

**WATERSHED MANAGEMENT, APPROACH
AND ITS ASSESSMENT: A CASE STUDY OF
NATIONAL WATERSHED DEVELOPMENT
PROGRAMME FOR RAINFED AREAS
(NWDPRA)**

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By

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CERTIFICATE

I, Poulomi Banerjee, certify that the dissertation entitled "Watershed Management, Approach and its Assessment: A Case Study of National Watershed Development Programme for Rainfed Areas (NWDPR)" submitted for the degree of Master of Philosophy is my bonafide work and may be placed before the examiners for evaluation.

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*DEDICATED TO MY
PARENTS AND BROTHER*

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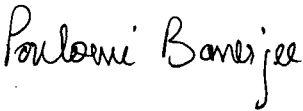
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Chapter 1

Introduction

1.1 Introduction

Natural resources of sunlight, water and land constitute the primary life support systems for all form of life-microbes, vegetation, animals and human beings. Prolonged use of such resources has created a chronic situation, with particular reference to environmental degradation, ecological sustainability, etc world over. Conditions is all the more pathetic in case of developing countries where indiscriminate clearing of forests, unplanned development, shortage of resource base possess a threat to the very existence of human life. Such a continuos depletion of natural resources has its obvious and serious repercussions on the rural life in general and agriculture in particular. This is so because agriculture in developing countries are subjected to environmental stability and market forces. Thus any instability in either of two creates a adverse impacts over agriculture. Thus conservation of soil and water has become the prior theme of most development programmes.such conservation gives us a number important benefits such as green cover on wasteland, healthier forests, increased availability of moisture in the soils and nutrient rich good quality soils, more infiltration of water in the ground raising water table. Thus to have a healthier and richer ecological balance a holistic approach regarding soil-water conservation should be maintained.

Conservation of land and water has badly suffered in the period after independence. The quest for economic developepment to provide food, fuel, clothing, education, health care etc. without being conscious of and taking into consideration the adverse effects that could be produced by such development process have resulted in exerting tremendous pressure on our natural resources, more on land and water. This problem became all the more acute by the turn of 1980s when growth of yield among irrigated crops and regions, attained during the initial phase of green revolution, has come to an end of a halt. Hence, the future growth of agricultural production will have to increasingly come from dry land regions. Secondly, failure of rainfall especially since 1980s has resulted into highly fluctuating productivity in dry land regions (Shah, 1994), making it difficult to sustain the increasing population on

the farming system alone. Thirdly, the resorting to immediate solutions of tapping groundwater for short term purpose of increasing production has also reached alarming levels. Fourthly, with increasing human and livestock population along with uncertain crop yield has reduced availability of the common property land resources and the bio-mass thereof. Fifthly, frequently crop failure and politically volatile situations in many dry land regions have jeopardized the co-operative support system for credit, input supply and marketing of milk and other farm produce. Together these factors have led to a situation where stabilising high levels of crop productivity becomes essential not only for maintaining a balance between agricultural production and population at the macro-level, but also, for sustaining large proportion of rural households depending on uncertain economic activity with a declining per capita resource base. Natural resource management thus becomes crucial for a long term development goal that takes into account poverty alleviation and sustenance of rural livelihood into its fore. Land and water conservation efforts need to be planned in an integrated manner for this purpose as these two resources, lay the base for agricultural activities, on one hand, and have strong interlinkages, on the other. Specifically, conservation of rain water, checking of soil erosion, recharging of ground water etc. become the central themes for development of agriculture. Development of *watershed development (WSD) Programmes* especially since mid 1980s is a manifestation of such realization (Reddy and Rao, 1999.)

The central thrust of the W.S.D programmes are to enhance productivity of land and water resources on the basis of a scientifically defined watershed that connotes a geo hydrological unit rather than an administrative unit. Land and water are organically linked to each other in such a unit that drains its water in a stream from a common point. The holistic approach that watershed development programmes focus on integrates livelihood sustenance of the rural poor and management and conservation of land, water and vegetation. Such programmes initiate measures for both common and private land, thus bringing into its fold potential conflicts between social and private benefits, conservation and productivity, extensive-intensive farming etc. Broadly speaking, they represent to some extent the usual dilemmas of environment and economic development. It is therefore essential

that the WSD programmes are able to strike a balance between the environmental and developmental needs in a given spatio-temporal context.

1.2 Historical development of watershed projects in India

The concept of watershed has along history, it started as region specific scheme since 1950's. During 1960's special schemes for drought and desert prone areas were launched. The decade from 1970's to 1980's saw the coming up of national watershed development programme like national scheme for soil conservation for river valley projects. World Bank initiated Watershed development project, National wasteland development project etc. It was 1990-91 first holistic watershed programme was launched at the national level by the ministry of agriculture, naming National Watershed Development Programme for rainfed areas (NWDPR) in 4400 micro watersheds covering an area of 4.2 m ha. (Shanker, 1999). The results were encouraging. As against these results the technical committee under the chairmanship of Prof. Hanumantha Rao appointed by the government in 1993 to review and recommend suitable measures for improvement DPAP DDP programmes. In 1994 the committee came up with an *integrated watershed approach with specific guidelines*. Integrating all the programmes like Drought Prone Area Programme (DPAP), Desert Development Programme (DDP), Integrated Wasteland Development Programme (IWDP) was launched by the Ministry of Rural development.

At present different ministry is dealing with different programmes.

Table 1.1 Different Watershed Programmes Undertaken by Different Ministries

Area developed under major watershed development programme of the central Ministries since independence upto 9 th five year of plan							
Sl no		Upto 9 th five year plan		During 9 th five year plan		Total	
		Area treated ha	Total investment lakhs	Area treated ha	Total investment lakhs	Area treated ha	Total investment lakhs
Ministry of Agriculture, Department of Agriculture & co operation							
1	NWDPR(1990-91)	42.23	967.93	27.70	911.00	69.93	1878.94
2	RVP&FPR(1962)	42.83	944.62	12.02	571.58	54.85	1516.21

Area developed under major watershed development programme of the central Ministries since independence upto 9 th five year of plan							
Sl no		Upto 9 th five year plan		During 9 th five year plan		Total	
		Area treated ha	Total investment lakhs	Area treated ha	Total investment lakhs	Area treated ha	Total investment lakhs
Ministry of Agriculture, Department of Agriculture & co operation							
3	Alkali soil(1985-86)	4.84	62.29	0.97	14.09	5.81	76.38
4	WDPSCA(1974-75)	0.74	93.73	1.57	82.00	2.31	175.74
5	EAP	10.00	646.00	5	1425	15	2071.01
	Sub total	100.64	2714.57	47.26	3003.67	147.90	5718.28
Ministry of Rural Development, Department of Land Resources							
1	DPAP(1973-74)	68.59	1109.93	24.79	657.21	93.38	1767.14
2	DDP(1977-78)	8.48	722.79	11.97	519.82	20.45	1241.61
3	IWDP(1988-89)	1.57	101.79	35.66	514.70	37.23	616.49
4	Sub total	78.64	1934.51	72.42	1691.73	151.06	3625.24
5	GRAND TOTAL	179.28	4649.08	119.68	4695.40	298.96	9343.52

SOURCE: Ministry of Agriculture, GOI, 2000

From the above table it is evident that on a national scale, the programmes like National Watershed Development Programme (NWDPR) and Drought Prone Area Programme (DPAP) undertaken by Ministry of Agriculture and Ministry of Rural Development respectively are two most important projects having the highest coverage of area in hectare. Other projects like soil conservation in catchment of river valleys(RVP), integrated water shed management in the catchment of flood prone rivers (FPR), watershed development projects in shifting cultivation area are projects of minor important. The total investment provided by Central Ministry of Agriculture was the highest for externally aided projects and lowest for alkali soil. In case of Ministry of Rural Development maximum area treated is DPAP (68.59hectares) while minimum area accorded to integrated wasteland development project. Total investment for all the programmes both by ministry of agriculture and rural

development shows a declining trend. The only exception is EAP or Externally Aided Projects shows an increase.

From the above discussion some of the principal objectives of all the rural development programmes applying watershed approach are as follows

- Simultaneous development of land, water and biomass resources in the light of the symbiotic relationship among them
- Integrated farming system approach
- Meeting food, fodder and fuel requirements of the human and livestock population that depend on these resources
- Ensuring environmental sustainability along with economic viability by promoting low-cost technologies
- Improving land productivity by promoting better agronomic practices and input use
- Releasing population pressure on land by creating non-farm employment
- Development of local institutions for future management through participatory approach.

The study of watershed programmes from various sources of literature provides a background of the proposed thesis. Thus a review of literature is imperative to formulate the basic objectives of the study

1.3 Literature Review

- Basic concept of watershed management

Water and land are basic inter dependent resources which interact with the bio-systems in any watershed region to form a well-defined resource region. Thus careful planning and utilization of these are of vital need. Watershed is defined as a drainage area of which the runoff leads to a single water body. It is an Eco-system or bio-geophysical unit in which the interdependence is internalized. Monitoring this

watershed and making it as a basic unit for sustained agricultural development has a long history to go. (*Desphande, 1999*)

Increasing emphasis on watershed development programme is the manifestation of the shifting priorities in Indian agriculture sector. Frequent failure of rainfall, depletion of ground water and CPRS, crop failure and politically volatile situation have jeopardize the co-operative support systems for credit, input supply and marketing etc. Besides scientific research of 1970s has opened up new vistas in Indian agriculture. Thus conservation of rain water and checking of soil erosion therefore, becomes the central themes for development of dryland farming. Formulation of integrated watershed development programme since 1980s is the manifestation of this realization. (*Shah, 1998*).

- History of the development of watershed programmes

The concept of watershed programme has a long history in India. Although the Integrated concept began during post 1990s yet it was very much in prominent during 1950s as a sectoral top down programme. It was initiated in 1956 the CS & WCR & TI, Dehradun in 1974 ORPS were taken up of suknomajri & Bunga. Fakot etc. However Ministry of Rural Development initiated the programme of Drought Prone Area Programme (DPAP), Desert Development Programme(DDP), and wasteland development programme(WDP) on the basis of watershed approach during post 1990s. Government of India under Ministry of Agriculture launched National Watershed Development Programme of Rain fed Agriculture(NWDPR-A) in the 7th plan. By 1984-85 work was launched in 4400 micro watersheds over 4.2 m ha. The results were encouraging against these results, the technical committee under the chairmanship of Prof. C.H. Hanumantha Rao appointed by Government of India in 1993, to review and recommend suitable measures for improvement in DPAP & DDP and IWDP. Thus in 1994 the committee came up with Integrated Watershed Development approach in 1994 and it was eventually implemented in April 1995. (*Shankar:1999*)

- Features of watershed programmes

Integrated watershed approach is a much new concept. Some of the salient feature of the current paradigm of people-centered watershed management are:

Institutional Arrangements:

Ministry of Rural Development implements its programmes through District Rural Development Agencies by remitting funds directly to district head quarters. In the NWDPRRA programme of Ministry of agriculture any department like agriculture, watershed development , soil conservation, land development corporations , autonomous Agriculture Technology Management Agency(ATMA)can be identified as nodal agency.

Entry Point Activities :

A maximum of three percent funds are earmarked to create rapport or take up confidence building activities.

Contributions:

Farmers are expected to bear 10 to 15 percent cost of activities on private land and 5 per cent on common land .The contribution rate of SC/ST on individually oriented activities ranges from 5 to 35 percent and 5 percent on common activities.

Watershed Development Funds:

Contribution made by all participants are placed into a separate bank account to build up a corpus fund for sustaining development.

- Women Participation:

They constitute more than half of labour input especially in hilly, rainfed and arid eco-system where male migration elsewhere is quite common for supplementing family income. Women's groups have been relatively more successful in credit and thrift societies, silkworm rearing , and dairying , raising of nurseries , poultry, etc.

Involvement of landless /disadvantaged sects:

Some of the landbased programmes in the past did not focus this category of stakeholders adequately. Of course NWDpra programme of VIII plan made provisions for small production system to serve landless or small land holders.

Convergence:

This is a much larger issue of several dimensions. Heterogeneity in terms of policy, guidelines, norms and institutional arrangement is there across different departments /ministries /donors.

Common property resource management:

Free riding behaviour in the exploitation of common or open access resources like grazing lands, forests , fishing, ground water irrigation canals , biodiversity , etc has afflicted their sustainability adversely. Social fencing through mechanisms of equitable sharing systems, incentives, joint forest management, resource use regulation by the community based institutions has been sharpened in the common approach.

Watershed Budgeting Norms:

Paradigm shift in favour of community organization, capacity building, resource conservation, land based enterprising and livelihood concerns for landless are adequately enshrined in the major budget components.

Monitoring and Evaluation:

This role has been assigned to national, state, district and watershed level multi disciplinary or multi –agency committees.

Conflicts:

Policy initiatives for improving delivery system are usually obstructed by the jurisdictional, attitudinal and behavioral contradictions. Therefore ,capacity building programme to bring about changes in mind set through conciliatory

group dynamics has been accorded high priority in the common approach (Samara 2000)

However, to tackle such vast land resources (75 m. hectare) of India. It has been divided into 4 agro-economic regions (120 agro-climatic zones) classified by Planning Commission. (Reddy & Rao 1999).

- Technical aspects of watershed management

To accomplish these aims and objects in many states modern GIS techniques are in use. Particularly in Andhra Pradesh where government has launched a 10 years perspective action plan in December 1997 for development of 100 lakh hectares of dry and degraded lands. However, in general all over India GIS and Arc View software are being used for digitizing watershed area in each village, area under treatment, number of large small and marginal farmers as well as landless people involved in the watersheds, involvement of SCs, BCs & OCs and various treatments like soil conservation, minor irrigation, Afforestation, Horticulture etc. being fed to computers in digitized maps. The performance of each watershed is being monitored on the above parameters and the corrective actions are being taken wherever required for its future improvement. (Jain: 1999).

The watershed development planning requires a proper blending of peoples requirement and suggestions for solutions with technical information of area to be treated and technically viable solutions. In this regard maps help to have a very clear picture about the condition of the selected area. Computerized GIS provides a much better way to handle such maps, overlaying, scale alterations, quarrying etc (Saraf: 1999)

- Comparative study of several watershed programmes

The Government from time to time has launched number of watershed programmes to conserve and check further degradation of land as well as for restoration of environment and ecology. The individuals and other agencies including foreign donors have also joined the government in these efforts. But there is lack of parity in the working of all these. In the governmental approach emphasis was laid on

the technical aspects while element of sustainability and people participation was neglected. While others hardly emphasize on technical aspect. Thus a common strategy for overall development is needed. (*Srivastava: 1999*)

The projects undertaken by ministries and private organizations show a clear cut disparity. Those who take a more participatory approach and are managed by NGOs have in fact performed better in conserving natural resources and raising agricultural productivity. But such success may come at the expense of the poorest people in watershed areas because improving the management of a watershed usually requires restricting accesses to the natural resource base on which they depend. Thus for watershed development to succeed on a large scale, projects must find a way for all the affected parties to share in the net gains generated. (*Kerr with Pangare 2000*)

Now the application of this watershed programme in village level requires active participation from local people. The ZP is responsible for the implementation of watershed development projects at district level. ZP approves the plan and selection of PIA. It receives the funds directly from the government of India and releases to PIAS and watershed committees for the implementation of approved programmes. ZP also lays down the guidelines for community organization, farmers training, exposure visits and maintenance of accounts. To advice and assists ZP/DRDA a watershed Development Advisory Committee (WDAC) is provided. To discharge the role of project implementation Agency (PIA) a team for every 10-12 watershed are prepared. The Panchayati Raj Institutions at District, Samiti / Mandal and Village level can monitor and review the implementation of programme and give suggestions and guidance for improvements in administrative arrangements and for ensuring convergence of other development programmes to supplement and complement the watershed programme. (*Moinuddin 1999*).

Participatory process and empowerment of village institutions are expected to gather livelihood and realize resource conservation sustainability. Community consultative process, transparency, contributions, equity, gender balance, accountability and replicability are important elements for attaining people's participation. The current paradigm shift calls upon greater involvement of landless

and disadvantaged sections of the society by creating productive employment through promotion of small production systems. (*Samra1999*)

Watershed Management Programme is a people's movement and the government and voluntary agencies are only motivators, at best. It need be our endeavour to see that the watershed programme develops on a gradual basis (tier system). The technologies need be simple and doable at the farm level. And for this assisting the stake holders in their capacity building and create awareness of the details of the programme through training at different levels from policymakers to actual doers. To achieve this noble objective, the indigenous knowledge has to be the start point. (*Venkateswarlu 1999*).

Peoples participation is therefore one of the pre-requisites for successful development of watershed projects. The success story of wasteland development

By women in Metlakunta village of Kottur of Medak District came to light very recently. Here community participation plays the most vital role in managing the vast resources and bring about success in the watershed management project(*Chakraborty1999*)

However in this connection the role of women deserves special mention since women have a closer affinity with the environment and therefore, a greater inclination for conservation. They are the main victims of environmental degradation and hence should play a central role in the management of natural resources. Now a days emphasis is placed on women's concerns for the relational aspects and the totality of the livelihood base. Women has a direct role in nursery raising, plantation, protection of pasture etc. To ensure women's participation special institutional arrangements have been visualized in terms of forming organization like women's thrift groups, kisan mandals and tree growers cooperatives. (*Shah2000*)

However there were many case studies done evaluate the role of women in watershed management, one such was Guraiya Panchyat, Madhya Pradesh. The Gyraiya experience can be viewed from an Eco-feminist perspective which links the emancipation of women, nature and non human species and seeks freedom from patriarchal domination. When deprived and marginalized groups are the focus for

development activities it gives them a sure of purpose and therefore a better chance of success (*Gate 2001*).

The concept of watershed approach has undergone a paradigm shift from sectoral to more holistic approach. the traditional top down approach has not paid any good results partly because of entire stress on biophysical aspects without proper regard for socio-economic aspects. Watershed management programmes should therefore be intimately linked with the people whose socioeconomic and cultural backgrounds play a decisive role in meaningful planning, implementation and operation of watershed programmes. (*sharda:2001*)

National watershed programmes for rainfed areas are doing a very good job particularly in Andrapradesh, Gujarat, Rajasthan, etc. Here dryland horticulture is an important activity of the programme. Tremendous successes has made NWDPRRA a major source of livelihood. (*Sharma:2001*)

Watershed Development Project in shifting cultivation areas (WDPSCA) is a scheme undertaken by ministry of agriculture. It started in 74-75 with main focus on sustaining ecological balance in major hilly regions of India. In Meghalaya major success has been found in umsiang watershed and middle rongre watershed. (*Shah:2000*)

NWDPRRA has been taken at a national level with modified guidelines. Although according to this programme rainfed areas should get top priority yet more well of states generally gets more share. The experience of implementation processes of NWDRA shows that a fresh start is needed. In the face of liberation, if rainfed area have to participate in the market effectively, it will be necessary to improve substantially upon the processes of implementation of NWDPRRA. (*Despande and Thaimmaia: 1999*)

Among various foreign aided projects, Indo-German bilateral projects are one of most important. Their stories tell us about the promotion of self-help group and livelihood improvement in Tamil Nadu and Jharkhand. (*shah: watershed management2000*)

The main approach of IWD is that it is a truly peoples programme and the role of government is to be limited to providing only infrastructural and technological supports. (*Jha1999*).

In short the IWDP will try to integrate conservation of natural resources, soil, water and biological with the process of comprehensive development of the rural areas comprising the watershed. It involves a unique integration of natural, human resources, sectoral activities in agricultural horticulture, pasture, silvi pasture and forestry, innovative approach to community involvement and management.

