covered under the programmes of various Ministries / Departments as well as the State Governments.

Other Issues :

1. Village Level Watershed Development Approach
2. Examination of legal and administrative hurdles affecting performance of Watershed Programmes and suggest remedies.

Members :

1. Joint Secretary (RFS), **Chairman**
   Department of Agriculture and Cooperation, MoA, GOI.
2. Joint Secretary (WD),
   Department of Land Resources, MoRD, GOI.
3. Vice Chancellor,
   Gujarat Agriculture University.
4. Dr. S.P. Wani,
   Principal Scientist, ICRISAT, Hyderabad.
5. Principal Secretary (Agriculture),
   Government of Gujarat, Gandhinagar.
6. Dr. Y.S. Ramakrishna,
   Director, CRIDA, Hyderabad.
7. Dr. R. Nawal Gunde,
   Director, NRSA, Hyderabad.
8. Director General (Forests),
   Ministry of Environment and Forests, GOI.
9. Shri Deep Joshi,
   Executive Director, Pradhan, New Delhi.
10. Dr. Renu S Parmar, Director, Agriculture, Planning Commission

Coordinator from DAC
Shri L.K. Tewari, Additional Commissioner (RFS)

Appendix II B

Sub-Group No.2

Terms of Reference for the Sub-Group :

1. Outline the contours of a 'Watershed Plus' strategy that would build on natural resources potential of rainfed / dry farming areas to foster sustainable livelihoods and to integrate livestock husbandry and inland fisheries in to this strategy.

2. Suggest measures for enrichment and improvement in the watershed programmes and for ensuring convergence of other development programmes in rainfed areas where watershed programmes are undertaken.

Other Issues :

1. Suitable packages for livelihood / income generating activities for different agro-ecological regions with thrust on SC / ST / Landless and Women.
2. Availability of credit to farmers and resource mobilization for watershed programmes.

Members :

1. Shri Y.S.P. Thorat, **Chairman**
   Managing Director, NABARD, Mumbai.
2. Shri Anil Shah, Chairman,
   Development Support Centre, Ahmedabad.
3. Prof. R.S. Deshpande, Head, ADRT Unit,
   Institute for Social and Economic Change, Bangalore.
4. Dr. Y.S. Ramakrishna, Director,
   CRIDA, Hyderabad.
5. Secretary, Water Conservation and Rural Development,
   Government of Maharashtra.
6. Representative of Ministry of Panchayati Raj, GOI.
7. Joint Secretary (RFS),
   Department of Agriculture and Cooperation, MoA, GOI.
8. Dr. Renu S Parmar, Director, Agriculture, Planning Commission

Coordinator from DAC
Shri K.R. Dandapani, Additional Commissioner (WM)
Shri S. K. Dalal, Additional Commissioner(RFS)

Appendix II C

Sub-Group No.3

Terms of Reference for the Sub-Group :

1. Suggest measures for reclamation and efficient use of waste land such as alkaline lands, ravine lands and seriously degraded lands which requires high cost for their reclamation and identify the role of PRIs and Public-Private Partnership in securing this objective.
2. Suggest measures / programmes for land resources development in the XI Five Year Plan and requirement of funds and also the area to be covered under the programmes of various Ministries / Departments as well as the State Governments.

Other Issues :

1. Application and imbibing the Science and technology tools for furthering the WSD Programmes.
2. Compilation / digitization of scientific researches on WSD Programmes and documentation of success stories.

Members :

1. Dr. J.S. Samra, DDG, ICAR, Pusa, New Delhi. ***Chairman***
2. Dr. K.S. Gajbhiye, Director, NBSS & LUP, Nagpur.
3. Joint Secretary (WD), Department of Land Resources, MoRD.
4. Shri Mihir Shah, Secretary, Samaj Pragati Sahyog, Bagli, District Dewas
5. Secretary (Agriculture), Government of Rajasthan, Jaipur.
6. Joint Secretary (RFS), Department of Agriculture and Cooperation, MoA, GOI.
7. Representative of NRSA
8. Dr. Renu S Parmar, Director, Agriculture, Planning Commission

Coordinator from DAC
Shri Shamsher Singh, Additional Commissioner (NRM)

Appendix II D

Sub-Group No.4

Terms of Reference for the Sub-Group :

1. Study the feasibility of Public-Private partnership and scope for the investment by private sector in Watershed Development Programmes.
2. Delineate the outlines of an institutional mechanism (at all levels) to ensure high quality implementation of Watershed Programmes.