1.4 The objectives of the study

1. To assess the norms adopted and the consequent impact of watershed development programmes in different parts of India undertaken by different programmes.
2. To analyze the extent of watershed area coverage in major agro climatic zones of India. The programme chosen is NWDPR.
3. To determine how far NWDPR is implemented according to the ecological fragility in terms of the priority given to the spatial extent in different agro climatic zones.
4. To determine the extent to which financial allocation per unit of NWDPR project area depends on the degree of need defined in terms of physical, demography and production efficiency parameters.

1.5 Database

Data availability regarding relevant issues is limited. Data on watershed area extent is available on block level which have been aggregated into district level and then into agro climatic zones. Problems have been encountered in collecting data regarding financial allocation of NWDPR across districts. Such paucity of data restricted the analysis to state levels.

The database used in this work are as follows:

- Agro- climatic Regional planning at State Level-Profiles, issues Strategies & Programmes.

Data related to rural poverty, land productivity, rain fall, groundwater balance, net sown area, density, wasteland, used in the analysis have been taken from here.

- State report on area treated by NWDPR, Ministry of agriculture

Data regarding watershed area coverage across districts all over India are being taken.

- Annual Report on Financial allotment. Ministry of Agriculture, Government of India 2000-01.

Data regarding fund released and expenditure incurred by several states under NWDPR are being obtained.

1.6 Methodology

From the detailed study of various literature catering to watershed development a proposed framework for analysis has been prepared. Most of the literature and various project reports show that there has been mostly microlevel studies conducted at various parts of India. But an overall macro level perspective taking into account the overall condition of Agro-climatic zones are been totally bypassed. Hence on the proposed thesis a macrolevel study of watershed programme has been done across Agroclimatic zones. The programme chosen is NWDPR. To obtain data for such macro level analysis the methodology followed are aggregation of block level and districted data into agroclimatic zone wise. The zone are curved out by the Agro – climatic Planning Unit. Percentage of each area of watershed cover to total geographical area has been done. Computer Cartography techniques particularly Arcview to show the spatially distribution of watershed area. Besides a fragility index has been prepared with the help of Principal Component Analysis. This index has been chosen to see ecological, demographic and social condition of the Agro-climatic zones, so that priority can be given to most fragile zones. Bivariate correlation has been done between Watershed area and financial allocation with need based to see whether it follows the priority process that is whether the most desirable state or agro-climatic zones are getting the right attention or not.

Chapter 2

Overview of Major Watersheds Schemes in India with Special Reference to National Watershed Development Project for Rainfed Areas (NWDPA)

2.1 Introduction

Rural development is the main pillar of Nation's development. The reasons for this are obvious. In spite of rapid urbanization, a large section of our population still lives in the villages. Secondly, rural India is lagging behind in development because of many historical factors. In order to correct the developmental imbalances and to accord due priority to development in rural areas, Ministry of Rural Development, and Ministry of Agriculture and various multilateral and bilateral agencies are implementing a number of programmes aimed at sustainable holistic development in rural areas. The thrust of these programmes is on all round economic and social transformation in rural areas, through a multifaceted strategy, aiming in the process, to reach out to most disadvantaged sections of the society (Reddy and Rao, 1999). In order to catalyze development in rural areas, during last few years, top priority has been accorded to enhancing agricultural productivity, improving degraded land, generating employment etc, not only in terms of allocations of additional funds and resources but also through introduction of new programmes and restructuring of existing ones.

In the last few years, there has been a paradigm shift in the strategy for overall development with focus on decentralization through speedy and effective devolution of financial and administrative powers to the panchayatiraj institutions. A strategic proper policy in terms of which the rural poor are treated as a resource rather than as a burden, whose ideas and experiences are now all integral part of provisions of constitution (73rd Amendment) Act, 1992 and the provisions of panchayats (Extension to Scheduled areas) Act 1996 by December 31, 2002 was adopted by consensus. (*Annual Report Ministry Of Rural Development, 2000*) The most modern and successful manifestation of such policy shift is *Integrated watershed programme*.

At present different government and non government organisations are implementing soil and water conservation measures through watershed approach.

The major objectives of all these includes raising rainfed agriculture, recharging ground water for drinking and irrigation, raising productivity of non-arable lands, reducing soil erosion, skewing benefits towards poorer section of society, creating employment, promoting collective action, and building social institutions. Almost all the projects undertaken by different ministries and various research institutions follow these with varied relative emphasis.

This chapter deals with micro level evaluative studies done by government and non government agencies regarding the success or failure of different watershed programme . From this a possible policy inferences can be drawn which would provide a background to our study.

3.2 An Overview of Various Watershed Programmes in India

There are about four major categories of programmes are being undertaken by different agencies. Different agencies have different areas of emphasis but as a whole they emphasize on several physical and socio- economic parameters. From the evaluative study of the performance indicator a reflection of the objectives can be done. Over and above the emphasis of the several agencies includes raising Rainfed agriculture, recharging ground water for drinking and irrigation, reducing soil erosion,skewing benefits towards poorer members of society,creating employment,promoting collective action, and building and strengthening social institution.(*Kerr 2000*). However all the programmes can be clubbed together into four categories undertaken by several ministries and non government associations.

- Central assisted projects
- States assisted projects
- Non Government organizations
- World bank aided projects
- Foreign collaborative projects
- NGO and Government collaboration projects.

Before analyzing the performance evaluation of micro level studies of government and non-government institutions it is imperative to have a theoretical knowledge of these programmes.

2.2.1 National Watershed ,Programme For Rainfed Area (NWDPRA)

Two-thirds of the country's cultivated area is rainfed. Only one-third or 37percentof the 142 million hectare of land cultivated annually in India is irrigated. The green revolution in the irrigated areas, induced by modern agricultural technologies, by-and large by- passed the rainfed regions. Agriculture in these regions is characterized by low levels of productivity and low input usage, foodgrain yields in rainfed areas are half than those in irrigated regions. Dependence on rainfall makes crop production considerably unstable in rainfed areas, which are home to the bulk of the rural poor.

The central government has accorded highest priority to the holistic and sustainable development of rainfed areas through the integrated watershed management approach (NWDPRA). It was started during 8th Five Year Plan 1990-91 in 25 states 22 union territories. It envisages to develop all rainfed areas where moisture scarcity limits biomass production by adopting the twin concept of integrated watershed development and promotion of the entire farming systems.

The broad objectives of NWDPRA are as follows:

- Enhance agricultural productivity in a sustainable manner.
- Restore ecological balance in degraded and fragile rainfed ecosystems by greening these areas through an appropriate mix of trees, shrubs and grasses.
- Reduce regional disparity in terms of production between irrigated and rainfed areas
- Generate sustained employment opportunities for the rural poor.

The major thrust areas of the scheme includes, integrated development of natural and social resources, adoption of a ridge-to-valley approach with the emphasis

on production enhancement activities for land-owners, and livelihood support for landless families.

Based on the experiences of the 8th plan the NWDPRAs have been radically restructured for implementation during the 9th plan. A common approach for watershed development has been jointly formulated and adopted by the Ministry of Agriculture and the Ministry of Rural Development, Government of India, incorporating the strengths of their earlier first generation-based watershed programmes.

Important features of NWDPRAs are as follows:

- The programmes are implemented by district nodal agency
- Within each state there is no coalition of NWDPRAs and DDP, DPAP, IWDP programmes.
- Reports of land degradation mapping prepared by National Remote Sensing Agency (NRSA) and All India Soil and Land Use Survey (AISLUS) should be utilized by the state and district levels agencies for identification of watersheds to be taken up under the watershed programme.
- Blocks having less than 30 percent of assured means of irrigation are selected.
- Three main categories of personnel associated with NWDPRAs
 - (a) administrators and managers.
 - (b) implementers.
 - (c) trainers.
- Generation of awareness among the community members regarding the new strategy is one of the main features.

- A maximum of 3 percent fund is allocated for Entry Point Activities (EPA) which shall be released directly to watershed agency (WA) by head of District Nodal Agency after its registration under the society act.
- Four types of groups are to be organized at the village level namely: - Self Help Group (SHG), User Group (UG), Watershed Association (WA), Watershed Committee (WC).
- Proper linkage of watershed institutions with Panchayati Raj Institution
- Integration of Social Resource Management (SRM) with Natural Resource Management (NRM) is crucial for achieving sustainable results.
- For a unit watershed of 500 ha the budget provision of Rs. 22.5 lakhs and Rs. 30.00 lakhs has been made for areas having less than 8percent and more than 8 percent respectively.
- Technology mainly includes check dams, drop structures, diversion drains, contour bunds etc.

2.2. 2 Integrated Wasteland Development Programme (IWDP)

IWDP, a centrally sponsored programme, has been under implementation since 1989-90 and was transferred to the Department of waterland development (now Department of Land Resources) along with the National Wasteland Development Board in July 1992. From 1 April 1995, the programme is being implemented through watershed approach under the common guidelines for watershed development.

The basic objects of IWDP are as follows:

- Developing wastelands/degraded lands on watershed basis, keeping in view the capability of land, site conditions and local needs.
- Promoting the overall economic development and improving the socio-economic condition of the resource poor and disadvantaged sections inhabiting the programme areas.

- Restoring ecological balance by harnessing conserving and developing natural resources i.e. land, water, vegetative cover.
- Encouraging village community
- Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village.
- Employment generation, poverty alleviation, community empowerment and development of human and other economic resources of the village.

2.2.3 Drought Prone Area Programme (DPAP)

DPAP is the earliest area development programme launched by the central government in 1973-79 to tackle the special problems faced by those fragile areas, which are constantly affected by severe drought conditions. The major problems are continuous depletion of vegetative cover, increase in soil erosion and fall in ground water levels due to continuous exploitation without any effort to recharge underground aquifers.

Though the programme had a positive impact in terms of creating durable assets, its overall impact in effectively continuing the adverse effects of drought was found to be not very encouraging. Many of the states had been demanding inclusion of additional area under this programme. With a view to identifying the infirmities in the programme and also for considering the case for inclusion of additional areas under the programme, a high level technical committee under the chairmanship of Prof. C.H. Hanumantha Rao, was constituted in April 1993 to critically review the contents, methodology and implementation processes of all area development programmes and suggest suitable measures for improvement.

Based on the recommendations of the Hanumantha Rao Committee, comprehensive guidelines for watershed development, commonly applicable to all watershed programme were issued in October 1994 and applicable from 1.4.1995.

The basic objectives of DPAP are as follows:

- To minimize the adverse effects of drought on the production of crops and livestock and productivity of land, water and human resources thereby ultimately leading to the drought restriction of the affected areas.
- Promotion of overall socio-economic condition of the resource poor and disadvantaged sections.

2.2.4 Desert Development Programme (DDP)

The Desert Development Programme (DDP) was started both in hot desert areas of Rajasthan, Gujarat and Haryana and the cold deserts of Jammu and 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 deserts areas, sand dunes stabilization and shelter belt plantations were given greater weightage. On the other hand, in cold desert areas, since rainfall is negligible, crop cultivation and afforestation could be taken up only through assured irrigation. The programme was reviewed in 1994-95 by C.H. Hanumantha Rao Committee.

The major objectives of DDP are as follows

- 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
- To implement developmental works through the watershed approach for and development and afforestation/pasture development.

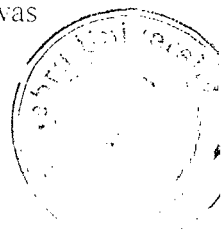
2.2.5 World Bank Aided Projects

Its main focus are on improving drinking water condition, recharging ground water balance, improving irrigation facilities, soil conservation livestock development, horticulture etc.

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2.2.6 Non Government Organisations and State Collaborative Projects

Along with the programmes initiated by the union Government and external Funding agencies, the state government of Karnataka, Maharastra, Andhra Pradesh, Orissa, Madhya Pradesh and Rajasthan have shown special interest in watershed development. As for example Karnataka initiated two major programmes like

1. Dry Land Development Board Programme with an outlay of Rs25 crores
2. Soil Conservation Watershed basis with an outlay of Rs 1.5crore. during 8th plan. Besides various NGOs are also actively participating in watershed management projects. Some of the important NGOs are *Agramee in Orissa*, *MYRADAB in Bangalore*, *Pradan in West Bengal*, *Rusa in MANIPUR*. However their main objectives is socio economic enhancement of rural areas with special reference to tribal society upgradation of tribal economy, along with this other objectives are improving agriculture, irrigation, ground water infiltration etc.

All these theoretical knowledge provides a backdrop to assess the performance of various watershed programmes undertaken by government and non government agencies. Following section deals with analysis of various micro level evaluative studies .

2.3 Comparison of WDP Evaluation Indicators Selected by Ministries and Governmental Agencies, Non-Governmental Institutions and Individual Researchers

All the watershed programmes have got one common objective of improving the general standard of living of rural poor through by sustaining and stabilizing their income and standard of living through natural resource management. A review of the existing literature reveals that while WDPs have had a lot of positive impact, in no way have this impact been consistent. The degree of success of all these programmes undertaken by government, multilateral, bilateral agencies vary from region to region. Some of this inconsistency emerges from the fact that even for similar projects, the evaluation parameter tends to vary depending on the agency that is responsible for such evaluation. For example, assessments done by government agencies and non-

governmental organizations/individual researchers for the same watershed programme vary to a considerable extent. It is therefore important to critically look at the parameters for evaluation of these programmes.

Development of any region incorporates enhancement in the standards of living, resource base and demographic sector which in turn gets reflected in the improvement of firstly, agricultural productivity, cropping pattern, diversification of non farm sector, secondly ground water recharging, and thirdly improvement in literacy, nutrition and health. But all the major programmes are not capable of bringing success in all these arenas. Some may be highlighting demographic sectors while others may take into consideration of socio economic parameters, and still other stress on natural resource base. This analysis is based on micro level case studies of evaluation of WDs programme. We have identified performance indicators that have been chosen by different agencies or individual scholars for this purpose. The performance indicators chosen can be grouped into five broad categories

1. Income related /Economic variables: Horticulture, Income, Crop productivity, Rural Diversification, Revenue return from fallow land, Fisheries
2. Infrastructure
3. Demographic/Social wellbeing: Migration, Female literacy, Nutrition.
4. Natural Resource Enhancement: Soil Conservation, Ground Water Balance.
5. Institutional Parameters: Peoples Participation

From the analysis of various parameters being taken by Government agencies that is Ministries or Government Institutions, and Non government organisation like NGOs, Research Institutes, or Individual scholars provides a clear idea about how the evaluation varies from agencies to agencies. These discrepancies in evaluation might be because of differences in selection of the parameters , which in turn throws much light to the assessment of the programmes. Table 2.1 shows a detailed outline of various programmes.

Table 2.1 Performance Parameters of Major Watershed Programmes in India

Name	Implementing agency	Evaluating Agency	State	District	Economic	Infrastructure	Demographic/ social wellbeing	Natural Resource Base	Institutional parameters	Positive /negative results
1 Government										
Ministries										
NWDPR	Ministry agriculture; state	Ministry of Agriculture	Andhra Pradesh	Markapur village	yes	no	no	yes	no	positive
Do	do	do	do	Giddalur	yes	no	no	yes	no	Positive
Do	do	do	do	Makurampalam	yes	no	no	yes	no	Positive
Do	do	do	do	North Soastal Andhra	yes	no	no	yes	no	Positive
Do	do	do	do	Guddapah	yes	no	no	yes	no	Positive
Do	do	do	do	do	yes	no	no	yes	no	Positive
DPAP	Ministry of rural development	do	Do	Nellore Raylseemae	yes	no	yes	yes	no	positive
Do										
Government funded Institutions										
NWDPR	Ministry of agriculture	Economic Research center	Andra Pradesh	Guddappah	yes	no	yes	yes	no	Both positive & negative
Do	do	IIRS	Harayna	Hissar	yes	no	no	yes	no	Do
2 Non Government										
Individual Scholars										
Integrated Watershed programme	MYRADA	Johh Kerr	Maharastra	25Villages	yes	no	no	yes	no	Negative
Watershed Development programme	World bank and ICAR	Sharma, Indian Journal of Rural Development 1999	Andrapradesh	Giddalur	yes	no	no	yes	no	do
Sukhomajori	Harayana State govt	do	Harayana	Hisar	yes	yes	yes	yes	yes	Positive
Fagot	do	do	U.P		yes	yes	yes	Yes	yes	Positive
Guriya watershed project	Guriya village committee	Smita Gate; IJGS	M.P		yes	yes	yes	yes	nyes	Positive
CSWCRTI		J.S Sharma, IJRD	Harayna	do	yes	no	yes	yes	yes	Positive
IWP	Indo german collaboration	John kerr, IJFP	Maharastra	12 Villages	yes	yes	yes	yes	yes	Positive

Source; Literature review

From table 2.1 it is clear that the choice of parameters varies from government to non government institutions. As a whole Government shows inclination towards physical improvement in the quality of soil, agriculture, water harvesting and income generation, employment and to some extent people's participation. Individual scholars showed a greater tendency towards the social aspects. Thus on the basis of this they have comment on to the conclusions of success and failure of all these programme. Other agencies like World Bank aided projects or foreign collaborative projects over and above shows a better result taking almost all the possible parameters required for development. Hence the success rate is much better In their evolution reports overall holistic aspects have been shown.

2.4 Impact Analysis of Watershed Development Programmes based on Review of Micro-level Studies

From all these micro level analysis taking into account the parameters chosen by various government and non government studies a possible backdrop of impact assessment can be drawn. Almost every study talked about the success and failure of the watershed programmes. This evaluation of micro level studies varies because of possible variations of parameters chosen. Thus from the comparative analysis of various reports various positive and negative aspects of the programme can be highlighted.

2.4.1 Positive Assessment

Improvement in the productivity and resource base: Most of the programmes undertaken by both government and various other bilateral and multilateral agencies it can be inferred that productivity in terms of cropping pattern improvement, yield increase, Horticulture, Fisheries etc showed formidable increase. Improvement in the soil water conservation measures, drainage lines reconstructing are all been highlighted in the various programmes.

Increase in economic well-being: From various case studies it can be said that the one of the major objectives of watershed programme encompasses improvement income, employment, and mass awareness among the rural poor. Most of the case

studies in this regard has given a mixed opinion. From various sources it can be summed up that although all watershed programmes in general has been able to improve standard of living of the rural poor.

2.4.2 Negative assessment

Selection of Sites: From the various case studies it can be inferred that programmes like NWDPR is implemented in more accessible villages close to bus stops, market centres and taluk head-quarters.

Equity Issues: Within the selected watersheds, it has been observed that cultivators, particularly large land owners rather than landless people in the rural community have been benefited more (Kerr, 2000). Some of this Thus by and large these programmes offer benefits primarily to landowners with landless people benefiting indirectly either through peripheral programme or trickle down activities. While programmes undertaken by NGO's are more region specific. This analysis can further be substantiated by reports of few micro level case studies. Table 2.2 shows a particular case studies of NWDPR done by R.S Despande and Thaimahmaiah in the Indian Journal of Rural Development Volume 18 1999

Table 2.2 Case study of NWDPR over selected states of India

Performance indicators	Gujarat	Madhya Pradesh	Maharashtra	Rajasthan
Improvement in productivity	High	Moderate	Significant	Moderate
Employment	Moderate	Significant	Significant	Moderate
Environmental improvement	Moderate	Moderate	High	Moderate
Peoples Participation	Moderate	Low	Moderate	Low

Source: Deshpande and Thimahmaiah, Journal of Rural Development, 1999

This study clearly shows that the rate of increase in terms of agricultural productivity, Employment, Environmental improvement is high or significant in most of the states. However people's participation shows moderate to low development in the four states, particularly in the states of Rajasthan. and Madhya Pradesh. This clearly brings into conclusion the fact that peoples participation is neglected in NWDPR, more so in the Northern states. From these we can say that there is a clear regional divide between Northern and Southern India. In Northern India class heterogeneity is more rigid which leads to conflicts, lobbying and marginalisation of poor people. In the south the social structure is more homogeneous, the grassroot level organisations are well developed. Income level is much well organised particularly in the states of Kerala. Coastal Andhra, etc. Thus watershed programme is of much success there. Another important criteria for success is the institutional set up in which the programme being implemented. In case of Northern India this area has been largely neglected. Mostly the Projects are implemented in extremely poor areas. (Kandi Project in Harayna). In the areas of mixed groups the success rate is much less as the richer class is not at all interested in such small scale programmes. The concept of Direct Approach and Leadership Approach are hardly being taken care off (Reddy:2001). While in comparison in South India both this approach have been a success.

Another case study done by John Kerr in the International Journal of Food Research Policy 2000 shows impact of different watershed programme implemented by different agencies. It shows that during pre 1994 watershed programmes were more inclined towards enhancing physical and technocratic aspect while post 1994 era is more inclined towards social development. The study has been conducted in Maharashtra where agro climatic conditions are difficult or infrastructure and support services have been neglected. Table 2.3 and 2.4 highlights this aspect.

Table 2.3 Impact assessment done by Individual Scholar (1991)

Schemes	Performance Parameters in 1990-91								
	Irrigation	Public Health	Electric Connectio	Informal Credit	Drinking Water	Revenue obtained fuel/govt land	Infrastru-cture	Literacy	People's Participa-tion
NWDPR	moderate	low	low	high	high	high	low	low	low
DDP	moderate	low	low	high	moderat	moderate	low	moderate	low
NGO	low	low	low	high	high	high	moderate	high	high
IWDP	low	low	low	high	moderat	high	moderate	high	Very hig

Source ;John Kerr, Ganesh Pangare, Vasudha Lokur Pangare Watershed development projects in India ,An Evaluation-Research Report 127.

Table 2.4 Assessment of NWDPRA in Maharashtra

Schemes	Performance Parameters in 1997								
	Irrigation	Public Health	Electric Connection	Informal Credit	Drinking Water	Revenue obtained fuel/govt land	Infrastru-cture	Literacy	People's Participa-tion
NWDPRA	high	low	moderate	high	high	high	moderate	moderate	low
DDP	high	low	low	high	high	moderate	low	moderate	low
NGO	high	high	low	high	high	high	moderate	high	Very high
IWDP	moderate	high	moderate	high	moderate	high	moderate	high	Very high

Source ;John Kerr, Ganesh Pangare, Vasudha Lokur Pangare Watershed development projects in India ,An Evaluation-Research Report 127.

Thus from these case studies a clear cut idea about temporal and inter agency policy change can be observed. Both government and non government organizations have shown successful results within their own policy framework, but none of them have been able to bring an overall development for the rural poor. Although the guidelines provided by ministries and other agencies highlights the importance of people's participation, role of women, improvement in the standard of living of the disadvantaged section the net result shows lot of discrepancies. For the projects like NWDPR or DDP, government act as a major decision making body, while people's role is side lined. From table 2.3 and 2.4 it can be inferred that from 1991 to 1997 there has been a policy shift with greater priority been given to the social sector as a whole. However there are lot of dichotomy among Government and Non Government agencies. While government though making progressive development in drinking water, irrigation, and revenue sector yet its results in social wellbeing is very meager. On the other hand the success as being assessed by the authors is highest for Integrated Watershed Development Programme (IWDP) being implemented by Maharashtra government in collaborations with NGOs. The work of NGOs is very much region specific. Thus their success may be at a greater extent but not for a larger scale.

Another factor for the success of the watershed programme undertaken by Non Government agencies is the funding source. In case of Foreign agency the rules for allocation of funds are much strict. Thus irrespective of the implementing agencies the success rate of watershed programme is much higher. People's participation has always been a very important aspect for NGO's but success stories says that leadership factor in a particular project determines its ultimate success. Various other state collaborative projects almost tells the same stories. Thus the main conclusion derived from the above analysis are as follows :

- There has been a shift in the degree of performance of government and non government programmes from pre 1990s to post 1990s. Pre 1990 programmes stresses more on technocratic top down aspect while post 1990 emphasizes more to bottom up social aspect.

- From the evaluation of various performance indicators it can be inferred that as whole Government institutions like Ministries, Government funded Institution shows inclination towards physical improvement in the quality of soil, agriculture, water harvesting and income generation, employment and to some extent people's participation.
- NGO's are more area specific working mainly for tribal population and shows lack of coordination in terms of maintaining records. Other non-government Institutions and evaluation done by individual scholars reflects the importance of social, economic and institution parameters. All these differences in the selection of parameters created differences in the successes of watershed programme all over India. Other agencies like World bank aided projects or foreign collaborative projects over and above shows a better result taking almost all the possible parameters required for development. Hence the success rate is much better.
- The institutional setup

A proper institutional set up should be maintained. In this regard the building block approach deserves special mention. In this approach the entire village is divided into various communities. Among them the most suitable person having the leadership capability are chosen to represent the village. In this way a common group is formed for a particular village. Together with other villages it forms a larger group. Proper coordination among them can thereby ensured it to be a second more competitive and common peoples programme. The second approach is that of leadership. It has been seen that most of the success stories, generally of NGOs are largely dependent on the person giving the leadership. If the leadership is not up to the mark then programme does not show the real success. Besides in most of the cases even if one leader is good it may so happen that the subsequent leaders will be also be good. Thus there is high possibility that there would be lack of consistency in the success of the programme. In this regard the southern states particularly Andhra Pradesh, Kerala and southwestern states like Maharastra, Gujarat perform better since there is less heterogeneity in the class structure. While the Northern states like Uttar Pradesh, Harayana, show a massive difference in the society in terms of economic as well as social structure. Thus forming either

groups or providing leaderships not always become possible. Hence proper evaluation should be done before its implementation. The third approach is of direct implementation to by the people. This will provide a better participation of people making it as a truly peoples programme.

Any rural development project requires a holistic approach which watershed management are supposed to provide but unfortunately there is lot of lacuna in the policy framework. A common guideline, a common inter ministerial office and proper coordination among various ministries and private organization requires a high priority. This could ensure a better future for rural beneficiaries falling under the pretext of watershed programme.

Chapter 3

Evaluation of Prioritisation of National Watershed Development Project In Rainfed Areas (NWDPRAs) across Agro-climatic zones of India

3.1 Introduction

Rainfed agriculture in India's semi arid tropics is characterized by low productivity, degraded natural resources and wide spread poverty. However, the degree of fragility or susceptibility to natural hazards or other variations in the physical, social and economic environment the farmer interacts with is different for different regions. It would be logical to anticipate that to a large extent, such susceptibilities that have direct bearing on the livelihood sustainability of the poor would be linked to agro-climatic zones. In general, it may be observed that most of the people living in Indian semi arid tropics depending on agriculture and natural resource management for their livelihood would be affected by unstable and low income. Giving priority to such fragile areas have been inbuilt in the objectives of most of the watershed development programmes which directs its resources towards encouraging and initiating productive and environmentally sustainable land and water management system.

Watershed development projects are designed to harmonize the use of water, soil, forests and pasture resources in the way that conserves their resources while raising agricultural productivity both by conserving moisture in the ground and increasing irrigation through tank and aquifer based water harvesting. watershed projects have therefore become widespread in Rainfed areas.

This chapter is evaluative in nature where the main objective is to assess whether the prioritization accorded to the different watersheds in terms of their spatial coverage and its growth under NWDPRAs is consistent with their physical and social needs. This analysis has been attempted for 77 major agro-climatic zones across India.

The focus on NWDPRAs is justified as that the regions that are not categorized under desert or drought prone areas but with meager or no irrigation cover often tend to be neglected. This is evident from the fact that NWDPRAs, that cover such areas, have started as late as the 1990-91. Out of 328.7 million hectares of geographical area of India, 142 million hectares is net cultivated. Of these, about 57 million hectares (60 percent) is rainfed. The irrigated area contributes 55 percent of food grains while rainfed about 45 percent. To tackle the problems of degradation of soil and water conditions various sectoral and isolated programmes have been undertaken by several ministries. (Shah: Amita, *Economic and Political Weekly* 1994). National Watershed Development Programme for Rainfed Areas was the first more comprehensive programme that started at 8th plan (1990-91). Its guidelines got changed with due course of time and it has now become an *Integrated Watershed Development Programme*. NWDPRAs under the Ministry of Agriculture have been implemented following watershed approach.

3.2 Watershed area coverage by NWDPRAs

In NWDPRAs, typically an area of 25000 to 30000 hectares is covered under each watershed. Each of these macro watersheds are divided into sub watersheds, each having an area of 5000 to 6000 hectares. Each of these then became the unit of planning (IVARASA-JAN SAHBHAGITA, *Guidelines for NWDPRAs; Government of India, Ministry of Agriculture 2000*). Prioritization of these sub watersheds is usually carried out on the basis of sediment yield, runoff potential index, degree of land degradation, underground water status, etc. Such information is available from All India Soil and Land Use survey. Each of the prioritized sub-watersheds is then divided into micro watersheds each having an area of 500 hectares. This then becomes the unit for management under the Watershed Association. After identification of priority micro watersheds the names of the villages within these watersheds are identified. This is done by superimposing the topographical map on the cadastral maps of the villages. In this manner, a village or a group of villages is selected for planning and implementation.

3.3 Demarcation of watershed area on the basis of Agro-climatic Zones of India

Agro-climatic region is defined as an area having homogeneity in relief, soil type, climatic conditions, farming practices, crop produced and crop associations. India is a vast country and is endowed with diverse geographical conditions, which are to bring regional variations. Such a variations in physical and economic factors has resulted in its divisions into several Agro-climatic zones.

Till now most of the impact analysis and monitoring studies have been done at village level or at best at the micro-watershed level. While the reason for this is understandable, the result of these studies are so varied, that it often becomes difficult to monitor policy and change the existing guideline meaningfully. The present study is an attempt to fill such a gap.. *Secondly*, agro-climatic region serves as a planning tool as it gives an overview of agriculture in economic terms. *Thirdly* based on various Agro-climatic factors, the scarce financial resources can be better channelised

To begin with the analysis India is been divided into 77 Agro-climatic zones (*source: Agro-Climatic Reional Planning At State Level, July 1991*) Such zones are by clubbing together selective districts within each states.

On the basis of socio-economic indicators, natural resources inventory including rainfall, soils, climate and ground water. A detailed analysis of agricultural parameters was attempted and development of irrigation and other infructures indicated. Non crop sectors like livestock and fishery were also included partially.

By clubbing together each blocks a districts level area coverage is prepared which are again clubbed together it form a Agroclimatic zone . In these way 77 Agroclimatic regions are prepared in major selected states in India. The watershed area coverage are calculated in two points of time , in 8th and 9th five year plan ,i.e in 1990-91 and 1997-98. (The districts that are falling under each Agro-climatic zones are given in Appendix 1.1).Percentage of watershed area to total geographical area are being calculated. Table 3.1 explains the extent of watershed area coverage. Also a growth rate percentage from 1991to97 has been calculated to analyze the extent of growth that has been taking place between these two points of time. Ranking of each has been done to have a vivid picture of the programme implementation.

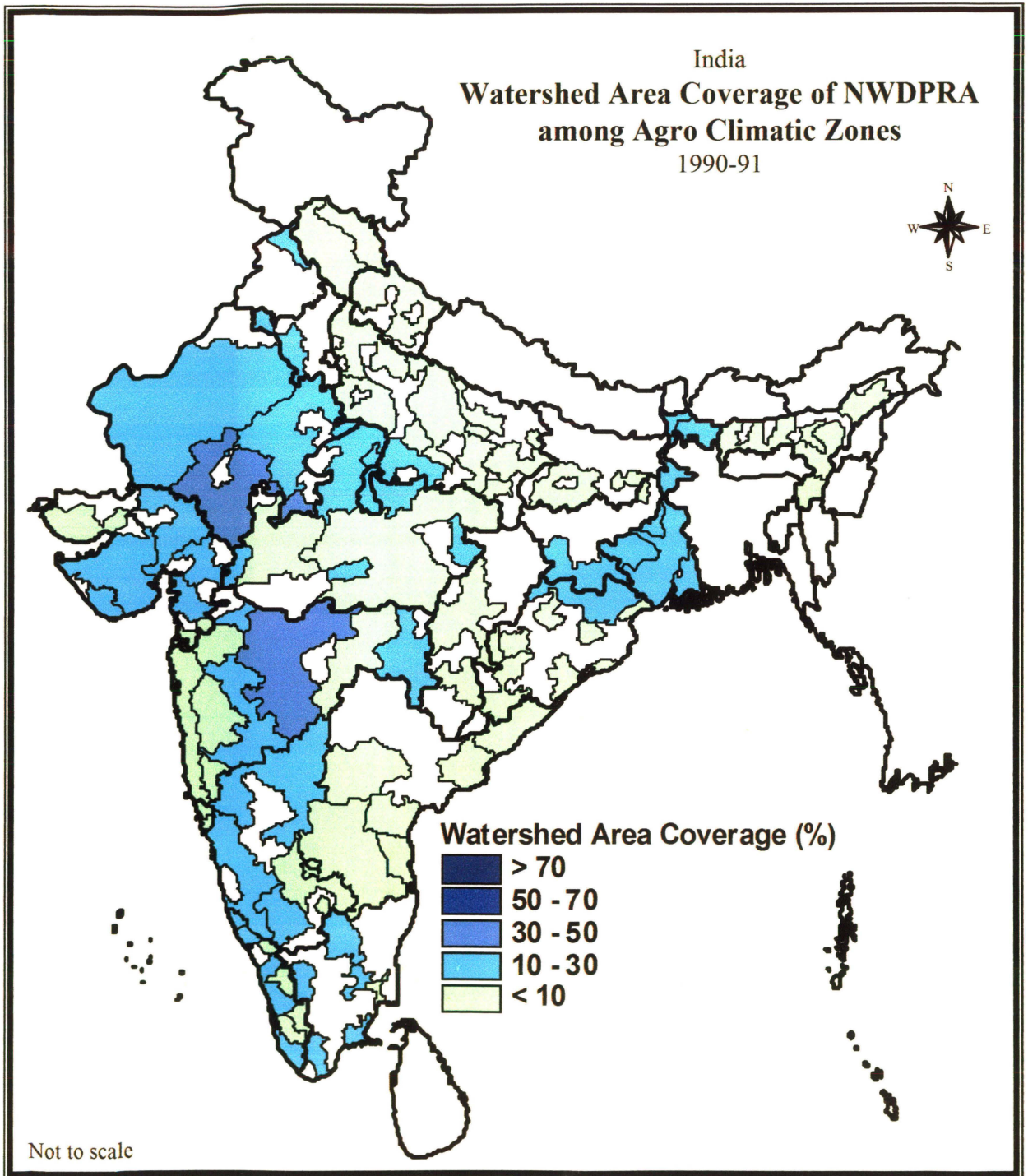
Table 3.1 Percentage Area Coverage of NWDPRP Programme During 8th and 9th plan

STATES	AGRO-CLIMATIC ZONES	Percentage area coverage during 8th plan	Percentage area coverage during 9th plan	Rank of area of 1997-98	Growth rate in percentage from 8th to 9th plan	Rank of growth rate
ANDRA PRADESH	N. Coastal Andra	3.4	5.82	9	71.25	22
	S.Coastal Andra	2.93	5.42	7	85.08	29
	Nellore	3.17	6.89	15	117.87	53
	Rayalseema	7.88	12.93	31	64.14	18
	S.Telangana	3.08	6.17	11	100.49	42
	N.Telangana	3.76	5.83	10	55.39	16
ASSAM	N.E Hills	5.31	9.91	24	86.30	32
	Lower Bramputra	7.67	15.34	39	99.10	36
	Upper Brahmaputra	7.96	15.62	40	96.10	35
BIHAR	S.Bihar Plains	3.89	4.37	4	12.54	7
CHATTISGARH	Chattisgarh plain	1.31	4.81	5	265.81	74
	Chattisgarh hill	9.57	30.75	58	221.46	70
GUJARAT	S.hills	2.85	7.24	17	153.89	64
	S. Gujarat	13.33	26.66	52	100	38
	Middle Gujarat	14.26	31.88	61	123.59	56
	N.Gujarat	11.69	26	50	122.29	54
	NW Arid	2.81	6.65	13	137.09	60
	N.Saurashtra	16.25	36.31	64	123.51	55
GOA	S.Saurashtra	14.14	36.65	65	159.24	66
	N.Goa	3.51	12.59	28	258.23	72
	S.Goa	3.76	13.62	34	262.16	73
HARAYANA	Foothills	7.83	19.47	45	148.53	63
	Arid	12.32	31.83	60	158.26	65
H.P	I(1)	6.18	11.92	26	92.87	34
	3(3)	.27	.53	1	100	38
KARNATAKA	N.Dry region	20.85	30.19	57	106.09	48
	Central region	2.49	49.91	70	139.41	61
	S. Region	14.52	7.82	19	214.11	68
	Hills and coastal plains	14.03	34.78	63	139.48	62
KERALA	Coastal midlands	16.35	29.21	56	108.18	49
	Midlands	7.50	34.06	62	108.31	50
	Hills	5.75	20.81	46	177.36	67
M.P	N.Hills	29.15	7.92	20	37.61	14
	Bundelkhand	23.14	37.21	66	27.66	8
	Keymore plateau	40.68	31.61	59	36.58	13
	Vindhyan plateau	39.33	52.92	74	30.08	9
	Satpura plateau	1.98	51.84	72	31.81	11
	Central Narmada	21.33	3.96	3	100	38
	Grid	27.31	27.9	53	31.41	10
	Jhabua hills	28.83	50.08	71	83.36	28
	Malwa&Nimar plateau	3.32	38.45	67	33.36	12

STATES	AGRO-CLIMATIC ZONES	Percentage area coverage during 8th plan	Percentage area coverage in 9 th plan	Rank of area of 1997-98	Growth rate in percentage from 8 th -9 th plan	Rank of growth rate
MAHARASTRA	E.Vidarbha	11.51	6.92	16	108.73	51
	W.Hills	2.85	19.18	44	66.55	21
	Scarcity region	2.57	6.51	12	128.73	58
	Central plateau	.48	8.21	27	218.91	69
	Central vidarbha	3.30	52.91	73	274.17	75
ORISSA	Konkan	3.30	13.01	32	293.53	76
	Inland	4.45	7.7	18	73.15	23
	N/plateau	12.72	24.53	48	92.81	33
	SW.Hills	3.11	5.45	8	75.20	24
	Coastal	2.53	5.12	6	102.11	45
PUNJAB	Ganjam	6.44	10.43	25	61.91	17
	N.Punjab	14.36	29.14	55	102.92	46
RAJASTHAN	S.Plains	33.61	59.75	75	77.75	25
	E.Plains	22.25	41.36	68	85.88	30
	S.Plateau	49.26	81.42	77	65.28	19
TAMILNADU	West Grid	12.67	25.37	49	100.18	41
	N.region	12.67	45.88	69	115.19	52
	Central region	21.32	12.81	29	85.99	31
	Delta	6.89	65.3	76	237.13	71
UTTRANCHAL	SECoastal	19.37	8.34	22	100	38
	W.Hills	4.17	16.71	42	126.53	57
U.P	NE Hills	7.38	13.81	36	81.05	26
	East Plains	7.63	14.18	38	134.01	59
	Vindyan	4.32	8.76	23	101.71	44
	Central plains	4.48	8.19	21	82.91	27
	NW plains	.32	2.46	2	677.01	77
	S.plains	3.35	6.74	14	101.39	43
	Bundelkhand	11.58	23.57	47	103.59	47
WESTBENGAL	Barind	13.98	13.98	37	0	3.5
	Alluvial	13.28	13.28	33	0	3.5
	Coastal	18.7	18.7	43	0	3.5
	Rarh&E.plateau	12.84	12.84	30	0	3.5
	Terai	26.04	26.04	51	0	3.5
	Hills	28.01	28.01	54	0	3.5
JHARKHAND	Chattisgarh plateau	10.66	15.69	41	47.22	15
	Chatisgarh hills	8.23	13.67	35	65.96	20

Source: Appendix tabl:2

Referring table 3.1, column no 1 and 2 we can have a clear picture of the percentage area coverage of watershed programme. The entire coverage has been categorized into five classes i.e. very low about below 10percent , low from 10percent to 30 percent, moderate from 30percent to 50percent, high 50percent to 70percent



and very high 70percent and above. Area coverage on the basis of these a table has been prepared to analyze area treated under watershed at two points of time.