Members :

1. Shri Vivek Bharti, **Chairman**
   FICCI, New Delhi.

2. Commissioner, Watershed Development,
   Government of Karnataka, Bangalore.

3. Dr. S.P. Wani,
   Principal Scientist, ICRISAT, Hyderabad.

4. Smt. Sharmisthaben,
   Jagavat Sadguru Foundation, Dahod, Gujarat.

5. Representative of Ministry of Panchayati Raj, GOI.

6. Joint Secretary (WD),
   Department of Land Resources, MoRD.

7. Joint Secretary (RFS)
   Department of Agriculture and Cooperation, MoA, GOI.

8. Shri Jagadeesh Rao,
   (Representative of Managing Director),
   National Dairy Development Board, Anand,
   Gujarat.

9. Dr. Renu S Parmar, Director, Agriculture, Planning Commission

Coordinator from DAC
Shri S.K. Dalal, Additional Commissioner (Crops)

Appendix – III

Minutes of the meeting of the Working Group of the Sub-Committee of National Development Council on Agriculture and Related Issues on Dry Land/Rainfed Farming System, including Re-generation of Degraded Wastelands, Watershed Development Programme held at 11.00 A.M. on 21st December, 2006 at Circuit House Gandhi Nagar under the chairpersonship of Hon'ble Chief Minister of Gujarat, Shri Narendra Modi.

At the outset, Shri Avinash Kumar, Additional Chief Secretary, Gujarat informed that this meeting of Working Group of the Sub-Committee of National Development Council (NDC) on Agriculture and Related Issues on Dry Land / Rainfed Farming System including Re-generation of Degraded Wastelands, Watershed Development Programme has been convened to finalize the report of the Working Group. He requested all participants for their brief introduction.

Shri Prem Narain, Joint Secretary, RFS Division, DAC extended warm welcome to the participants. He acknowledged the guidance extended by the Chairman in preparation of the report and informed that the draft report has already been circulated to all the members of the Working Group along with four Sub-Group Reports for views / comments. However, no comments have been received on the draft report and, therefore, this meeting is required to finalize the report of the Working Group. He requested participants to contribute their views/comments for inclusion in the final report

In his opening remarks, Chairman of the Working Group and Chief Minister, Gujarat, Shri Narendra Modi expressed his satisfaction on the efforts taken up by the Chairmen and Group Members in preparing the sub-group reports which formed basis for the draft report. It was advised by him that since a new perspective has been given by the Planning Commission for the next five year plans in their approach paper for the XI Plan, the report should contain useful input. He stated that although lot of work on Watershed Development has been done by Government Sector, but considering the fact that large area is still remaining untreated the Group may re examine whether it is possible to complete the task by Government effort alone. The Working Group may think of alternate means for the purpose. He also asked to consider peoples participation in this developmental efforts. The Chairman cited example of Forest Department where provision for developing compensatory afforestation by the user agencies in lieu of forest land diverted for developmental projects has been made and put for consideration a similar idea for considering a provision for the industries who are provided with agricultural or other lands for development projects to treat and fully develop equivalent waste lands to the benefit of the community. He suggested that some specific recommendations based on the relevant recommendations made by the Regional Conference on Natural Resources Conservation, Use and Sustainability

in Drylands (December 18-20, 2006), i.e. “Bhuj Declaration”, may also be examined and incorporated in the report.

Chairman pointed out that people’s participation has helped development of dry land agriculture in the State of Gujarat by way of water harvesting, boring well and other conservation measures which need to be replicated in other parts of the country. He stressed the need for improvement of the fertility of degraded lands to ensure higher agricultural productivity and emphasized that the agricultural growth in the country can only be achieved through development of dryland agriculture. For educating and bringing awareness at school level dryland development be included in the school syllabus. He stressed the need for involvement of media, TV, mass campaigning, mobile exhibition etc. for bringing awareness and educating people on the success stories of dryland development in large scale. Government of India may even think of special sponsored programme on Doordarshan for dryland agriculture. He emphasized the need for involvement of unemployed educated youth in the process of development of wasteland and degraded land for achieving the means of income as well as involvement in the mainstream development of the country.

Chairman expressed that although the country’s rainfall, is not evenly distributed, yet, it is enough to meet the water requirement. There are water surplus areas like eastern and southern India and water deficient areas like north-western India. Therefore, river grid development is vital to rationalize the availability of water in the river systems of the country.

For developing a competitive and effective system for watershed development and land development, a revenue model based on incentive approach may be proposed. 20 % of the allocation amount of the State may be considered as an incentive to the State for good achievement in the dryland sector. Chairman suggested for a special development model for the border / coastal districts linked with national security to address both development and security aspects jointly. He gave an example that the retired defence / para military personnel may be assigned the task of development of the wasteland / degraded land / common property resources, particularly in the border / coastal districts which will also enable providing a vigilance to the border through some special incentives. It was advised by him that looking into the energy crisis in a global scenario and expectations that huge global financing will be flowing in this sector in the coming future, bio-fuel be encouraged in dryland farming in waste / degraded land through revenue models. Similar importance need also be given to herbal / medicinal / aromatic plantations in these areas which have a great economic potential. The Chairman expressed that in the present scenario, only limited economic activity is taken up by the women self-help-groups based upon their thrift activities. Special incentives may be thought of to develop some viable models for more productive activities to ascertain greater economic development. Further, it was mentioned that since in these days, outlay and outcome are the principal means in planning and strategic decisions, the XI plan proposals in the report need to look into these aspects.