Most of the area covered under watershed programme during 1991 and 1997 remained same. However particularly in 1997 some area increased in few agro climatic zones, like upper and lower Brahmaputra in Assam, Nand South Goa, Foot Hills of Harayana, 1(1) of Himachal Pradesh. several areas of Madhya Pradesh like Bundelkhand, Hills, Jhabua and Konkan, Gangam of Orissa, Chattisgarh Plains and Chotonagpur hills of Jharkhand, Western hills, North East and Eastern Plains of Uttranchal and Uttar Pradesh respectively have been increased. All these areas increased from low to moderate to very high. However question remains whether such a spatial coverage is in consistent with the physical and social need of the Agro-climatic zones or not. This is however been analyzed in course of discussion. From the growth rate percentage, as been given in table no 3.1 a positive growth rate can be seen from 1991 to 1997. However growth rate has been maximum in the Agro climatic zone of North west Plains and Central Plains of Uttar Pradesh, while no growth rate have been found in West Bengal. Northern Hills, Bundelkhand, Keymore Plateau, Grid and Jhabua of Madhya Pradesh. Besides zones like Konkan, Scarcity Region, Central Plateau and Western hills of Maharastra shows comparatively low growth rate. However whether such growth rate is in consistent with the ecological and social needs of the Agro-climatic zones, are been deduced with the help of a cross sectional analysis with need based of the selected zones

Table: 3.2 Percentage Area Coverage of Watershed Programme (NWDPPRA) in 1991-97 and 97-03

Range	Agro-climatic zones/States in 1991-97	Agro-climatic zones in 1997-03
Very low	A.P North coastal Andra, South Coastal Andra, Nellore, South Telangana. Northern Telangana, Assam North East Hills Lower Brahmaputra, Upper Brahmuptra, Bihar South Bihar Plains, Chattisgarh Chattisgarh Plain, Chattisgarh hills. Gujarat North West Arid Goa North Goa. South Goa, Harayna Foot Hills, H.P 1(1), 3(3), Karnataka Central region Kerala Midlands, Hills, M.P Satpura Plateau, Malwa and Nimar. Maharastra Western Hills. Scarcity region Central	A.P North coastal Andra, South Coastal Andra, Nellore, South Telangana, Northern Telangana, Assam North East Hills, Bihar South Bihar Plains, Chattisgarh Chattisgarh Plain, Gujarat South HILLS, North West Arid, H.P 1(1), Karnataka Southern Region, M.P Northern Hills Central Narmada, Maharastra Eastern Vidarbha, Scarcity region, Central Plateau, Orissa Inland, South West Hills South Coastal, T.N South East Coasral, U.P

	Vidarbha, Konkan, Central Plateau, Orissa Inland, South West Hills, Coastal. Ganjam, T.N Delta, U.P Vindyan, Central Plains, North West Plains, Southern Plains, North East Hills, East Plains. Uttranchal western Hills	Vindyan, Central Plains, North West Plains, Southern Plains,
Low	A.P-Ryalseema, Gujarat Southern Gujarat, Middle Gujarat, North Gujarat, North Saurashtra, South Saurashtra. Harayna Arid, Orissa Northern Plateau, U.P NE Hills, E. Plains, Bundelkhand, C. Plains. T.N Delta Maharashtra-Eastern Vidarbha, Konkan M.P Northern Hills, Budelkhand, Central Narmada, Grid, Jhabua Hills, Kerala Coastal Midlands, Karnataka Northern Dry Region, Southern Region, Hills & Coastal Plain, Rajasthan Eastern Plains, West Grid, T.N Central Region. W.B Barind. Alluvial, Coastal, Rarh and Eastern Plateau, Terai, Hills,	A.P Rayalseema, Assam Upper Brahmaputra, Lower Brahmaputra, Gujarat Southern Gujarat, North Goa, South Goa, Harayana Foot Hills, H.P 1(1), Kerala Coastal Midlands, Hills, M.P Grid, U.P North East Hill, Eastern Plains, Bundelkhand Uttranchal W. Hills, Maharashtra Western hills, Konkan T.N Central region, Orissa Northern plateau. Gangam Punjab North Punjab Plain Rajasthan West Grid, W.B Barind, Alluvial, Coastal, Rarh and Eastern Plateau, Terai, Hills, Jharkhand Chattisgarh Hills, Chattisgarh Plateau,
Moderate	Rajasthan Southern Plateau, M.P Keymore Plateau Vindhyan Plateau,	Gujarat Middle Gujarat, North Saurashtra, South Saurashtra, Harayana Arid Karnataka Northern Dry Region, Central Region, Hills and Coastal Plains, Kerala Midlands M.P Budelkhand, Keymore Plateau, Malwa & Nimar, Rajasthan Eastern Plains, T.N Northern U.P Vindhyan Jharkhand Chattisgarh Plains & Hills
High	No Zones falls in these Category	M.P Vindyan Plateau, Satpura Plateau, Jhabua hills Maharashtra Central Vidarbha Karnataka, Central Dry Region
Very High	Do	Rajasthan Southern Plateau

Source: Computed from table no. 3.1

The above mentioned table has been explained with the help of figures. In the figure 1 the degree of extent of watershed area has been shown for the year 1990-91 and 1997-98. Lighter colour means low percentage of area coverage while darker shade reflects high percentage of area coverage.

Similarly the percentage growth rate from 1991 to 1997 has been shown in the figure 4 where there has been a net increase in the growth of area coverage between these two points of time. Table 3.3 shows the changes in the growth rate pattern

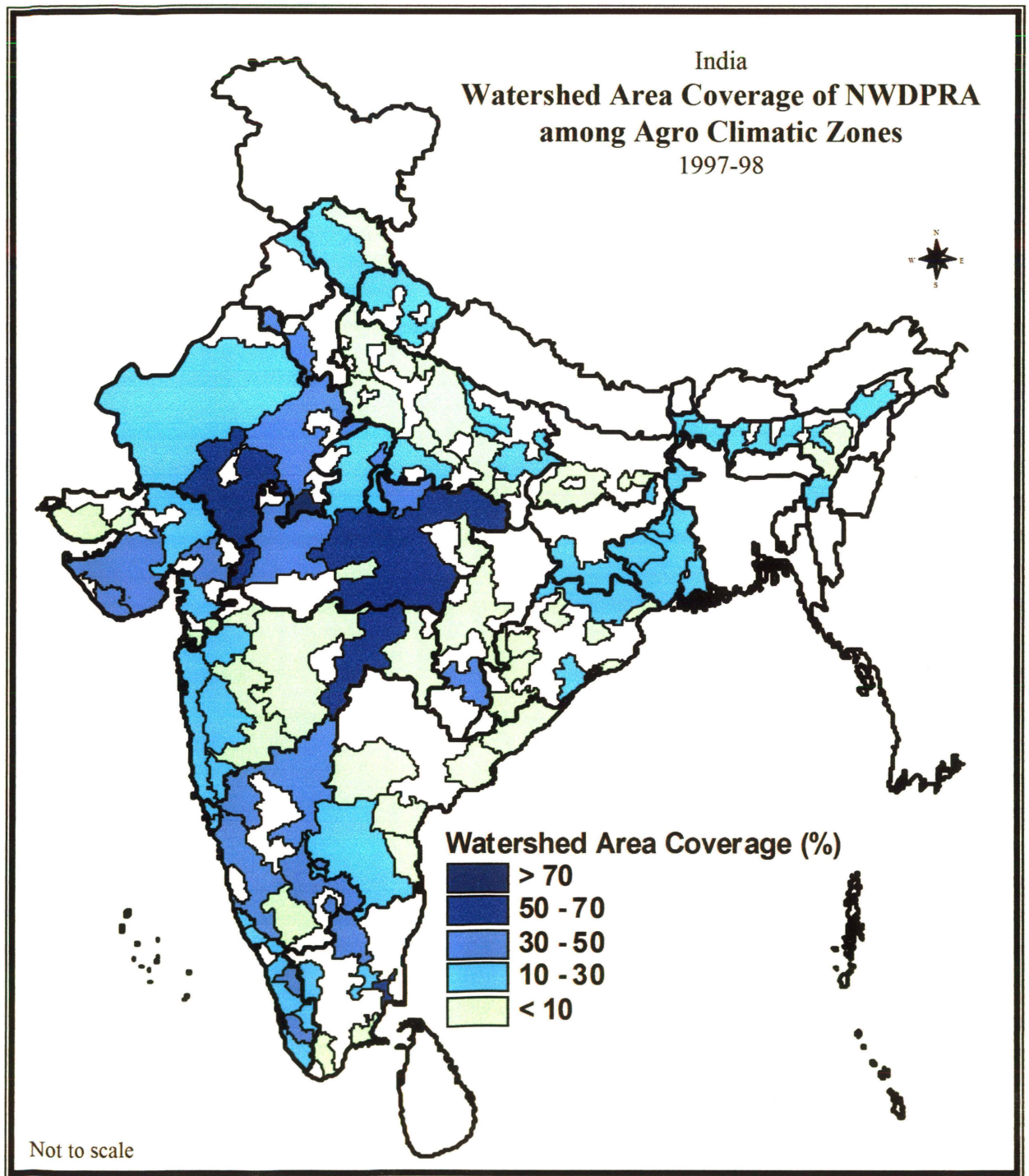


Table 3.3 Percentage Growth Rate from 1991-97 and 1997-2003

Range	Agro-climatic zones
Very High	Chattisgarh Chattisgarh plains & Hills, Goa North & South Goa, Karnataka South Region, Maharashtra Central Plateau, Central Vidarbha, Konkan, T.N Delta, U.P North West Plain,
High	Gujarat South Hills, South Saurashtra, Harayana Arid, Kerala Hills
Moderate	A.P Nellore, South Telangana, Gujarat South Gujarat, North West Arid, North Saurashtra, South South Saurashtra, Harayana Foot hills, H.P 3(3) Karnataka Northern dry Region, Central Region, Hills & Coastal Plains, Kerala Coastal Midlands, Midlands, M.P Central Narmada, Maharashtra Eastern Vidarbha, Orissa Coastal, Punjab North Punjab, Rajasthan West Grid, T.N north Region, South East Coastal, Uttaranchal Westwrn Hills, Eastern Plains, Vindyan, South Plains, Budelkhand
Low	A.P North Coastal Andra, South Coastal Andra, Rayalseema, Assam North East Hills, Lower & Upper Brahmaputra, H.P 1(1) M.P Jhabua, Maharashtra Western hills, Orissa Inland, North Plateau, South West Hills, Gangam, Rajasthan Southren Plains, Eastern Plains, South Plateau, T.N central Region, U.P north West Hills, Central Plains, Jharkhand Chotonagpur hills
Very Low	Bihar South Bihar Plains, M.P Northern Hills, Bundelkhand, Keymore, Satpura. Grid, Malwa & Nimar Jharkhand Chotonagpur Plateau

Source: Computed from table 3.1

3.4 Importance of need based index

Need based index for 77 Agro-climatic zones have been prepared with the help of Principal Component Analysis. Such a need based index will help to have a detailed picture of actual requirement of the zones. This in turn will help to formulate a suitable policy framework. Need based index or fragility index is been prepared by taking into account Resource base indicator, Demographic indicator, Standard of living Indicators. (*Agro-climatic planning unit July 1991*). These variables are as follows:

- *Rainfall*
- *Ground water balance*
- *Total waste land*
- *Average labour productivity.*
- *Density*
- *Rural poverty*
- *Percentage Net sown area*
- *Land Productivity*

Before going into the quantitative analysis let us see how these variables would affect watershed programmes

3.4.1 Rainfall in (mm)

Rainfall (mm) is one of the important resource base indicator which determines the climatic conditions soil, vegetation and human life to a great extent. Its affect on watershed programmes is paramount. For example the states of Rajasthan, Gujarat, having rugged tracts, medium to less rainfall adversely affects agriculture, livelihood pattern and basic survival of human being. Thus scarcity region requires more watershed programmes.

3.4.2 Ground Water Balance (mcm/year)

As measured by mcm/yr is another important resource base parameter being defined as the surplus amount left between recharge and discharge. More is the balance more water is available for agriculture, irrigation etc. Thus proper watershed projects should take into account ground water balance maintenance.

3.4.3 Total Waste Land

It is one of the most important variables used for regionalisation. In India percentage of total wasteland to total geographical area is 20.17%. For preparing the index only one to eleven categories are been taken The categories of wasteland are:

- *Gullied and/or Ravines land*
- *Upland with or without scrub*
- *Waterlogged and Marshy land*
- *Land affected by salinity/alkalinity/coastal/inland*
- *Shifting cultivation area.*
- *Under utilized/degraded notified forest land.*
- *Degraded pastures/ grazing land.*
- *Degraded land under plantation crop*
- *Sands-Inland/coastal*
- *Mining/industrial wasteland*
- *Barren rocky/stoney area*
- *Steep sloping area*

All elements have been added up to find out total waste land that affect watershed programme

3.4.4 Population Density

Among the demographic parameters the most important which determines the prosperity of any region is population pressure. This can be measured as per/sqkm. Less density region coupled up with high rural poverty, low land and labour productivity needs to be taken care off. On the other hand if density is high and other factors like poverty, productivity are low then also more and more land reforms like watershed projects are needed. Thus as a variable population density should be taken into account while framing any policy decisions.

3.4.5 Rural Poverty

Poverty is one of the variables which has affected our policy decision to a considerable extent. The standard of living of any region of any rural India are largely depends on Thus various poverty alleviation programmes are being launched. Various ministry i.e Ministry of agriculture and rural development, NGOs etc taken into consideration the rural poverty of any region and thus framing respective strategies

3.4.6 Land Productivity

As expressed in RS/ha it has a direct impact on standard of living of most of rural India. Better is the productivity better is the condition of living. Thus all land development schemes should take this variable into consideration in order to improve the standard of rural cultivators.

3.4.7 Percentage Net Sown Area (NSA)

Percentage increase of NSA is one of the principle objectives of watershed development programme. Various governmental and non governmental agencies emphasizes technical procedures to enhance net sown area of rural India.

3.4.7 Average Labour Productivity (ALP)

In India in different agro climatic zones all the above mentioned variables vary which in turn affect any policy interventions. Average labour productivity is also one

of them. It is expressed as RS/capita. A prosperous region should have high average labour productivity, again regions where (ALP) is low it should be treated more carefully.

A composite index being prepared for 77 Agro-climatic zones. Principal component analysis has been taken because it *shows the spatial variation of ecological, socio-economic and demographic factors and thus a proper regionalization scheme can be prepared.* The data confers to 1991, paucity of data over Agro-climatic zones at 1997 has restricted analysis with former only. Thus 1991 data have been taken as base year data for correlating with the Thus taking these eight variables into consideration a ecological fragility index has been prepared. By using statistical tool of Principal Component Analysis the index is spatial extent cover across Agro- climatic zones. Among the variables some has received more weitges than others . this has been given in the following table 3.4

Table3.4 Component score coffecient Matrix

Variables	Component1
Population Density	.387
Ground Water balance	.120
Labour Productivity	.160
Land Productivity	.422
Net Sown Area	.188
Rural Poverty	-.201
Total Waste land	.060
Rainfall	.211

Source; Computed from Principal Component Analysis

From the table 3.5 a detailed idea about Rank of composite index can be obtained. Here the ranking is being done on the basis of ascending order for the composite index. That means the region, for example Rajasthan showing highest need has got the lowest value in the composite index. The rank accorded to it is one. Similarly the area and growth rate having highest value are been given one. This means if need is one, that is maximum, and area covered and growth rate is less ,then the policy is badly formulated.

Table 3.5 Deviation Index and Ranking of Composite index 1991 and 1997

STATES	AGRO-CLIMATIC ZONES	RANK OF 1997 AREA COVERAGE	RANK OF FAC	Deviation Index for growth rate	Deviation index for area coverage	Rank of growth rate
ANDRA PRADESH	N. Coastal Andra	69	50	-6	-19	56
	S. Coastal Andra	71	64	15	-7	49
	Nellore	63	46	21	-17	25
	Rayalseema	47	30	-30	-17	60
	S. Telangana	67	17	-19	-50	36
ASSAM	N. Telangana	68	35	-27	-33	62
	N.E Hills	53	40	-6	-13	46
	Lower Bramputra	39	48	6	9	42
BIHAR	Upper Brahmaputra	38	52	9	14	43
	S. Bihar Plains	74	55	-16	-19	71
CHATTISGARH	Chattisgarh plain	73	31	27	-42	4
	Chattisgarh hill	20	9	1	-11	8
GUJARAT	S. hills	50	62	53	9	14
	S. Gujarat	26	56	52	13	39.5
	Middle Gujarat	17	38	48	1	22
	N. Gujarat	28	32	17	30	24
	NW Arid	65	8	16	21	18
	N. Saurashtra	14	34	8	4	23
	S. Saurashtra	13	53	-10	-57	12
GOA	N. Goa	44	59	1	20	6
	S. Goa	61	57	41	40	5
HARAYANA	Foothills	33	67	52	34	15
	Arid	18	36	23	18	13
H.P	1(1)	51	7	-37	-44	44
	3(3)	77	4	36	-73	39.5
KARNATAKA	N. Dry region	21	25	-5	4	30
	Central region	8	29	12	21	17
	S. Region	59	47	37	-12	10
	Hills and coastal plains	15	69	53	54	16
KERALA	Coastal midlands	22	75	46	53	29
	Midlands	16	70	42	54	28
	Hills	32	74	63	42	11
M.P	N. Hills	58	19	-45	-39	64
	Bundelkhand	12	10	-60	-2	70
	Keymore plateau	19	11	-54	-8	65
	Vindhyan plateau	4	15	-54	11	69
	Satpura plateau	6	21	-46	15	67
	Central Narmada	75	18	-22	-57	39.5
	Grid	25	27	-41	2	68
	Jhabua hills	7	6	-44	-1	50
MAHARASTRA	Malwa & Nimar plateau	11	13	-53	2	66
	E. Vidarbha	62	20	-7	-42	27
ORISSA	W. Hills	34	45	-12	11	57
	Scarcity region	66	33	13	-33	20
	Central plateau	56	22	13	-34	9
	Central vidarbha	5	14	11	9	3
	Konkan	46	68	66	22	2
ORISSA	Inland	60	37	-18	-23	55
	N/plateau	30	23	-22	-7	45
	SW. Hills	70	24	-30	-46	54
	Coastal	72	54	21	-18	33
	Ganjam	52	43	-18	-9	61