The four Sub-Group reports along with recommendations were then presented. Shri Prem Narain, Joint Secretary(RFS) presented the report of Sub-Group-I. Dr. V. Tagat, CGM, NABARD presented Sub-Group-II report on behalf of Chairman, NABARD. Dr. J.S. Samra, DDG, NRM, ICAR presented Sub-Group-III report and Shri Vivek Bharati, FICCI presented Sub-Group-IV report. Presentation of Sub-Group reports were followed by discussions.

Dr. M.C. Varshney, Vice Chancellor, Anand Agricultural University emphasized need for multiple and inter-cropping in dryland areas to mitigate the risk. It was suggested by him that for extension activities Krishi Mahotsav Model may be adopted. For wasteland development, species suitable for bio-diesel (Jatropha *etc*.) may be encouraged. He narrated the experiments carried out for setting up bio-diesel plant for 250-300 ha area which can be suitably incorporated as an activity under watershed development and waste land development. He also suggested that Government lands along canals, roads and railway lines can be leased to the farmers for productive use. The farm ponds need to be encouraged on a greater scale. He suggested for establishment of a water management authority for effective management of both surface and ground water.

Dr. R.P. S. Alhawat, Vice Chancellor, NAU Navsari suggested that in areas where soil depth is shallow, grass lands may be developed under pasture development component.

Dr. S.P. Wani, ICRISAT said that watershed programmes have been taken up in all parts of the country on a large scale, but, the appropriate knowledge on watershed technology is not reaching to the farmers. There is a need to fill this gap. All developmental programmes need to critically address the technical and development aspect in a defined manner. A consortium approach is required to be thought of for dryland development. The approach should be farmer centric with a focus on income generation of individual farmers. If involvement of private sector is taken up, a decentralized model facilitating value addition at farmers level and further processing at industrial level will be more useful. Public-Private Partnership should be farmer centric. Farmers should not be at the loosing end. Industry may loose and survive, but farmers can not. Water use efficiency is not being ensured anywhere. He also emphasized that micro-nutrient deficiencies need to be addressed appropriately in successive programmes.

Shri Vivek Bharati, FICCI suggested that for success of the programmes, the concept of supply chain needs to figure prominently. Emphasis may be laid on relationship building and not on the statutory or legal restrictions. There is a need to create market and revenue models to optimize the benefit. This can be done in supply chains. The waste land development policy need to be thought of. Wastelands need to be identified and demarcated for allocation to different agencies/ organizations for development. The terms of engagement of private sectors in watershed programmes be prepared. The procurement policy need to be suitably developed for the benefit of farmers. The policy on bio-diesel should address a right revenue model to facilitate its

adoption by the farming community. Participation and linkages of farmers in the global market economy has by and large, been ignored in India and there is need to appropriately address this issue.

Shri Avinash Kumar, Additional Chief Secretary, Gujarat indicated that in the newly constituted National Rainfed Area Authority, there is no state representation. He observed that uniform guidelines will not provide adequate flexibility in watershed development programmes since development of watersheds in different agro-ecological regions require specific measures. He suggested that instead of linking watersheds statutorily to KVKs / SAUs etc., the Krishi Mahautsav needs to be popularized as has been done in the State of Gujarat. He also outlined the need for insurance of funding partner / stake-holders etc. Flexibility in cost norms in different programmes of development of wastelands and degraded lands is necessary depending on location specific requirements. It was pointed out that lack of capacity prevails not only with the farmers, but also in the Government system. The institutional convergence is, therefore, important. The income criteria has to be more important in programmes based on watershed development approach, rather than the area treatment.

Dr. G. Behara informed that the NRSA has developed GIS data base and the specific imagery developed thereupon can be used for planning purposes. The NRSA has a Village Resource Programme (Village Resource Centre) and this model can be replicated as ICT application for land mapping exercise. He emphasized need for issuance of soil health cards to farmers and for low cost weather forecasting system. He also suggested that such data can be analyzed and disseminated to the farmers by the NGOs.

Prof. R.H. Ghaghada, Research Scientist, JAU suggested that drip irrigation and brackish water aqua culture may be promoted under watershed programme.

Shri Rakesh Behari, Joint Secretary, DoLR highlighted that the National Bio-diesel Mission is likely to be established shortly as the working model for bio-diesel promotion in the country. He, however, stressed the need for more research and scientific data base on Jatropha for effective implementation of the programme. He suggested the need for better transparency and accountability in WSD programmes which appears weak at present. He emphasized need to Support Voluntary Agencies at State and District level with master trainers to meet the need based training requirement at PIA and micro-watershed development, as is being done by CAPART. He further mentioned that equity aspect is not properly addressed in the ongoing programmes which need strengthening and even Women Watershed Committees may be thought of for greater involvement of women in the watershed programmes. Looking into the alarming depletion of ground water, the watershed programmes should also address the ground water issues along with recharge and some regulatory mechanism for rational use of ground water.

Dr. Y.S. Ramakrishna, Director, CRIDA, Hyderabad suggested for specific incentives to rainfed farmers for bio-mass plantation by way of special subsidy for fertilizer inputs, micro-nutrients *etc*. He also stressed the need for subsidized labour component for soil conservation activities taken up by the individual farmers and that bio-fuel species should not be taken up in good agricultural land for its promotion and should be restricted to only waste lands and degraded lands. The farmers can be encouraged to take up such plantations in fencing and as road side plantations. In no way, the net sown areas should be affected by other development works. He suggested that common property resources can be given to the villagers on lease basis for economic activities. "Salah Samities" at village level may be established as a part of Gram Sabha for better transparency and utilization of resources. Thrust may be given to livestock based farming system in arid condition and the aqua based farming system in high rainfall regions. Specific diversification planning based on raw material availability need to be considered for industrial promotion. Market intelligence may be gathered for safeguarding the economic interests of the farmers before linking it to industrial sector.

Dr. D.B. Karchhadiya, Director of Research, JAU, Junagarh emphasized the need for water harvesting in dryland development.

The Chairman made following concluding remarks :-

1. There is a need for development of strategy for contract farming to encourage PPP in the dryland agriculture.
2. Relevant recommendations on outcomes and output of different components may be considered in the report.
3. Chairman of the Working Group emphasized the "soil to satellite" approach which needs to be promoted along with computerization of land records. He informed that in every village of Gujarat, the maps taken with the help of remote sensing have been provided in CD form which is being used for planning purposes. JS (DoLR) informed that it is proposed to have a six layers wasteland mapping on internet with the help of NRSA and a scheme in this respect is under preparation. Chairman suggested that this may be taken up at the earliest and on a large scale so that there is a clear-cut identification of wastelands in each village which is known to the village community as well as to the Government agencies.
4. Soil health card has proved a great success in increasing the agricultural production in the State of Gujarat and need to be extended to other parts of the country. This can be achieved in a time bound manner by strengthening the laboratories of APMC centres and science schools having laboratory already existing in the rainfed areas through financial support and training for preparation of soil health cards at local level. This should be a continuous process and may be reassessed after every two years. Some specific targets for issuance of soil health cards by adopting the above mechanisms may be proposed for XI Plan.

5. Chairman emphasized the need for having a complete national data and information of all the agencies whether Government, Private or NGOs involved in Watershed Development. He suggested that a national portal on Watershed be developed with this information and with linkages to the other relevant websites of different agencies.
6. There is need for social audit for all the expenditure incurred in watershed development programmes in the last ten years.
7. Specific projects / packages may be designed for development of Grass land and Fodder Banks to take care of the livestock feed in the States which are affected by frequent droughts and other calamities.
8. There is need for regular meeting of corporate sector, private sector, Government sector at national and of NGOs at district level to share their experiences in the dry land agriculture at least once in a year.
9. For better monitoring and transparency, the progress of watershed works along with expenditure details should be reported and discussed in the Gram Sabha at least twice in a year. This should be made compulsory.
10. Rainwater harvesting may be made mandatory in all private and Government buildings within a specific time frame by amending the building bye-laws. Such rainwater harvesting was conventionally practiced in Gujarat and it is best demonstrated in the ancestral house of Mahatma Gandhi at Porbandar.
11. To encourage plantation it may be made mandatory that for access to the road construction fund of Government, the villagers be encouraged to take up the road side plantation by themselves. Even the contractors / organizations taking up the road construction works may be asked to take up the plantation first if the work is awarded to them. In the urban areas too, the green coverage may be linked to f.s.i (floor space index) .
12. There is need for some special incentives for greenery development even in the individual household to encourage plantation by the farmers.
13. There is need for specific strategy and revenue models may be thought of for different rainfall ranges.

At the end, the Chairman of the Working Group, suggested that based on the discussion today, the draft report should be modified and enriched. He asked the Member Secretary of the Working Group to finalize the final report at the earliest.

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

Annexure - I

Statement Showing Geographical Area, Net Sown Area, Net Irrigated Area and Rainfed Area in the States and Union Territories (2000-01)

(Area in '000 Ha.)