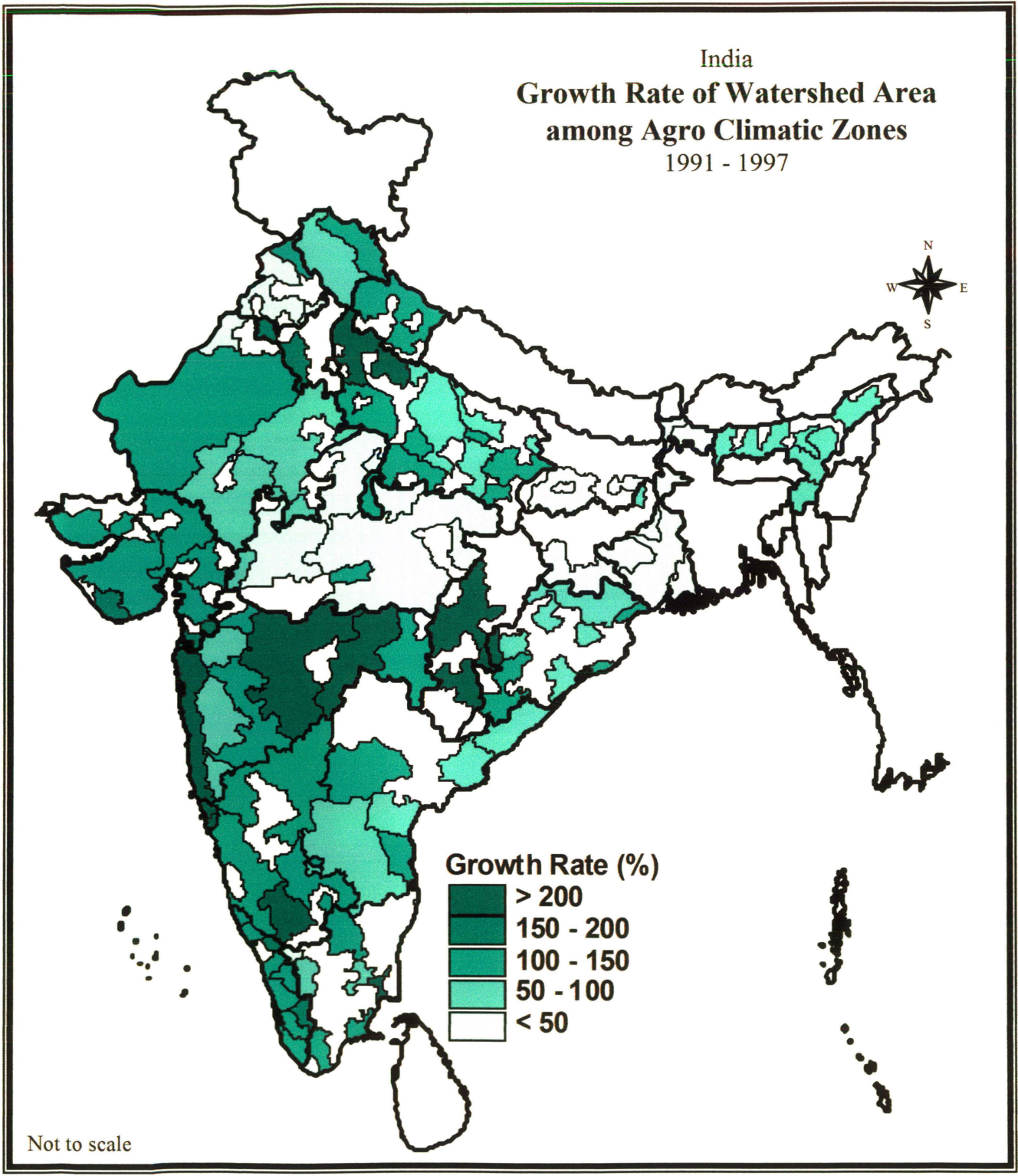
STATES	AGRO-CLIMATIC ZONES	Rank of area coverage of 1997-98	Rank of Fac Index (Need Index)	Deviation of Growth rate	Deviation of area coverage	Rank of growth rate
PUNJAB	N.Punjab	23	65	33	42	32
RAJASTHAN	S.Plains	3	2	-51	-1	53
	E.Plains	10	1	-47	-9	48
	S.Plateau	1	5	-54	4	59
	West Grid	29	3	-34	-26	37
TAMILNADU	N.region	9	44	18	35	26
	Central region	49	49	2	0	47
	Delta	2	71	64	69	7
	SECoastal	55	42	25	-13	39.5
UTTRANCHAL	W.Hills	36	39	18	3	21
U.P	NE Hills	42	63	11	21	52
	East Plains	40	66	47	26	19
	Vindyan	54	12	-22	-42	34
	Central plains	57	76	25	19	51
	NW plains	76	77	76	1	1
	S.plains	64	58	23	-6	35
	Bundelkhand	31	26	-5	-5	31
WESTBENGAL	Barind	41	60	-14.5	19	75
	Alluvial	45	73	-1.5	28	75
	Coastal	35	72	-2.5	37	75
	Rarh&E.plateau	48	61	-13.5	13	75
	Terai	27	51	-33.5	24	75
	Hills	24	41	-33.5	17	75
JHARKHAND	Chotonagpur plateau	37	16	-47	-21	16
	Chotonagpur hills	43	28	-30	-15	18

Source: Computed from appendix table:3

Thus from the composite index a component coefficient matrix can be obtained. This shows which variable are more important in affecting the overall fragility index of the region.

From the above given table 3.3, column1 reflects the weights given to each single variable in the composite index. Here highest score has been given to the land productivity followed by population density. However lowest weightage has been given to the rural poverty. These weights determine the importance of each variable in the composite index. The factorial index (as given in table 3.4) is at 60 percent significance level, the component score matrix highlights that in the overall development Standard of living variable should be given more importance than Land and Labour productivity, particularly and rural poverty at much lesser extent. This should be followed by resource variable where most important is Rainfall, ground water balance, Net sown area, and waste land. If a planner wants to improve

India
Growth Rate of Watershed Area
among Agro Climatic Zones
1991 - 1997



region, land productivity, population density labour productivity percentage net sown area etc should be given more priority. In the region where all these variables are at poor condition that region requires more treatment. Thus soil water conservation programme like watershed Management should operate in arid to semi arid region where either resource base is fragile or standard of living is poor.

The purpose of these need based index is to correlate with the spatial coverage of watershed area so as to see whether it is consistent with the need of the respective region. In this regard agro climatic zone has been used to have a macro level perspective to actually observe the true picture behind success. Table 3.5 gives the detailed account of the composite index of all 77 agro climatic zones. The index is then ranked according to ascending order. This means that index having smallest value has been given smallest number. This in turn means that region having the highest need shows the lowest value. Thus Rajasthan having lowest ranking and Kerala having highest one. This in turn is being compared with ranking of 1997 percentage area coverage and ranking of percentage growth rate. The percentage area and growth rate between 1991 and 1997 has been ranked in a descending order. From this a deviation index is being calculated by subtracting rank of area coverage and rank of percentage growth rate from need based respectively. This again will help to see actual picture in terms of policy implementation. This means if need is more and area coverage is less then the policy is not consistent with the fragility condition of the Agro-climatic zones. Then the value of deviation index would be negative which in turn reflects the lacuna in the policy. If the deviation index is zero then spatial extent of watershed area is in perfect consistent with the need of the region, thus it can be stated that the policy there follows the correct path. If the deviation index is positive then also there is lack of consistency between area coverage growth rate and need of the region. Here it means less is the need while more is the coverage. Thus more closer it is to zero better is the policy framework.. From these a range is being prepared that ranges from High need, Moderate need, and Low need.

From the given table 3.5 it is evident that need index ranking is lowest in Rajasthan in the zone of eastern plains where need is maximum. While the value is highest in Uttar Pradesh where the need is minimum. Major Agro-climatic zones are

then categorized into low medium and high need on the basis of composite index values.(Refer to table 3.4) From the associated figure 5, a clear idea about the fragility condition can be observed. The states of Madhya Pradesh, Harayna, Maharastra, Orissa,Rajasthan, Andra Pradesh are some of the most needed states While the states of West Bengal, Kerala , Karnataka, shows a better results.

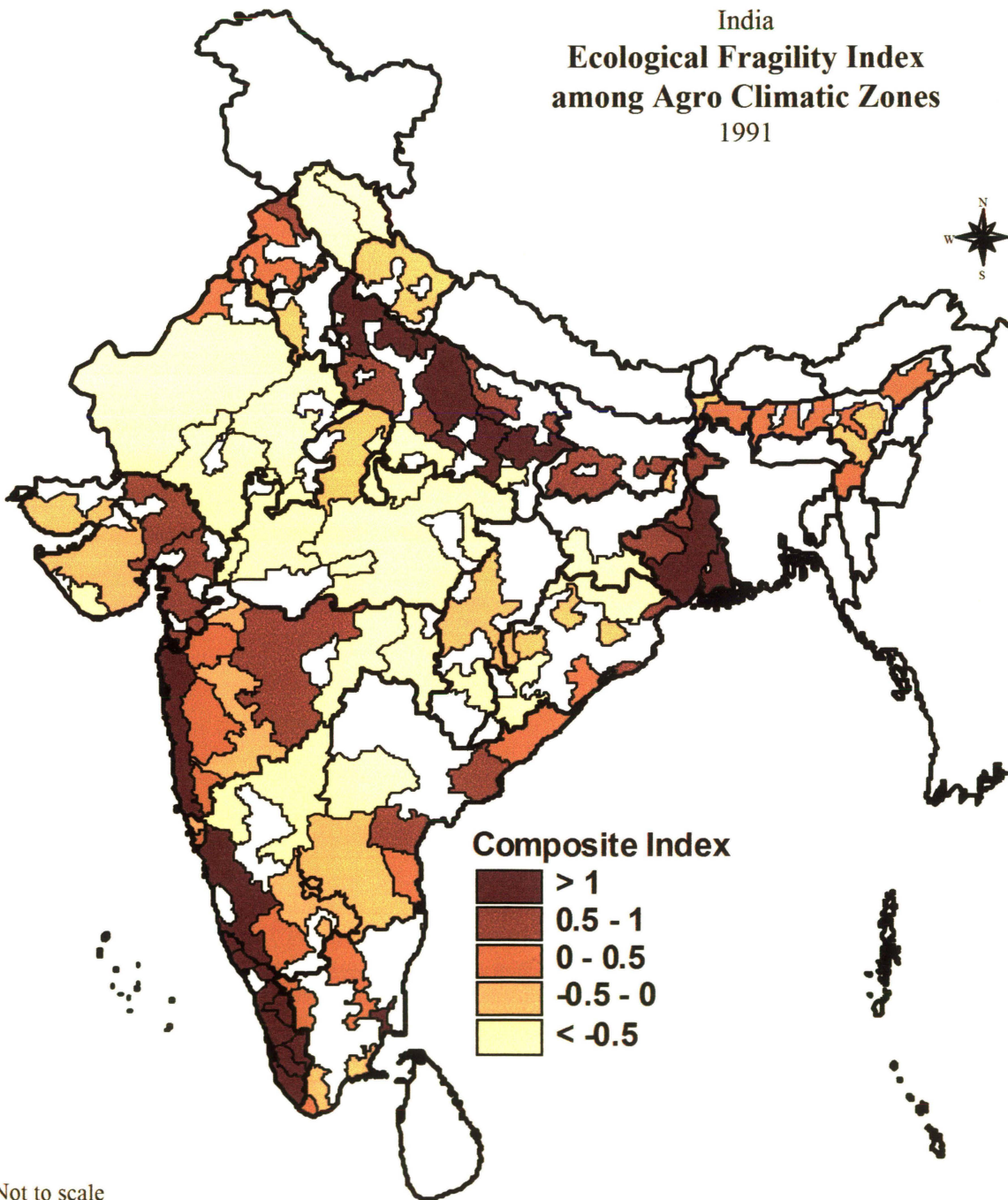
In order to further look into the relation between watershed area and need based index a Pearson Correlation has been derived. The negative answer will disregard the null hypothesis which says that there is no correlation between need base and area coverage of watershed programme.

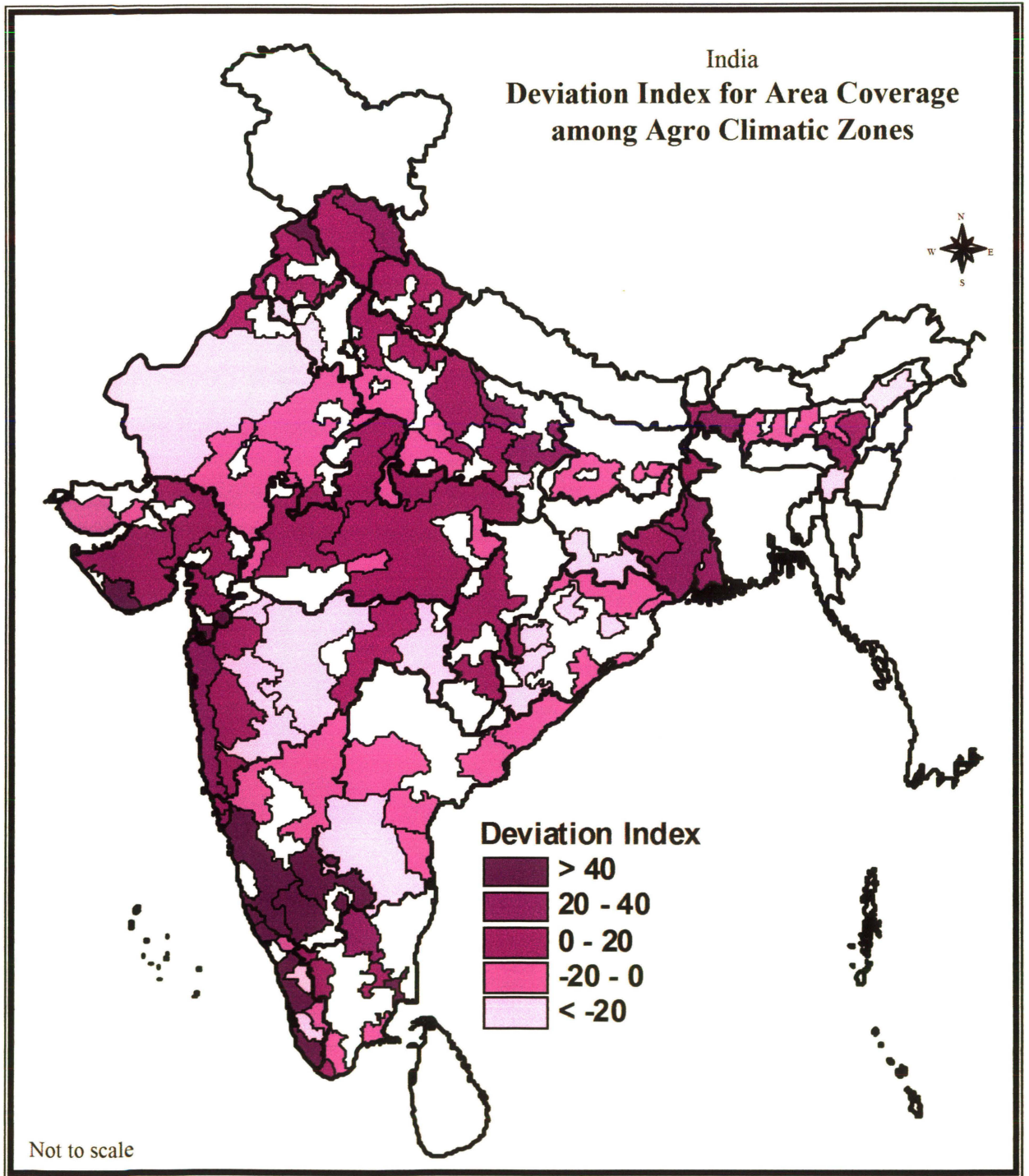
Table3.6 Categorization of need based index in major agro-climatic zones of India

Ranges	Agro-climatic zones/States	Remarks
Very High to High need	A.P Rayalsemma,Southern Telangana Northern Telangana, Assam North East Hills, Chattisgarh Chattisgarhill Chattisgarh Plains, Gujarat NorthWest arid. North Saurashtra,South Saurashtra, Goa North Goa Harayna Arid, H.P 1(1),3(3) Karnataka North Dry Region Central region M.P Bundelkhand.Keymoreplateau,Vindyan Plateau,Satpura.Central Narmada,Grid,Jhabua hills,Malwa &Nimar Plateau, Maharastra Centralvidarbha. Eastern Vidarbha,Western hills, Scarcity region, CentralPlateau Orissa Northernplateau,SouthWesternHills, Rajasthan Southern.Plains,Eastern.plains,Southren.plateau,West Grid T.N Southern coastal, Uttranchal Westren Hills, U.P ,Vidyan,Bundelkhand Jharkhand ,Chattisgarh plain&Hills W.B Hills	All these requires a special care specially climatic factors plays a greater role. All these regions specially in the states of Rajasthan, Andra pradesh,Maharastra, Gujarat the deviation index from needbase to area coverage is more.
Moderate need	A.P NorthCoastal Andra, South Coastal Andra, Nellore, Assam Upper&Lower Brahmaputra, Bihar S.Bihar Plains.,Goa South goa Gujarat Southern Hills,,North, Middle &South Gujarat Karnataka Southern Region, Orissa Coastal, Ganjam, Punjab North Punjab Plains,Western hills,SECoastal Region,Central region, T.N Northern region,Central Region, U.P Southern Plains, W.B Barind ,Rarh, Terai	Greater care has to be taken since these are mixed zones, having positive to negative deviation. Hence carefull analysis has to be taken.
Low need	SouthCoastalAndra,,Southern Hills Harayna Foot Hills, Kerala Coastal midlands, Midlands, Hills, Maharastra Konkan T.N ,Delta, U.P East plains,Central plains, North West Plains W.B Alluvial, Coastal.	Requires lower attention comparatively. Here sometimes more emphasis has been given. This highlights the policy error.

Source: Computed from factorial index(table 3.4)

India
Ecological Fragility Index
among Agro Climatic Zones
1991





From the table 3.7 it is clear that the states of Andrapradesh, Gujarat, Himachal Pradesh, Maharashtra Orissa, Uttar Pradesh, Jharkhand Shows a very high negative deviation from the normal that is here the area coverage is much less than it is needed. While on the other hand very high positive growth can be seen in the States of Goa, Kerala, Some Zones of Tamil Nadu, and Punjab. Here watershed area coverage is much more than it is actually needed. Only the zone of Central Region of Tamil Nadu has a perfect matching with the ecological need of the region. This has been illustrated with the help of figure 6. Growth index also varies from positive to negative. Maximum positive growth deviation occurs in the states of Kerala, Some zones of Tamil Nadu, Uttar Pradesh particularly in the North West plains. While maximum negative deviation are generally occurring in the states of Himachal, Madhya Pradesh, Rajasthan. That means here growth is much lesser than the required amount.