S.No.	State / UT	Geographical Area	Net Area		
			Sown	Irrigated	Rainfed
1.	Andhra Pradesh	27507	10410	4238	6172
2.	Arunachal Pradesh	8374	164	42	122
3.	Assam	7844	2734	170	2564
4.	Bihar	9416	5664	3462	2202
5.	Chattishgarh	13519	4800	1151	3649
6.	Goa	370	141	23	118
7.	Gujarat	19602	9622	2994	6628
8.	Haryana	4421	3566	2938	628
9.	Himachal Pradesh	5567	550	102	448
10.	J & K	22224	748	310	438
11.	Jharkhand	7972	1769	164	1605
12.	Karnataka	19279	10031	2565	7466
13.	Kerala	3886	2191	377	1814
14.	Madhya Pradesh	30825	14859	4735	10124
15.	Maharashtra	30771	17619	2975	14644
16.	Manipur	2233	140	65	75
17.	Meghalaya	2243	230	59	171
18.	Mizoram	2108	188	16	102
19.	Nagaland	1658	333	65	268
20.	Orissa	15571	5845	1938	3907
21.	Punjab	5036	4250	4038	212
22.	Rajasthan	34224	16765	4520	11345
23.	Sikkim	710	95	17	78
24.	Tamilnadu	13006	5172	2801	2371
25.	Tripura	1049	280	37	243
26.	Uttaranchal	5348	793	347	446
27.	Uttar Pradesh	24093	16812	12391	4421
28.	West Bengal	8875	5522	2376	3446
29.	A & N Island	825	38	0	38
30.	Chandigarh	11	2	1	1
31.	D & N Haveli	49	23	8	15
32.	Daman & Diu	11	4	1	3
33.	Delhi	148	29	29	0
34.	Lakshadeep	3	3	1	2
35.	Pondicherry	48	24	21	3
Total		**328726**	**141345**	**55876**	**85469**

Annexure -II

Land Degradation in India (NBSSLUP - 2005 on 1:250,000 scale)

Area ('000 ha)

S.N	State	Water erosion	Wind erosion	Water logged/ flooding	Saline/ Alkaline	Soil acidity	Complex problems	Total degraded area	Total geo. Area	Degraded Area (%)
1	J & K	5460	1360	200	0	0	0	7020	22224	31.6
2	H.P	2718	0	1303	0	157	0	4178	5567	75.0
3	Punjab	372	282	338	288	0	0	1280	5036	25.4
4	Haryana	315	536	146	256	0	214	1467	4421	33.2
5	UP(icluding Uttaranchal)	11392	212	2350	1370	0	0	15324	29441	52.0
6	Delhi	55	0	6	10	0	11	82	148	55.4
7	Rajasthan	3137	6650	53	1418	0	110	11368	34224	33.2
8	Gujarat	5207	443	523	294	0	1666	8133	19602	41.5
9	Maharashtra	11179	0	0	1056	517	303	13055	30771	42.4
10	MP(including Chattisgarh)	17883	0	359	46	6796	1126	26210	44345	59.1
11	Kerala	76	0	2098	0	138	296	2608	3886	67.1
12	Tamil Nadu	4926	0	96	96	78	138	5334	13006	41.0
13	Karnataka	5810	0	941	110	58	712	7631	19179	39.8
14	A.P	11518	0	1896	517	905	156	14992	27505	54.5
15	Goa	60	0	76	0.4	2	24	162.4	370	43.9
16	Bihar (including Jharkhand)	3024	0	2001	229	1029	0	6283	17387	36.1
17	West Bengal	1197	0	710	170	556	119	2752	8875	31.0
18	Orissa	5028	0	681	75	263	75	6122	15571	39.3
19	Sikkim	158	0	0	0	76	0	234	710	33.0
20	A & N Island	187	0	0	9	0	9	205	825	24.8
21	Arunachal Pradesh	2372	0	176	0	1955	0	4503	8374	53.8
22	Mizoram	137	0	0	0	1050	694	1881	2108	89.2
23	Manipur	133	0	111	0	481	227	952	2233	42.6
24	Nagaland	390	0	0	0	127	478	995	1658	60.0
25	Assam	688	0	37	0	612	876	2213	7844	28.2
26	Tripura	121	0	191	0	203	113	628	1049	59.9
27	Meghalaya	137	0	7	0	1030	34	1208	2243	53.9
	Total	**93680**	**9483**	**14299**	**5944.4**	**16033**	**7381**	**146820**	**328602**	

Annexure - III

Category wise Wstelands of India
(Wasteland Atlas – 2005, MoRD)

(Area in Sq. Km)

S.No	Wasteland Category	Area	Percentage (%)
1.	Gullied and/or ravenous – Shallow	10283.06	0.32
2.	Gullied and/or ravenous – Medium	4685.43	0.15
3.	Gullied and/or ravenous – Deep	4070.85	0.13
4.	Land with Scrub	150566.60	4.76
5.	Land Without Scrub	37382.89	1.18
6.	Waterlogged and marshy – Permanent	5341.15	0.17
7.	Waterlogged and marshy – Seasonal	4403.82	0.14
8.	Saline/Alkaline – Strong	2569.69	0.08
9.	Saline/Alkaline – Moderate	5349.64	0.17
10.	Saline/Alkaline - Slight	4104.72	0.13
11.	Shifting Cultivation – Abandoned	12218.99	0.39
12.	Shifting Cultivation – Current	6546.87	0.21
13.	Degraded Forest – Scrub Dominating	108417.76	3.42
14.	Agriculture Land inside Notified Forest	18134.05	0.57
15.	Degraded pastures/grazing land	19344.30	0.61
16.	Degraded land under plantation crops	2138.24	0.07
17.	Sands – Flood Plain	1945.55	0.06
18.	Sands – Levees	32.24	0.00
19.	Sands – Coastal Sand	943.14	0.03
20.	Sands – Semi Stab. To Stab.(>40m)	2672.88	0.08
21.	Sands – Semi Stab. Mod (15-40m).	16380.70	0.52
22.	Sands – Semi Stab. To Stab. Low (<15)	10262.95	0.32
23.	Sands – Closely Spaced Inter-Dunal Area	1746.74	0.06
24.	Mining wastelands	1421.72	0.04
25.	Industrial wastelands	555.63	0.02
26.	Barren Rocky/Stony waste area	57747.11	1.82
27.	Steep slopping area	9097.38	0.29
28.	Snow covered and/or glacial area	54328.16	1.72
	Total	**552692**	**17.45**
	Total (Mha)	**55.27**	**17.45**

TGA: Total Geographical Area, Source*: 1:50,000 Wasteland Maps -2003 prepared based on IRS-LISS III Data*

Note: 1, 20,849.00 Sq. Km. in Jammu & Kashmir is not Mapped.

Annexure-IV

State wise extent of Wastelands in India - 2003
(Wasteland Atlas – 2005 – MoRD)

(Area in Sq. Km.)

Sl. No.	State Name	No. of Distt.	TGA	Total WL	% To TGA
1.	Andhra Pradesh	23	275068	45267.15	16.46
2.	Arunachal Pradesh	16	83743	18175.95	21.70
3.	Assam	23	78438	14034.08	17.89
4.	Bihar	37	94171	5443.68	5.78
5.	Chhatisgarh	16	135194	7584.15	5.61
6.	Goa	2	3702	531.29	14.35
7.	Gujarat	25	196024	20377.74	10.40
8.	Haryana	19	44212	3266.45	7.39
9.	Himachal Pradesh	12	55673	28336.80	50.90
10.	Jammu & Kashmir*	14	101387	70201.99	69.24
11.	Jharkhand	19	79706	11165.26	14.01
12.	Karnataka	27	191791	13536.58	7.06
13.	Kerala	14	38863	1788.80	4.60
14.	Madhya Pradesh	49	308252	57134.03	18.53
15.	Maharashtra	33	307690	49275.41	16.01
16.	Manipur	9	22327	13174.74	59.01
17.	Meghalaya	7	22429	3411.41	15.21
18.	Mizoram	8	21081	4469.88	21.20
19.	Nagaland	7	16579	3709.40	22.37
20.	Orissa	30	155707	18952.74	12.17
21.	Punjab	17	50362	1172.84	2.33
22.	Rajasthan	32	342239	101453.86	29.64
23.	Sikkim	4	7096	3808.21	53.67
24.	Tripura	4	10486	1322.97	12.62
25.	Tamil Nadu	29	130058	17303.29	13.30
26.	Uttranchal	13	53483	16097.46	30.10
27.	Uttar Pradesh	70	240928	16984.16	7.50
28.	West Bengal	18	88752	4397.56	4.95
29.	Union Territory	20	10973	314.38	2.87
	Total	**597**	**3166414**	**552692.25**	**17.45**
	Total (Mha.)		**316.64**	**55.27**	

**Unsurveyed Areas (J&K)* *120849.00*

Total Geographical Area (TGA) = 3287263 Sq. Km = 328.7 Mha.
SOURCE: 1:50,000 Wasteland Maps-2003 prepared based on IRS-LISS III Data

Annexure - V

Projected Treatment/Reclamation of Land under Watershed Development Programmes and Funds requirement with cost sharing in successive Five Year Plans (Prepared by the Planning commission)

(Amount Rupees in Crore)