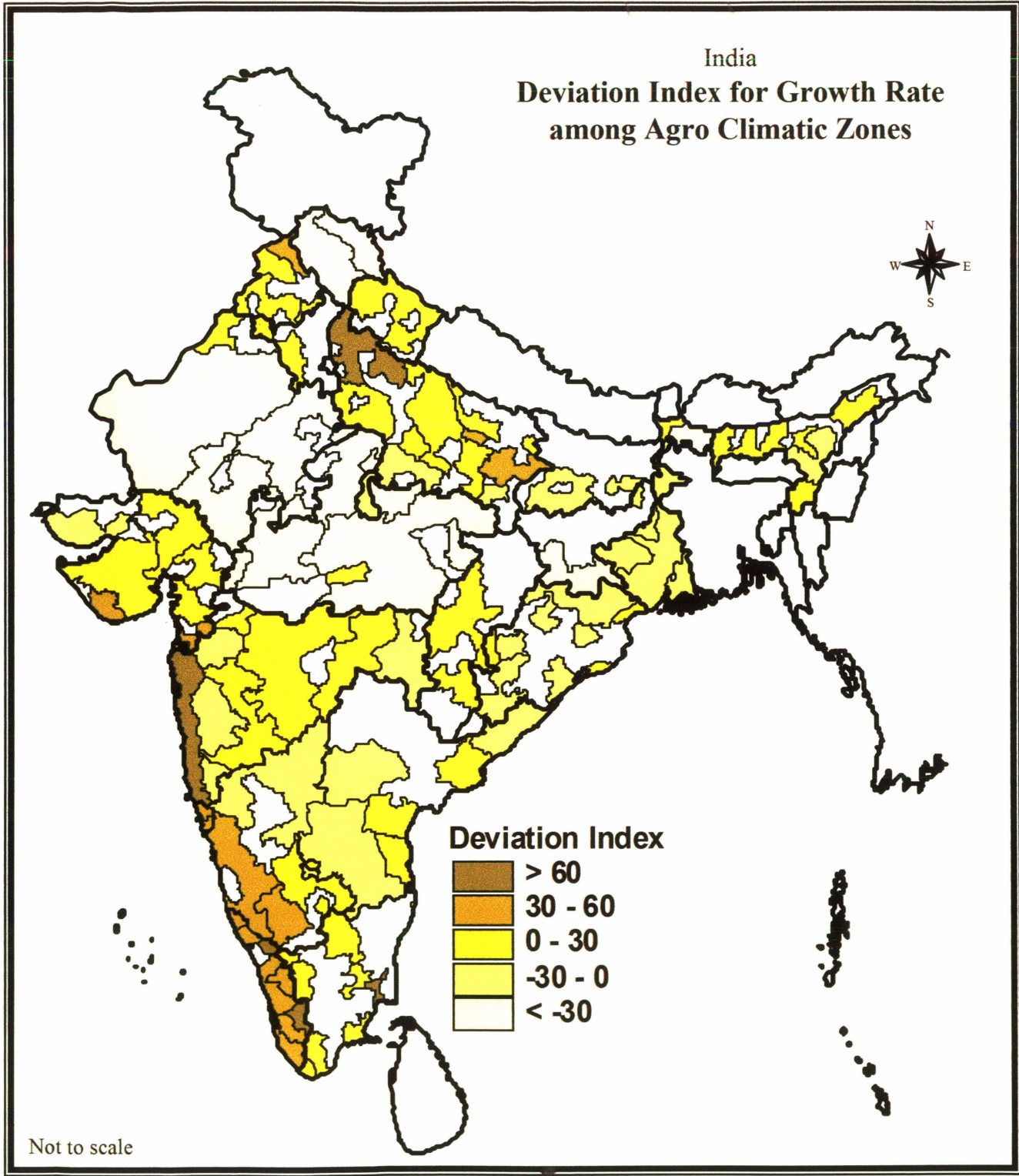
This can be shown in the following table

Table 3.8 Deviation of growth rate

Range	Agro-climatic zones
Very high positive deviation	Kerala Hills, Maharashtra Konkan, T. N. delta, U.P. north West Plains
High deviation	Goa North & South Goa, Gujarat Southern Hills, Southern Plateau, Harayna Foot Hills, Arid, Karnataka South Hills, Hills & Coastal Plains, Kerala Coastal Midlands, Midlands, Punjab North Punjab, U.P. eastern Plains.
Moderate deviation	A.P. South Coastal Andra, Nellore, Assam Lower & Upper Brahmaputra, Chattisgarh Chattisgarh Plain & Hills, Gujarat Southern Gujarat, Middle & Northern Gujarat, Northern Saurashtra, Harayna Arid, Karnataka Central Dry Region, Maharashtra Scarcity Region, Central Plateau, Central Vidarbha, Orissa Coastal, Tamil Nadu Northern Region, Uttaranchal Western Hills, U.P. southern Plains.
Moderately Bad Negative Deviation	A.P. North Coastal Andra, South Telangana, Rayalseema, Northern Telangana, Assam North East hills, Bihar South Bihar Plains, Gujarat North West Arid, Karnataka Northern Dry Region, M.P. central Narmada, Maharashtra Eastern Vidarbha, Western Hill & Plains, Orissa Inland Northern Plateau, South West Hills, Ganjam, U.P. Vindhyan, Bundelkhand, W.B. Barind, Terai, Jharkhand Chotonagpur Hills.
Very high Negative Deviation	H.P. 1(1), 3(3), M.P. UNDELKHAND, Keymore, Vindhya, Satpura, Grid, Jhabua, Malwa & Nimar Plateau. Rajasthan Eastern Plains, South Plains, South Plateau, West Grid, Jharkhand Chotonagpur Plateau

Source: Computed From Table 3.4

India
Deviation Index for Growth Rate
among Agro Climatic Zones



Not to scale

Thus from the above discussion it can be stated that the regions where the deviation is very high negative are most affected area. Here the growth rate is not at all in consistence with the need of the zones. Thus a wide loophole in the policy decision can be observed. However in the zones where growth is more than it is actually needed proves the fact that there is no uniform development of the watershed regions in parity with the resource requirement, improvement in the standard of living and overall holistic development of the area. So far discussing over the important issues it can also be stated that number of policies having high negative values are more in number than its positive counterparts. Hence this is been proved that NWDPRAs do not take into account the regional variations of agro climatic zones and thus are not been implemented according to the need based criteria of the zones. From the Pearson correlation method the **r value is coming -.283 at 1% significance level.** This nullifies the null hypothesis that means that there is no relation between watershed programmes and fragility condition of various zones Hence the policy needs to be modified based on the agro climatic zones' needs.

3.5 Summary

Thus from the above discussion we can conclude that NWDPRAs need a fresh look to the policy framework. Since, a vast country like India, which has got diversified climatic, soil, resource, and social conditions, formulating any rural development programme requires a careful evaluation of such variables. Thus prioritization of watersheds in each agro –climatic zones of the country is a demanding task. It is desirable that selection of each project during the plan period should be strictly based on objective criteria namely degree of Fragility, Environmental degradation. Although a new guidelines are being formulated during 1994 on the basis of prior experience and also on the recommendation of Hannumantha Rao committee. Yet a common guidelines are yet to be formed which can take into account the holistic view of its performance. How far the programme goes with the development index of the regions in terms of financial allocation is been discussed in the next chapter.

Chapter 4

Comparison of Requirement and Financial Allocation per unit Area under NWDPPRA: A State-level Analysis

4.1 Introduction

In the previous chapter a quantitative analysis of estimate of watershed area coverage over major agro-climatic zones and its comparison with the need based index of the selected zones have been done. This however provides an insight only to the quantitative aspect of NWDPPRA. Theoretically it is possible that low fund allocation has been spread over large areas, and this would affect the quality of work undertaken under the WDP. In this context, in absence of other variables, per hectare expenditure has been used as a measure to capture quality of implementation of programmes undertaken under NWDPPRA. Dearth of data has restricted the study to the state level and a state level need based index has been prepared to enable a proper comparison.

The objectives of this chapter are two fold:

- To compare the performance of different states in terms of fund allocation by central government and its utilization by state government.
- To assess if the per hectare expenditure is consistent with the ecological fragility index of the states.

4.2 Mechanism of allocation of watershed budget by central governments under NWDPPRA

Men, material, money and time are the prerequisites for the initiation, planning, implementation and maintenance of any project. Positioning of required number of right persons at different levels of time, building their capacity to discharge their responsibilities and monitoring the progress of implementation to complete the project are the functions of administration. Similarly, preparing the component-wise and activity wise cost estimates, indicating the source of funding, procuring the

required funds as per approved allocation and maintaining the accounts are the expectations from financial arrangements.

All the development projects, including water shed projects, are implemented by the government departments, institutions and non government organizations, with their administrative and financial backups. The implementation, achievements and impact of the community and the area development projects of government have been reviewed all over the country by the technical committee, constituted by the Ministry of Rural Development under the Chairmanship of Prof. Hanumantha Rao during 1994 and the impact of these programmes was not found as expected. Thus the Committee recommended that the watershed development projects should be planned, implemented and maintained with the active participation of village community for the satisfactory and sustainable development.

Allocation of budget for watershed programme under NWDPRA is being done for different components falling under the programme. For a unit watershed of 500 hectare the budget provision of Rs 22.5 lakh and Rs 30.0 lakh have been made for areas having less than 8 percent and more than 8 percent slope respectively. The broad allocation of funds for major components are given below

Table 4.1 Allocated of funds among various components

SI no	Components	Allocation of funds(%)
A	Management component	
	• Administration costs	10.0
	• Community organization	7.5
	• Training programme	5.5
	SubTotal	22.5
SI No B	Development Component	
	• Natural Resource Management	50.0
	• Farm production system for land owing families	20.0
	• Livelihood support system for land less families	7.5
	Sub Total	77.5
	Total	100.00

Source: Guidelines of watershed Development (2000) Ministry of Agriculture

About 50 percent of the funds are used for natural resource development , namely land and water. For conservation and development of natural resources a minimum contribution of 10percent for individual oriented activities and 5percent for community oriented activities would be collected from the users or user groups The contribution from sc/st may be a minimum of 5percent for individual oriented as well as community oriented activities. The 20percent fund for farm production system (for land owing families) is to be used for three sub components namely testing and demonstration of new technologies (in agriculture and allied sectors), Diversification of production system (Planting of horticulture & Agro forestry crops, household production system) and adoption of proven technologies .The funds allocated for testing of technologies may be used as 100percent grant from the project and 50 percent contribution from the participants. The funds for adoption of proven technology may be used as a revolving fund to be provided through mature user groups against micro plans.

The 7.5 percent of the fund for livelihood support system is to be used for improving the income, nutrition and food supplement from existing livelihoods as well as for adoption of new micro-enterprises. This amount will be used as a matching share to the revolving fund through small household group against a specific micro plan. The concerned members of the groups would make the choice of livelihood support and technologies. The watershed team may however organize training cum exposure visits of group members to success stories, particularly where new micro enterprise is being practiced. The required amount of fund is being given from the watershed association . The user group is expected to open a separate account in bank to operate the fund.

4.3 Expenditure compared to Allocation of funds among different states under NWDPR

Under the programme of NWDPR the entire funding is been done for the states by the central government for a particular plan period. From the total money allotted each year specific amount is being released depending upon the performance of the previous year. From that amount state spends and even in some cases expenditure exceeds the amount of fund released. If in a particular point of time the

fund gets under utilized then it gets carried over so that each and every fund gets utilized properly. Following table shows percentage of expenditure to fund released at two points of time.

Table 4.2 Percentage allocation of funds and its utilization among various states

States	Percentage expenditure to fund released (1990-91 to 196-97)	Percentage expenditure to fund released (1990-91 to 2001-02)
Andhra Pradesh	98.05	100.37
Assam	66.53	982.09
Bihar	34.39	213.82
Goa	35.85	842.89
Gujarat	98.12	112.48
Harayana	102.81	153.67
Himachal Pradesh	97.36	177.14
Karnataka	103.49	151.14
Kerala	99.95	107.77
Madhya Pradesh	100	124.97
Maharastra	106.81	134.84
Orissa	91.19	142.64
Punjab	94.71	200.58
Rajasthan	98.79	154.06
Tamil Nadu	100	162.82
Uttar Pradesh	88.37	205.42
West Bengal	78.87	138.75

Source: Computed from table no in the appendix

From the table 4.2 it is clear that there is no rationale in the matter of fund allocation. Most of the states at the end of 8th plan performed badly. These are more evident in the states of Bihar, Goa, Uttar Pradesh and West Bengal. However better performance are done by the states of Karnataka, Harayana. However the performance is better at the end of 9th plan, with the previous unutilized money are being properly utilized. This is particularly observed in the states of Bihar and Goa, Punjab, Uttar Pradesh. Following table shows the performance range among different states in 1991

Table 4.3 Utilisation Status of Resources under NWDPR under the 8th Plan

Range	States
Over utilized	Harayana, Karnataka, Maharastra, Kerala
Perfectly utilized	Tamil Nadu, Madhya Pradesh,
Under utilized	Andra Pradesh, Assam, Bihar, Goa, Gujarat, H.P, Orissa, Punjab, Rajasthan , Tamil Nadu Uttar Pradesh, West Bengal

Source: Derived from table 4.2

Table 4.4 Utilisation Status of Resources under NWDPR under the 8th and 9th Plan

Range of Utilization	States
• Largely overutilised	Assam, Goa
• Moderatly overutilised	Punjab, Bihar, Uttar Pradesh
• Lesser Extent overutilised	Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharastra, Orissa, Rajasthan, Tamil Nadu, Andhra Pradesh, West Bengal

Source; Computed from table 4.2

From table 4.4 it is clear that during 1997-98 all the states have over utilised the funds. Among them the highest being Assam and Goa. While to a lesser extent the utilisation of funds are been done by states of Gujarat, Harayana, Himachal Pradesh, Karnataka, Kerala, Maharastra, Orissa. Rajasthan, Tamil Nadu, Andhra Pradesh and West Bengal. Over and above there is lack of uniformity and flexibility in terms of funds released fund is far less than satisfactory. It is therefore necessary to have a second look at the allocations at the beginning of every financial year and revise them based on feedback from the respective states.

4.3 A comparative analysis of per hectare expenditure in watershed area with the ecological and social need of the different states under NWDPR

In order to have a holistic view of quality of work undertaken in different states under NWDPR, expenditure per hectare of watershed area are been chosen, at the two points of time, in the 8th Plan and cumulatively, both for 8th and 9th Plan. From

the analysis a clear picture of which states are expending more and that of less. Following table shows per hectare money spent by different states under NWDPR. In 1990-91 the states of Maharashtra, Orissa, Uttar Pradesh have incurred higher percentage of expenditure per hectare.

4.5 Per hectare expenditure of watershed area across states

States	Percentage expenditure per hectare 1990-91	Percentage expenditure per hectare 1997-98
Andhra Pradesh	4.19	3.74
Assam	2.75	1.86
Bihar	3.65	4.85
Goa	0.30	.43
Gujarat	2.55	2.35
Harayana	1.88	1.52
Himachal Pradesh	4.71	4.92
Karnataka	3.68	3.15
Kerala	5.82	5.02
Madhya Pradesh	1.65	2.02
Maharashtra	12.41	7.85
Orissa	8.22	6.39
Punjab	3.41	2.43
Rajasthan	2.29	2.73
Tamil Nadu	4.04	5.24
Uttar Pradesh	7.32	7.22
West Bengal	1.37	2.79

Source: Computed from appendix Table:4

Per hectare expenditure varies both spatially and temporarily. Two point of time that is 1990-91 and 1997-98 has been chosen to have a detail idea about expenditure incurred in NWDPR. Per hectare expenditure can be divided into three classes that is below 1 percent, about 1 to 5 percent, and above 1 percent. The condition is almost similar at two points of time. High per hectare expenditure can be seen in the states of Uttar Pradesh, Kerala, Orisa, Maharashtra, Similar condition can be observe during 1997-98 but the trend is declining. Here

highest percentage can be seen in the same states with only addition of Tamil Nadu. Very low expenditure can be observed in the state of Goa both during 1991 and 1997 respectively. While rest of the country shows a moderate performance of expenditure spending, during two points of time particularly in the states of Assam, Bihar, Gujarat, Harayana, Karnataka, Punjab, Rajasthan etc. Following table shows these extent of expenditure incurred among states across time.

Table 4.6 Range of expenditure per hectare of watershed across states in 1990-91 and 1997-98

Range of expenditure	States in 1990-91	States in 1997-98
Low	Goa	Goa
Moderate	Assam, Bihar, Goa, Gujarat, Harayana, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Punjab, Tamil nadu, West Bengal	Assam, Bihar, Goa, Gujarat, Harayana, Himachal Pradesh, Karnataka, Kerala, Rajasthan, Punjab, West Bengal
High	Maharastra, Kerla, Orissa, Uttar Pradesh,	Maharastra, Kerla, Orissa, Uttar Pradesh, Tamil Nadu

Source: Computed from table 4.3

Above done analysis from table 4.5 and 4.6 shows that the Expenditure per hectare of watershed varies from state to states. Now the question remains, whether the expenditure is occurring consistent with the priority of the states or not. That is to say whether the planning authority is taking into account the ecological fragility, Environmental Degradation or depletion of resource base into consideration. Thus the next section throws light on these issue.

The need index or ecological-fragility index are being calculated for different states. Here dearth of data has restrained the analysis to the state level. The method of Principal Component Analysis has been used for this purpose. The variable used are being divided into three major groups. These are (1) Resource base variable, which includes Ground water balance, annual rainfall, Total waste land, Percentage net sown

area.(2) Demographic variable represented by population density, (3) Variable indicating standard of living being represented by land productivity, Average labour productivity,rural poverty. A holistic approach should take into account all these together and should implement in those areas where need is maximum. Following table shows the factorial index of resource base and standard of living for each states:

4.7Table of rank of ecologically fragility index

States	Rank of factor index of Resource base	Rank of factor index of standard of living
Andra pradesh	4	3
Assam	13	14
Bihar	2	5
Goa	15	16
Gujarat	11	6
Harayana	16	13
Himachal Pradesh	4	10
Karnataka	7	11
Kerala	12	17
Madhya Pradesh	1	1
Maharastra	5	4
Orissa	6	7
Punjab	17	15
Rajasthan	3	8
Tamil Nadu	10	9
Uttar Pradesh	14	2
West Bengal	9	12

Source: appendix table:5

From the table 4.7 it is clear that the rank of factorial index, in column 2 and 3,shows the degree of variation of need among different states. The region having the worst condition has the lowest value while the region having the highest per expenditure has been given the highest value(Referring to the appendix table). Now the purpose is to evaluate whether the actual needy states are expending more per hectare, which in turn will provider an idea about degree of fund outlays of the ministries. The demographic variable shown by population density has been

standardized to have a better comparison with the need base. Following table shows the deviation index between needs base and expenditure incurred. This provides a insight to the degree of deviation from the requirements of respective state. Lastly a combined index , taking all the parameters into consideration have been done to get a better comparison with the expenditure.

4.8 Table of deviation index of major states in India

States	Deviation index of resources base	Deviation index of standard of living	Combined index	Deviation index of combined need base
Andra Pradesh	-4	-5	-.54	-3
Assam	-2	-1	-.11	-5
Bihar	-5	-2	-.42	1
Goa	-2	-1	.48	-3
Gujarat	-2	-7	-.24	-4
Harayana	0	-3	1.24	0
Himachal Pradesh	-2	4	-.87	-3
Karnataka	-2	2	-.48	-3
Kerala	7	12	1.14	10
Madhya pradesh	-13	-13	-1.39	-13
Maharastra	4	3	-.93	1
Orisa	3	4	-.45	4
Punjab	5	3	2.75	5
Rajasthan	-8	-3	-.81	-7
Tamil Nadu	6	5	.21	8
Uttar Pradesh	12	0	.07	9
West Bengal	-1	2	.35	3

.Source: Computed from appendix:5

From the table 4.8 an idea of expenditure done by different states per hectare can be obtain Both the resource base and standard of living shows a similar trend where most of the states particularly of arid ,semi arid tract of western and central India shows less expenditure in comparison to their ecological and social need. The states of Karnataka , Kerala , Maharastra, Orissa, Tami Nadu, Uttar Pradesh West Bengal shows a better performance where expenditure per hactare is equal to or more than the need. Even from the combined index similar picture can be obtain

Hence table can be prepared showing which are states falls under high resource and high per hectare category vis- vie states opposite to that.

4.9 Table of range of need base and expenditure per hectare among various states of India

Need Base				
Expenditure / hectare		High	Medium	Low
	High	Maharastra	Orissa, Karnataka,	Kerala
	Medium	Andra Pradesh, Himachal Pradesh	Bihar, Assam	
	Low	Madhya pradesh, Rajasthan	Gujarat	Goa, Harayna, Punjab, West Bengal

Source: Computed from table 4.6

Thus from the table 4.7 it is clear that financial allotments are not very flexible and it also do not take into account the ecological and social need of various states. This has been further proved with the help of Pearson correlation conducted among per hectare watershed expenditure with the resource and standard of living variable, for which the r values are -0.38 and -0.30 both of which are negative and insignificant. However the relation with the demographic indicator and expenditure is positive but again insignificant (r value= 0.07).

This is indicative of the fact that there is no relationship among per-hectare expenditure, resource base and standard of living. In fact ideally the expenditure should take into account tall these indicators. Hence it can be conclude that NWDPRRA does not follow the priority zone concept of spending more per unit of area covered in the more desired areas.

To sum up, our analysis shows the following:

1. The fund allocation is possibly low in all states with respect to the requirement, as considering the cumulative position of the 8th and the 9th plan, we see that all the states, without any exception has overspent compared to the allocation. There is

however, no apparent relationship with the degree of over-spending and the level of development of the state.

2. There is no relationship with the quality of work, as measured by the proxy variable of per-hectare expenditure, undertaken under NWDPRRA and the overall requirement of different states as measured by a composite index including economic, demographic and resource-base of different states. Even these parameters separately do not have any correspondence with the per-hectare expenditure of the states.

It has been argued here that the states that are more vulnerable in terms of overall livelihood status in rural areas should be able to cover a wider range of objectives more intensively, compared to the states that are better-off. The first step towards achieving this would be to allocate greater resources per unit of area covered, which is not obviously been followed in case of the project we have selected for our analysis.

Chapter 5

Summary and Conclusions

5.1 Introduction

With liberalization, the policy towards agricultural development in India has become complex than ever before. Infrastructural development takes equal priority along with development of the bypassed regions, crops and peasant classes, which did not receive the benefits of the technological change of mid sixties. Rainfed areas, crops and the population of these areas suffered both in terms of resource shares and the consequent decline in capital formation in the agricultural sector. This had an adverse effect on the overall agricultural growth of these region (*Chakraborty: 1999*)

As a result, rainfed areas remained more or less out of the ambit of the seed-water fertilizer technology. (*Deshpande & Thimmaiah: 1999*). The constraints of water availability were quite predominant in these areas and the pace of natural resource degradation was quite fast.

Recognising the pressing need of getting rainfed areas on the mainstream agricultural growth, early initiatives in the post-independence period were taken in terms of Grow More Food Campaign, DPAP, DDP etc. However, most of these were , technical and followed top-down approach and did not gain considerable results as expected in the rural areas .

One of the important milestone in the policy towards rainfed farming emerged from the beginning of the 6th plan. It for the first time attempted to put the framework of rainfed farming within the watershed development approach to check the spread of drought & deterioration of arable land and enhance natural vegetative cover of non-arable land. The policy was strengthened during the 8th plan which gets reflected in the programme of **National Watershed Development Programme for Rainfed Areas.(NWDPPRA)**, taken up by **Ministry Of Agriculture** during 1990-91.It has four fold objectives. These are as follows:

- To harvest rainwater

- To conserve soil moisture
- To extend cropping systems and farming practices for increasing production & mitigating risk.
- To make it as a bottom-up approach, so as to bring common people into it.

In this thesis an attempt to evaluate watershed programme with particular reference to NWDPRRA has been done. The choice of NWDPRRA as a programme of study is quite justified because it is one of the most important programme undertaken by Ministry of Agriculture in terms of area coverage and also money spent. Another important criteria for its selection is that this has started in 1990-91. Thus proper availability of data and its comparison with the performance of the later periods can be done. This is not possible in case of other programmes like DPAP, or DDP, since most of them started during 1974 where earlier data are not been maintained.

From the so far analysis of qualitative as well as quantitative performance of watershed programmes with reference to NWDPRRA some basic findings are obtained. These are as follows.

5.2 Summary

The main objective of the second chapter is to have a critical look at the parameters for evaluation of the programmes undertaken by different agencies and individual scholars. A comparative study of government and non-government projects, shows that the government projects are more technocentric, when compared to the non-government counterparts, which are more socially oriented. From the performance assessment of selection of different parameters chosen by Ministries, Government institutions, non government institutions and individual rescheres show a lot of variations in their evaluations. One of the possible reason could be the selection of the parameters made by them. However from such comparative analysis it can be sum up that most of the evaluation done by Ministries and government institution highlighted physical aspects like improvement in agricultural productivity, income and conservation of natural resource base. While the demographic as well as the institutional parameters like peoples participation are being ignored by them.

While Non Government institutions like Ngos and individual rescherchre stress more on the latter parameters.

Again from the impact assessment of watershed programmes being done by different agencies highlights both the positive as well as the negative aspects of the programmes. Almost all the case studies have shown that watershed programmes both government and non government are successful in enhancing agricultural productivity, generating income and to tap natural resource base there by bringing overall development in the physical and economic sectors. However the negative aspects of the programme are firstly, in most of the cases particularly in case of government programmes the social and institutional aspects like poverty and peoples participation are being sidelined. Secondly, the funding pattern also varies to a large extent which in turn determines the success of the programmes. Mostly when the funding is done by external agency, irrespective of the implementing agencies the performance is better. One possible reason could be the strictness of the norms being set by the funding agencies, which in the case of external funding sector like World Bank are much strict than government agencies and state collaborations. This brings better results in case of former watershed programmes. Thirdly, the selection of the watershed area is another determining factors of success. Where in case of Government projects like NWDPRAs mostly large landholdings, better accessible villages are chosen for programme implementation, which are owned by big landholders thus making the poorer sections for whom the programme was actually meant for remains outside the ambit of the success. Forthly, there are lot of variations in the extent of success of all these programmes. Mostly a regional divide between Northern India and Southwestern India can be seen. In case of southern as well as western India the success rate is much higher than Northern. The possible reason could be heterogeneity of the society in case of latter and lack of grassroot level organisations.

The second objective of the study is to evaluate the spatial extent of watershed programme (NWDPRAs) over major agro-climatic zones of India, and also to see whether such programme is being implemented in consistency with the need based of these agro-climatic zones. From the quantitative analysis it can be inferred that there

are lot of variations in terms of spatial coverage of watershed programme over agro-climatic zones. The states like Rajasthan , Gujarat, parts of Andhra Pradesh fragile tracts of Himalayas and Deccan tracts show a low coverage. While moderate coverage are seen along coastal plains & Western. plains where natural resources are high, yet productivity is low. High to very high are found in arid & semi-arid, tract of Madhya Pradesh, parts of Maharastra etc where resource base is low to moderate. Planning Commission 2000). Table 5.1 provides a broad view of the percentage area coverage in different Agro –economic zones, which includes several agro- climatic zones.

Table 5.1 Area Coverage in Agro-Eco. Zones

Agro-Economic Zones	Features of Agro-economic zones	Range of area coverage in 1990-91	Range of area coverage in 1997-98
Zone 1.	Levels of productivity & rainfall is high.	Moderate to high.	Moderate to high.
Zone 2.	Abundant water resources but low productivity.	-do-	-do-
Zone 3.	Peninsular region, including Rajasthan.	Moderate to low.	Moderate to low.
Zone 4.	Ecologically fragile Himalayas.	Low to very low.	Low to very low.

Source : Computed from Table 3.2 in chapter 3.

The question that whether this programme being implemented in consistent with the need based shows a different picture altogether. In case of NWDPRRA, the implementation is not been done on the basis of priority of the region. The agro-climatic zones having poorer index in terms of natural resource base, economic stability and social heterogeneity shows much lesser spatial coverage than areas having better off condition. Thus implementation is not taking place in the zones of priority.

Thus we can say that given the limited resource availability in developing countries, the rationale for proiritisation is a well established norm . In this regard, NWDPRRA needs to review the current policy implementation and include the relative

fragility of different agro-climatic zones for resource allocation within its policy framework. Since a vast country like India, which is characterized by diverse climatic and soil resource, as also social and economic conditions, formulating any holistic programme for rural development requires a careful evaluation of indicators reflecting the vulnerability position or risk status of different regions. Thus prioritization of watersheds in each agro-climatic zones needs to be carefully worked out, which is a demanding task. It is desirable that selection of each project during the plan period should be strictly based on objective criteria as indicated by our study.

As far as the third objective is concerned the study has been restricted to state level because of dearth of data over agro-climatic zones. Here a qualitative performance of NWDPRAs have been analyzed in terms of allocation of funds and its consequent expenditure by respective states. It further analyses whether such expenditure is in consistent with the resource need, demographic need and livelihood standard of the concerned states. The basic findings are, that the fund allocation is possibly low in all states with respect to the requirement, as considering the cumulative position of the 8th and the 9th plan, we see that all the states, without any exception has overspent compared to the allocation. There is however, no apparent relationship with the degree of over-spending and the level of development of the state.

There is no relationship with the quality of work, as measured by the proxy variable of per-hectare expenditure, undertaken under NWDPRAs and the overall requirement of different states as measured by a composite index including economic, demographic and resource-base of different states. Even these parameters separately do not have any correspondence with the per-hectare expenditure of the states. The Pearson correlation also shows no relation among various above mentioned variables with the per hectare expenditure. The states which are poor in terms of resources show low expenditure than compared to more richer states.

It has been argued here that the states that are more vulnerable in terms of overall livelihood status in rural areas should be able to cover a wider range of

objectives more intensively, compared to the states that are better-off. The first step towards achieving this would be to allocate greater resources per unit of area covered, which is not obviously been followed in case of the project we have selected for our analysis. Thus from the above analysis it is thereby evident that policy variables does not take into consideration all the requirements while expending an watershed.

5.3 Conclusion

Quantitative and qualitative analysis, exhaustive literature review and also from experience from several micro level studies an insight of overall performance of NWDPRA can be drawn. Although impact assessment of any programme can not be done by surveys through micro level studies yet we can infer that NWDPRA in several instances show considerable success particularly in terms of improving productivity, generating income, conserving natural resource base etc. But in case of generating mass awareness regarding the importance of the programme among rural poor the success rate is much restricted. Again its implementation on terms of agro-climatic zones in consistence with the need of the zones are mostly overlooked. When resource is limited, prioritisation is extremely important. Evaluating from this angle we have come to the conclusions that by and large NWDPRA failed either to accord priority to agro-climatic zones in terms of area covers or to the states in terms of per hectare expenditure. Either of which do not confirm with the requirement in terms of physical, socio-economic and demographic vulnerability.

5.4 Future Policy Implications

Watershed programmes have been receiving high priority from the union govt. the states, multilateral and bi-lateral agencies and the NGOs. The programme has been identified as a major priority area for future agricultural development in India (*Reddy & Rao, 1999*). So far discussed about the performance of watershed programme in general and NWDPRA in particular, a suitable policy framework can be identified. Several case studies, quantitative as well as qualitative analysis notifies the fact that watershed programmes needs a thorough modification. In this study some of the important issue emerges out are that in most of the cases a macro level analysis

have been overlooked. Small micro level case studies do not show the actual picture. Thus for all major programmes in general and NWDPRAs in particular need an all India level evaluation.

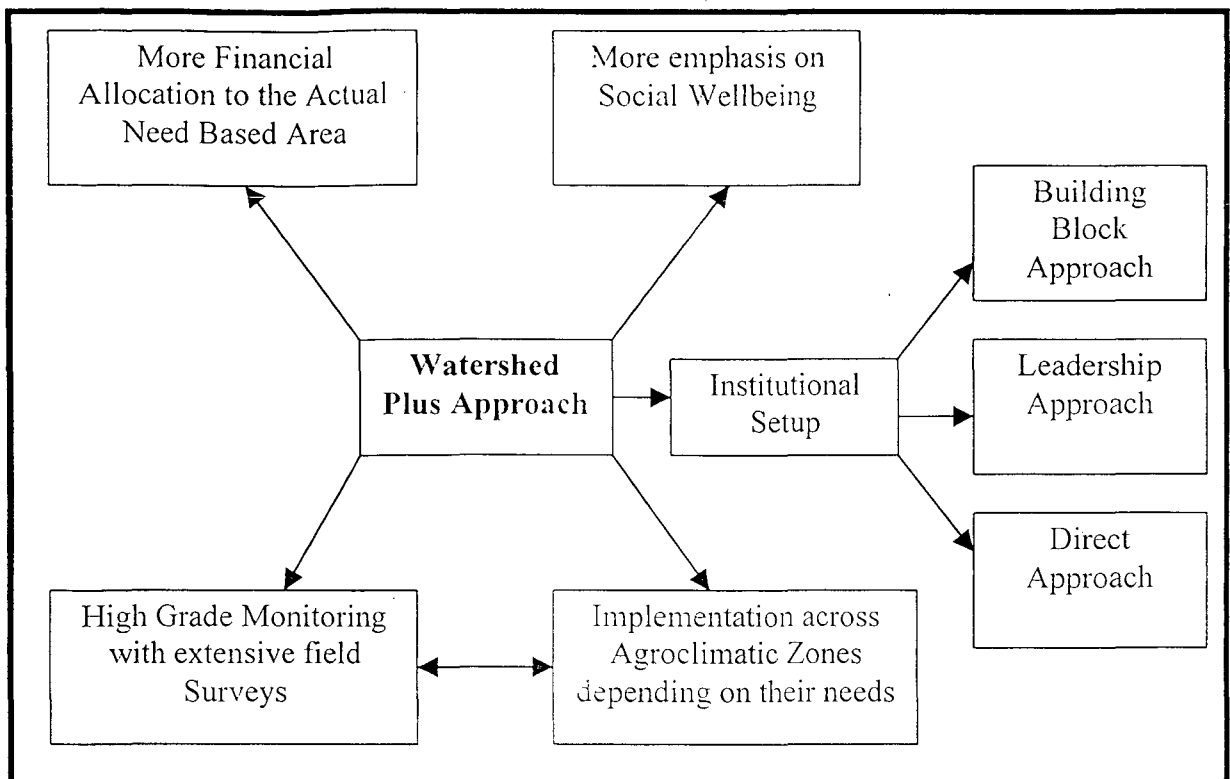
Secondly, there has been a regional disparity among North India and South, South West India in terms of success rate. Here the latter performed better. Now the reason probably as being stated earlier is that of differences in the institutional setup. Thus to mitigate such differences proper institutional arrangements should be done. In this regard the concept of Direct Approach, Leadership Approach and Building Block Approach could be followed. Particularly in case of North India Building Block Approach should be followed. This means that several villages should be divided into different blocks, among them some competent people should be chosen to initiate the programmes so as to make it more people's programmes. To achieve this it is important to unify the multiplicity of watershed programmes within the framework of one guideline and with active involvement of Gram Panchayats, self-help groups and NGOs.

Thirdly, Programme like NWDPRAs should be implemented on the agro-climatic zone basis. This should not be in pen and paper, but its actual correspondence with the field should be extended. Better-trained personnel and Monitoring agencies are to be formulated with the active participation of local people. Not the big landholders but the actual needy section who are the true beneficiaries of the programme should be treated more intensively.

Fourthly, implementation should be done on the basis of prioritisation, and in this regard different and varied variables like nutrition, literacy, migration, infrastructure, institution, resource base etc should be used to formulate the need base of various areas. Overhead expenditure in doing so would increase to a great extent but this will ensure that the project served is justified.

Thus from the so far analysis a new and a more humanistic approach of watershed should be formulated, where rural poor would be at the center. It should be a watershed plus approach.

Flow chart components of Future Policy



5.5 Future Research Proposals

Constraints of data, both quantitative and qualitative have restricted the scope of this research. to a considerable extent. From the various issues evolved in the course of these study provides guidelines for further study. Some of these are as follows

A more detailed and holistic study of other government and non-government programmes across various agroclimatic zones would provide a real picture of the status of watershed management programme in India. Thus a exhaustive study of other programmes are needed in future. Field level survey is needed to obtain qualitative data to further substantiate the issue of watershed development.

Another significant area of research would be to determine the role of women in watershed development. Since women plays a very important role in rural ares and as they have a more intricate relation with the environment study of women in the context of watershed is needed.

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Watersheds at Work

Success Stories of Watersheds Programmes Government of India (Ministry of Agriculture)-Department of Agriculture and Cooperation.

APPENDIX NO. 1

States	Agro Climatic Zones	Districts
Andhra Pradesh	North Coastal Andhra	Srikakulam, Vijaynagar, Vishakhapatnam
	South Coastal Andhra	East Godavari, West Godavari, Prakasam
	Nellore	Nellore
	Rayalseema	Chittoor, Cuddapah, Kurnool, Anantpur
	South Telengana	Mehboobnagar, Nalgonda, Rangareddy, Hyderabad
	North Telengana	Medak, Warrangal, Khammar, Niazambad, Adilabad, Karimnagar.
Assam	North East Hills	Karbi Anglong, North Cachar.
	Lower Brahmaputra	Barpeta, Dhubri, Nogaon, Darrang, Kamrup, Goalpara, Kokrajhar
	Upper Brahmaputra	Lakhimpur, Sibsagar, Cachar, Dibrugarh, Jorhat, Kari-mganj
Bihar	South Bihar Hills	Bhojpur, Rohtas, Patna, Aurangabad, Nalanda, Gaya, Navada, Munger, Bhagalpur.
Chattisgarh	Chattisgarh Plains	Durg, Bilaspur, Balaghat, Raipur, Rajnandgaon.
	Chattisgarh Hills	Mandla
Goa	North Goa	North Goa
	South Goa	South Goa
Gujarat	South Hills	Dangs, Valsad
	South Gujarat	Surat, Bharuch.
	Middle Gujarat	Baroda, Kheda, Panchmahals.
	North Gujarat	Ahmedabad, Gandhinagar, Mehsana, Sabarkantha, Banaskantha.
	North West Arid	Kutch
		Amereli, Bhavnagar, Jamnagar, Rajkot, Surendranagar
	Soth Saurashtra	Junagadh
Haryana	Foot Hills	
	Arid	Mahendragarh, Bhiwani, Hissar, Sirsa.
	(3)	Kinnaur, Lahul, Spiti.
	(1)	Bilaspur, Chamba, Hamirpur, Kangra, Kullu, Mandi, Shimla, Sirmaur, Solan, Una
Karnataka	North Dry Region	Belgaum, Bellary, Bidar, Bijapur, Dharwad, Gulbarga, Raichur.
	Central Region.	Bangalore, Chitradurg, Kolar, Tumkur
	South Region	Mandya, Mysore, Hassan
	Hills and Coastal Region.	Upper Kannada, Daskin, Kannada, Chikmagalur, Kodagu, Shimoga
Kerala	Coastal Midlands	Thiruvananthapuram, Allepey, Ernakulam, Trichur, Malappuram, Calicut, Cannore, Kasargod, Quilon
	Midlands	Pathanamitha, Kottayam, Palghat.
	Hills	Idduki, Wymad
Madhya Pradesh	Northern Hills	Raigadh, Surguja, Shadol
	Bundelkhand	Chattarpur, Datia, Tikamgarh
	Keymore plateau and satpura Hills	Jabalpur, Panna, Satna, Rewa, Sidhi, Seoni.
	Vindhya Plains	Bhopal, Damoh, Raisen, Sugar, Sehore, Vidisha
	Satpura Plains	Betul, Chindwara, Narsingpur.