Five Year Plan & Period	Area envisaged to be covered (Million ha.)	Estimated cost of development (Rs./ha.)	Total cost on average	Cost sharing Ratio*	Cost sharing		
					By Centre	By States	By People
Tenth (2002-07)	15.0	5000-7000	9000	50:25:25	4500	2250	2250
Eleventh (2007-12)	20.0	6000-8000	14000	40:30:30	5600	4200	4200
Twelfth (2012-17)	25.0	7500-9500	21250	30:30:40	6375	6375	8500
Thirteenth (2017-22)	28.5	9000-11000	28500	25:25:50	7125	7125	24250
TOTAL	88.5		72750		23600	19950	29200

* Cost – sharing ratio between Centre, States and People/Community

**Approximately 12 million hectare of degraded lands is expected to be treated during the Tenth Plan period. This will leave a balance of 76.50 million ha. of untreated degraded lands.

Annexure – VI

State-wise Extent of Alkali Soils and Progress of Treatment up to 2005-06

(Area in lakh ha. & Rs. in lakh)

Sl. No.	Name of State	Area affected by Alkali Soils	Progress up to 2005-06	
			Physical	Financial
1.	Andhra Pradesh	64.00	0.000	0.00
2.	Bihar	4.00	0.000	0.00
3.	Gujarat	610.00	0.383	1377.18
4.	Haryana	450.00	2.121	2743.41
5.	Karnataka	76.00	0.029	398.80
6.	Madhya Pradesh	164.00	0.001	183.53
7.	Maharashtra	59.00	0.000	0.00
8.	Punjab	718.00	2.765	3225.73
9.	Rajasthan	332.00	0.224	386.07
10.	Tamil Nadu	4.00	0.051	113.31
11.	Uttar Pradesh	1100.00	1.297	2165.50
	Total	**3581.00**	**6.871**	**10593.53**

Annexure - VII

Component - wise Cost Norms for Centrally Sponsored Progoramme of Reclamation of Alkalai Soils (RAS)

S. No.	Activity Item	Cost per ha. (in Rs.)	Cost	
			GOI	Beneficiaries
1.	On Farm Development (OFD)	3000	-	3000
2.	Link Drain (Drainage)	2500	2500	-
3.	Boring Rs. 8000/- each for 4 ha.	2000	1000	1000
4.	Pump set Rs. 16000/- ach for 4 ha.	4000	2000	2000
5.	Soil amendment (Max,5 tonnes per ha, @ Rs,. 2000/t.)	10000	5000	5000
6.	Green Manuaring (60 Kg./ha.	1000	500	500
	Sub-Total	22500	11000	11500
7.	Crop Production Paddy Cultivation ➢ HYV Paddy Seed 60 Kg./ha. at the rate of Rs. 20/kg.	1200	-	1200
	➢ Fertilizer – Nitrogen – 120 Kg./ha. (100/48 x 120 = 250 Kg. @ Rs. 5/Kg.)	1250	-	1250
	➢ Zinc Sulphate @ 20 Kg./ha. at cost of Rs. 25/K.G.	500	-	500
	Wheat Cultivation ➢ High Yield Variety Seed @ 120 Kg/ha @ Rs. 20/Kg.	2400		2400
	➢ Nitrogen – Urea 120 Kg./ha. (100/48 x 120 = 250 Kg. @ Rs. 5/Kg.)	1250	-	1250
	Sub-Total	**6600**		**6600**
	Total	**29100**	**11000**	**18100**

Note:

- A Block of minimum 4 ha. having alkalinity (pH more than 8.2 and crop productivity from such area is below the level of production) is to be selected for reclamation.
- The components listed from Sl. No. 1 to 6 are to be executed with active participation of beneficiary.
- In lieu of crop production component, horticulture plantation/fuel wood plantation be taken up within the cost norms permissible for crop production i.e. Rs. 6,600 per ha.
- The rate of application of soil amendment will be 5 tonnes per ha. as application beyond this limit does not lead to any economical return.
- For crop production, farmers have to be trained in advance for using the suitable seed and fertilizer from their own resources and no land should be kept fallow.