	Central Narmada Valley	Hoshangabad
Madhya Pradesh	Grid	Morena,Bhiud,Gwailor,Guna,Shivpuri
	Jhabua Hills	Jhabua
	Nalwar & Nimar Plains	Indore,Dhar,Ujjain,Ratlam,Dewas,Mandsan,Rajgarh,Shajapur,Khandwa,Kharagpur.
Maharashtra	East Vidarbha	Bhandaa,Chandrapur,Gadhchivoli
	West Hills&Plains	Kolhapur,Nasik,Pune,Satara
	Scarcity Region	Ahmednagar,Dhule,Sangli,Solapur
	Central Plateau	Akola,Amravati,Aurangabad,Bid,Buldara,Jalgaon,Jalna,Latur,Osmanabad,Parbhani
	Central Vidarbha	Nagpur,Nanded,Wadha,Yawatmal
	Konkan	Greater Bombay,Raigad,Ratnagiri,Sindhudurg,Thane
Orissa	Inlands	Bolangir,Dhenkanal,Sambalpur
	North Plateau & Hills	Keonjhar,Mayurbhanj,Sundargaon
	South West Hills	Kalahandi,Koraput,Phulbani
	Coastal	Baleshwar,Cuttack,Puri
	Ganjam	Ganjam
Punjab	North Punjab	Gurdaspur,Hoshiarpur,Ropad
Rajasthan	North Arid	Ganganagar
	Southern Plains	Banswara,Dungarpur,Pali,Sirohi,Bhilwara,Udaipur,Chittorgarh
	East Plains	Bundi,Kota,Ajmer,Tonk,Jaipur,Alwar,Bharatpur,Sewai Madhopur,Dholpur
	Southern Plateau	Jhalawar
	West Arid	Barmer,Bikaner,Churu,Jaisalmer,Jalore,Jhunjuna,Jodhpur,Nagore,Sikar
Tamil Nadu	Northern Region	Dharmapuri,Salem
	Central Region	Coimbatore,Madurai,Tiruchirapalli
	North East Coastal Region	Chengalpatti,Madras,North Arcot,South Arcot
	Delta	Thanjavur
	South East Coastal	Kamarajar,Ramnathpuram,Tirunelveli,P.M,Lingam
Uttaranchal	West Hills	Dehradun,Chamoli,Tehri,Pauri,Pithorgarh,Almora,Nainital.
Uttar Pradesh	North East Hills	Bahruch,Basti,Deoria,Gonda,Gorakhpur.
	East Plains	Azamgarh,Ballia,Faziabad,Gazipur,Jaunpur,Varanasi
	Vidhyas	Mirzapur
	Central Plains	Allahabad,Fatehpur,Unnao,Bareilly,Lucknow.Sitapur,Kheri,Pilibhit,Pratapgarh,Sultanpur,Bara,Banki
	North West Plains	Bareilly,Bijnor,Bulandshahar,Ghaziabad,Meerut,Moradabad,Rampur,Saharanpur,Shehjanpur,Muzaffarpur,
	South West Plains	Agra,Ferozabad,Aligarh,Mathura,Mainpuri,Etah,Etawah,Kanpur,Farukabad
	Bundelkhand	Jalaun,Jhansi,Hamirpur,Banda,Lalitpur
Jharkhand	Chattisgarh Plateau	Palamau,Gumla,Lokhandoga,Singhbhum
	Chattisgarh Hills	Godda

APPENDIX No. 2

STATE	agro climatic zones	geo-area	1991	91+97
AP	N Coastal Andra	235400	8000	13700
	s. Coastal Andra	562900	16470	30484
	Nellore	130800	4140	9020
	Rayalaseema	673000	53007	87007
	S.telangana	403800	12438	24938
	N.Telangana	744800	27979	43479
ASSAM	N.E.Hills	152200	8083	15083
	Lower Brahmaputra	345600	26506	53006
	Upper.Bramhaputra	287400	22891	44891
BIHAR				0
	S.Bihar Plains	406600	15815.44	17799.14
CHATTISGARH				0
	Chattisgarh Plain	811700	10667	39021.85
	Chattisgarh Hills	132600	12684	40774
GOA	N. Goa	158460	5567	19943
	S.Goa	84700	3185	11535
GUJRAT	S.Hills	70100	2000.01	5077.83
	S.Gujrat	167000	22258.47	44516.94
	Middle Gujrat	238500	34000.75	76023.5
	N.Gujrat	384800	45000.26	100032.52
	N.W Arid	456100	12800.43	30348.86
	N. Saurashtra	537300	87300.24	195120.48
	S. Saurashtra	106100	15000.54	38888.08
HARAYNA				0
	foothrills	38300	3000	7456
	arid	187000	23045	59518
HP				0
	1(1)	354400	21900	42239.5
	3(3)	202400	537	1074
KARNATAKA				0
	N.Dry Region	898000	131566	271150
	c. region	376800	78557	188070
	s region	237300	5908	18558
	Hills&Coastal Region	405800	58932	141133
KERALA				0
	Coastal Midlands	249600	35023	72913
	Midlands	66800	10921	22750
	HILLS	71900	5393.99	14960.99
MP				0
	N.hills	492800	28359	39026
	Bundelkhand	157700	45968	58687
	Keymore plateau&Satapura hills	503600	116548	159186
	Vindaya Plateau	424200	172556	224477
	Satpura Plateau	218900	86091	113477
	Central Narmada Valley	151500	3000	6000

	Gird	425700	90387	118786
	Jhabua Hills	67800	18516	33951
	Malwa&Nimar plateau	761200	219463	292676
MAHARASTRA				0
	E.Vidarbha	351100	11640	24296.64
	W.Hills& Plains	500100	57578	95899.29
	Scarcity Region	550200	15666	35834.03
	C.plateau	980700	25242	80499.04
	C.vidarbha	400000	13219	49461.81
	Konkan	293700	9706	38196
ORISSA				0
	INLAND	372600	16570	28692
	n plateau hills	284300	36166.17	69733.17
	sw hills	498500	15521.2	27194.2
	coasrtal	276400	7000	14148
	ganjam	125300	8072	13070
PUNJAB				0
	N.punjab	95300	13683	27766
RAJASTHAN				0
	S.Plainns	649200	218221	387904
	e plains	747400	166290	309115
	s.plateau	62200	30641	50645
	w grid	1753600	222232	444886
TN				0
	N.Region	182800	38974	83871
	C.Region	440300	30326	56406
	Delta	82600	16000	53941
	SECoastal region	239800	10000	20000
UTTARANCHAL				0
	W.HILLS	511200	37704	85408
UP				0
	NEHILLS	331800	25307	45819
	E.Plains	259500	15720	36787
	VINDYAN	113100	4916	9916
	C.plains	585700	26251	48017
	N.W Piains	475200	1505	11694
	S.Wplains	373500	12496	25166
	Bundalkhand	294200	34058	69341
WB				0
	Barind	90900	12707	12707
	Alluvial	349700	46435	46435
	Coastal	141400	26436	26436
	Rarh&E. Plateau	176900	22718	22718
	Terai	96300	25078	25078
	Hills	30800	8654	8654
JHARKHAND				0
	chotonagpur plateau	444800	47399.95	69782.35
	Chottonagpur hills	352300	29007.95	48141.95

Maharastra	W.Hills& Plains	0.08256
Maharastra	Scarcity Region	-0.38736
Maharastra	C.plateau	-0.64923
Maharastra	C.vidarbha	-0.78912
Maharastra	Konkan	1.08422
Orissa	INLAND	-0.13196
Orissa	n plateau hills	-0.60196
Orissa	sw hills	-0.58647
Orissa	coasrtal	0.51507
Orissa	ganjam	0.02556
Punjab	N.punjab	0.96201
Rajasthan	S.Plainns	-2.50564
Rajasthan	e plains	-2.51465
Rajasthan	s.plateau	-1.42361
Rajasthan	w grid	-1.75134
Tamil Nadu	N.Region	0.07259
Tamil Nadu	C.Region	0.26521
Tamil Nadu	Delta	1.30377
Tamil Nadu	SECoastal region	-0.00947
Uttranchal	W.HILLS	-0.06198
Uttar Pradesh	NEHILLS	0.88899
Uttar Pradesh	E.Plians	1.00271
Uttar Pradesh	VINDYAN	-0.85026
Uttar Pradesh	C.plains	2.56144
Uttar Pradesh	N.W Piains	2.6888
Uttar Pradesh	S.Wplains	0.63869
West Bengal	Bundalkhand	-0.56539
West Bengal	Barind	0.77094
West Bengal	Alluvial	1.63035
West Bengal	Coastal	1.5568
West Bengal	Rarh&E. Plateau	0.79116
West Bengal	Terai	0.44306
West Bengal	Hills	-0.01273
Jharkhand	chotonagpur plateau	-0.78221
Jharkhand	Chottonagpur hills	-0.49467

APPENDIX NO. 3

State	Agro-climatic zones	Factorial Index
Andhra Pradesh	N Coastal Andra	0.35143
Andhra Pradesh	s. Coastal Andra	0.89575
Andhra Pradesh	Nellore	0.11547
Andhra Pradesh	Rayalaseema	-0.42788
Andhra Pradesh	S.telangana	-0.73705
Andhra Pradesh	N.Telangana	-0.25159
Assam	N.E.Hills	-0.01923
Assam	Lower Brahmaputra	0.22017
Assam	Upper.Bramhaputra	0.45046
Bihar	S.Bihar Plains	0.52746
Chattisgarh	Chattisgarh Plain	-0.40657
Chattisgarh	Chattisgarh Hills	-0.9172
Goa	N. Goa	0.76683
Goa	S.Goa	0.62139
Gujarat	S.Hills	0.80959
Gujarat	S.Gujrat	0.6141
Gujarat	Middle Gujrat	-0.06993
Gujarat	N.Gujrat	-0.39358
Gujarat	N.W Arid	-1.08983
Gujarat	N. Saurashtra	-0.29537
Gujarat	S. Saurashtra	0.45432
Harayana	foothills	1.04468
Harayana	arid	-0.24335
Himachal Pradesh	1(1)	-1.11259
Himachal Pradesh	3(3)	-1.43039
Karnataka	N.Dry Region	-0.57333
Karnataka	Central Region	-0.45025
Karnataka	s region	0.2128
Karnataka	Hills&Coastal Region	1.25171
Kerala	Coastal Midlands	1.83589
Kerala	Midlands	1.27063
Kerala	HILLS	1.67365
Madhya Pradesh	N.hills	-0.68721
Madhya Pradesh	Bundelkhand	-0.8984
Madhya Pradesh	Keymore plateau&Satapura hills	-0.87621
Madhya Pradesh	Vindaya Plateau	-0.78752
Madhya Pradesh	Satpura Plateau	-0.65474
Madhya Pradesh	Central Narmada Valley	-0.68906
Madhya Pradesh	Gird	-0.50819
Madhya Pradesh	Jhabua Hills	-1.26921
Madhya Pradesh	Malwa&Nimar plateau	-0.81401
Maharastra	E.Vidarbha	-0.67951

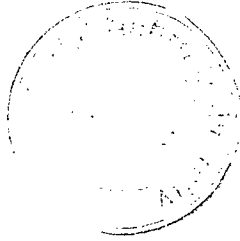
APPENDIX No.4

STATES	Expenditure 8th Plan	Expenditure 9th Plan	Funds Release 8th Plan	Fund Release 8&9th Plan	Fund Release 9th Plan	Expenditure to fund release 8th Plan	Expenditure to fund release 9th Plan
Andra pradesh	5115.777	2695.195	5217.677	7810.972	2685	98.04702	100.3797
Assam	1582.364	515.818	2378.387	2098.182	135	66.53097	382.0874
bihar	581.48	282.237	1691.033	863.717	132	34.38608	213.8159
goa	26.502	109.576	73.9333	136.078	13	35.84582	842.8923
gujarat	5557.93	5961.63	5664.442	11519.56	5300	98.11964	112.4836
harayana	491.06	530.17	477.652	1021.23	345	102.8071	153.6725
himanchal pradesh	1057.73	1071.717	1086.4	2129.447	605	97.36101	177.1433
karnataka	10139.48	9363.14	9797.635	19502.62	6195	103.489	151.1403
kerala	2992.381	2569.244	2993.9	5561.625	2384	99.94926	107.7703
madhya pradesh	12942.17	8270.7	12894.22	21212.87	6618	100.3719	124.9728
maharastra	16518.11	8940	15465.12	25458.11	6630	106.8088	134.8416
orissa	6845.95	2924.21	7507.095	9770.16	2050	91.19306	142.6444
punjab	467.2	206.6	493.293	673.8	103	94.71045	200.5825
rajasthan	14627.43	17873.62	14806.08	32501.05	11601	98.7934	154.0696
tamilnadu	3848.668	7392.356	3826.209	11241.02	4540	100.587	162.8272
uttar pradesh	8802.44	9011.62	9960.877	17814.06	4387	88.37013	205.4165
west bengal	1941.793	2025.68	2461.975	3967.473	1460	78.87135	138.7452

Appendix No. 5

Table: Composite Index of Resource Based, Standard of Living and Combined

States	Factorial index Resource Base	Factorial Index Standard Of Living	Combined Factorial Index
Andhra Pradesh	-.315	-1.00	-.54
Assam	.132	.597	-.11
Bihar	-.858	-.458	-.42
Goa	.431	1.156	.48
Gujarat	.072	-.435	-.24
Harayana	1.377	.412	1.24
Himachal Pradesh	-.810	.1254	-.87
Karnataka	-.372	.1828	-.48
Kerala	-.124	2.504	1.14
Madhya Pradesh	-.947	-1.542	1.39
Maharashtra	-.657	-.685	-.93
Orissa	-.509	-.387	-.45
Punjab	3.148	1.103	2.75
Rajasthan	-.831	-.280	-.81
Tamil Nadu	-.44	-.122	.21
Uttar Pradesh	.185	1.426	.07
West Bengal	-.127	.255	.35



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Summary of Basic Findings

A comparative study of government and non-government projects, shows that the government projects are more technocentric, when compared to the non-government counterparts, which are more socially oriented. From the performance assessment of selection of different parameters chosen by Ministries, Government institutions, non government institutions and individual rescheres show a lot of variations in their evaluations. However from such comparative analysis it can be sum up that most of the evaluation done by Ministries and government institution highlighted physical aspects like improvement in agricultural productivity, income and conservation of natural resource base. While the demographic as well as the institutional parameters like peoples participation are being ignored by them. While Non Government institutions like Ngos and individual rescherche stress more on the latter parameters.

Again from the impact assessment of watershed programmes being done by different agencies highlights both the positive as well as the negative aspects of the programmes. Positive aspect are enhancing agricultural productivity, generating income and to tap natural resource base there by bringing overall development in the physical and economic sectors. However the negative aspects of the programme are in case of government programmes the social and institutional aspects like poverty and peoples participation are being sidelined. The funding pattern also varies to a large extent which in turn determines the success of the programmes. Mostly when the funding is done by external agency, irrespective of the implementing agencies the performance is better. One possible reason could be the strictness of the norms being set by the funding agencies, which in the case of external funding sector like World Bank are much strict than government agencies and state collaborations. This brings better results in case of former watershed programmes. The selection of the watershed area on the basis of agro climatic zones.

The second objective of the study is to evaluate the spatial extent of watershed programme (NWDPR) over major agro-climatic zones of India, and also to see whether such programme is being implemented in consistency with the need based of these agro-climatic zones. From the quantitative analysis it can be inferred that there are lot of variations in terms of spatial coverage of watershed programme over agro-climatic zones. The real needy areas in terms of ecological, social, and economic stability is poor.

The question that whether this programme being implemented in consistent with the need based shows a different picture altogether. In case of NWDPRRA, the implementation is not been done on the basis of priority of the region. The agro-climatic zones having poorer index in terms of natural resource base, economic stability and social heterogeneity shows much lesser spatial coverage than areas having better off condition. Thus implementation is not taking place in the zones of priority.

As far as the third objective is concerned the study has been restricted to state level because of dearth of data over agro-climatic zones. Here a qualitative performance of NWDPRRA have been analyzed in terms of allocation of funds and its consequent expenditure by respective states. It further analyses whether such expenditure is in consistent with the resource need, demographic need and livelihood standard of the concerned states. The basic findings are, that the fund allocation is possibly low in all states with respect to the requirement, as considering the cumulative position of the 8th and the 9th plan, we see that all the states, without any exception has overspent compared to the allocation. There is however, no apparent relationship with the degree of over-spending and the level of development of the state.

There is no relationship with the quality of work, as measured by the proxy variable of per-hectare expenditure, undertaken under NWDPRRA and the overall requirement of different states as measured by a composite index including economic, demographic and resource-base of different states. Even these parameters separately do not have any correspondence with the per-hectare expenditure of the states. The Pearson correlation also shows no relation among various above mentioned variables with the per hectare expenditure. The states which are poor in terms of resources show low expenditure than compared to more richer states.

It has been argued here that the states that are more vulnerable in terms of overall livelihood status in rural areas should be able to cover a wider range of objectives more intensively, compared to the states that are better-off. The first step towards achieving this would to allocate greater resources per unit of area covered, which is not obviously been followed in case of the project we have selected for our analysis. Thus from the above analysis it is thereby evident that policy variables does not take into consideration all the requirements while expending an watershed.

Conclusion

Quantitative and qualitative analysis, exhaustive literature review and also from experience from several micro level studies an insight of overall performance of NWDPRAs can be drawn. Although impact assessment of any programme can not be done by surveys through micro level studies yet we can infer that NWDPRAs in several instances show considerable success particularly in terms of improving productivity, generating income, conserving natural resource base etc. But in case of generating mass awareness regarding the importance of the programme among rural poor the success rate is much restricted. Again its implementation on terms of agro-climatic zones in consistence with the need of the zones are mostly overlooked. When resource is limited, prioritisation is extremely important. Evaluating from this angle we have come to the conclusions that by and large NWDPRAs failed either to accord priority to agro-climatic zones in terms of area covers or to the states in terms of per hectare expenditure. Either of which do not confirm with the requirement in terms of physical, socio-economic and demographic vulnerability.

Future Policy Implications

Watershed programmes have been receiving high priority from the union govt, the states, multilateral and bi-lateral agencies and the NGOs. The programme has been identified as a major priority area for future agricultural development in India (Reddy & Rao, 1999). So far discussed about the performance of watershed programme in general and NWDPRAs in particular, a suitable policy framework can be identified. Several case studies, quantitative as well as qualitative analysis notifies the fact that watershed programmes need a thorough modification. In this study some of the important issues that emerge out are that in most of the cases a macro level analysis has been overlooked. Small micro level case studies do not show the actual picture. Thus for all major programmes in general and NWDPRAs in particular need an all India level evaluation.

Secondly, there has been a regional disparity among North India and South, South west India in terms of success rate. Here later performed better. Now the reason probably as being stated earlier is that of differences in the institutional setup. Thus to mitigate such differences proper Institutional arrangements should be done. In this regard the concept of Direct Approach, Leadership Approach and Building Block Approach could be followed.

Thirdly, Programme like NWDPRRA should be implemented on the agro-climatic zone basis. This should not be in pen and paper, but its actual correspondence with the field should be extended. Better-trained personnel and Monitoring agencies are to be formulated with the active participation of local people.

Fourthly, implementation should be done on the basis of prioritisation, and in this regard different and varied variables like nutrition, literacy, migration, infrastructure, institution, resource base etc should be use to formulate the need base of various areas.

Thus from the so forth analysis a new and a more humanistic approach of watershed should be formulated, where rural poor would be at the center. It should be a watershed plus approach

Future Research Proposals

Constraints of data, both quantitative and qualitative have restricted the scope of this research. to a considerable extent. From the various issues evolved in the course of these study provides guidelines for further study. Some of these are as follows

A more detailed and holistic study of other government and non-government programmes across various agroclimatic zones would provide a real picture of the status of watershed management programme in India. Thus a exhaustive study of other programmes are needed in future. Field level survey is needed to obtain qualitative data to further substantiate the issue of watershed development.

Another significant area of research would be to determine the role of women in watershed development. Since women plays a very important role in rural ares and as they have a more intricate relation with the environment study of women in the context of watershed is needed.

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FOR RAINFED AREAS (NWDpra)**

(ABSTRACT)

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By

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