Annexure- VIII

Areas affected by Shifting Cultivation and Progress made for their treatment under WDPSCA* up to 2005-06

Sl. No.	States	Jhum Cycle in years	Minimum areas affected by jhum (lakh ha.)	Progress up to 2005-06	
				Physical (lakh ha.)	Financial (crores)
1.	Andhra Pradesh	3	1.50		
2.	Arunachal Pradesh	3-10	2.10	0.242	16.75
3.	Assam	2-10	1.39	0,286	23.95
4.	Bihar	5-8	.81		
5.	Madhya Pradesh	10-15	1.25		
6.	Manipur	4-7	3.60	0.619	35.94
7.	Meghalaya	5-7	2.65	0.476	31.42
8.	Mizoram	3-4	1.89	0.836	59.21
9.	Nagaland**	4-9	6.33	0.754	63.12
10.	Orissa	5-14	26.49		
11.	Tripura	5-9	11.15	0.316	25.19
	Total		**49.13**	**3.529**	**255.58**

* The scheme of Central Sector to State Plan of Watershed Development Project for Shifting Cultivation Areas (WDPSCA) is being implemented only in 7 North-Eastern States from 1994-95 onwards

** The figures updated based on information furnished by States

ANNEXURE-IX

State-wise breakup of shifting cultivation areas (Wasteland Atlas 2005, MoRD)

(Area in Hectare)

Sl.No.	State	Current Jhum	Abandoned Jhum	Total Jhum
1.	Andhra Pradesh	103	624	**727**
2.	Arunachal Pradesh	49622	111691	**161313**
3.	Assam	349508	43589	**393097**
4.	Chattishgarh	6939	5638	**12577**
5.	Manipur	369714	111954	**481668**
6.	Meghalaya	11662	62721	**74383**
7.	Mizoram	287046	114695	**401741**
8.	Nagaland	80130	111660	**191790**
9.	Orissa	54103	63626	**117729**
10.	Tripura	11037	28489	**39526**
11.	Uttar Pradesh	2035	-	**2035**
	Total	**1221899**	**654687**	**1876586**

Annexure-X

Amelioration of Acid Soil---- Cost Norms - pH (< 5.5)

Sl.No.	Components	Unit Cost Rs /ha	GOI	Beneficiaries
1.	Survey, Project preparation and soil testing of acid soils	500	500	-
2.	On Farm Developmental activities- Bunding, Ploughing & mixing of lime with fertilizer in furrows.	2500	-	2500
3.	Cost of Soil amendment including transportation --@ (3-4 qs/ha.	2000	1000	1000
4.	Supply of Agricultural input like seeds, insecticide, fertilizer.	2500	-	2500
5.	Demonstration and Transfer of technology	500	500	-
	Total	8000	2000	6000

ABBREVIATIONS

AISLUS	All India Soil and Land Use Survey Organization, New Delhi
CAZRI	Central Arid Zone Research Institute, Jodhpur
CRIDA	Central Research Institute for Dryland Agriculture, Hyderabad
CSWRTI	Centre for Soil and Water Conservation, Research and Training Institute, Dehradun
DDP	Desert Development Programme
DoLR	Department of Land Resources
DoRD	Department of Rural Development
DPAP	Drought Prone Area Programme
DWC	District watershed Committee
EAP	Externally Aided Programme
ERR	Economic Rate of Return
GIS	Geographic Information Systems
GOI	Government of India
HADP	Hill Area Development Programme
IAEPS	Integrated Afforestation and Eco-Development Project Schemes
IARI	Indian Agriculture Research Institute
ICAR	Indian Council of Agriculture Research
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IGWDP	Indo-German Watershed Development Programme
IRR	Internal Rate of Return
ISRO	Indian Space Research Organization
IWDP	Integrated Watershed Development Programme
KWDP	Karnataka Watershed Development Project
MANAGE	National Institute of Agriculture Extension and Management, Hyderabad
MMA	Macro Management of Agriculture
MoA	Ministry of Agriculture
MoEF	Ministry of Environment and Forests
MoRD	Ministry of Rural Development
NABARD	National Bank on Agriculture and Rural Development
NAP	National Afforestation Programme
NASDORA	National Authority for Sustainable Development of Rainfed Areas
NBSSLUP	National Bureau of Soil Survey and Land Use Planning, Nagpur
NCA	National Commission on Agriculture
NGO	Non-Governmental Organization
NLCB	National Land Use and Conservation Board
NRAA	National Rainfed Area Authority
NRCAF	National Research Centre for Agro-Forestry
NRSA	National Remote Sensing Agency
NWC	National Watershed Council
NWDPRA	National Watershed Development Programme for Rainfed Areas
PIA	Project Implementation Agency

PRI	Panchayat Raj Institution
RAS	Reclamation of Alkali Soil
RVP & FPR	River Valley Projects & Flood Prone Rivers
SHG	Self-Help Group
SLWC	State Level Watershed Committee
SPWD	Society for Promotion of Wasteland Developments, New Delhi
SWC	Soil and Water Conservation
TOT	Training of Trainers
UG	User Group
WA	Watershed Association
W.B.	World Bank
WC	Watershed Community / Watershed Committee
WDF	Watershed Development Fund
WGDP	Western Ghats Development Programme
WOTR	Water Organization Trust
WDPSCA	Watershed Development Project in Shifting Cultivation Areas
WSD	Watershed Development

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