

**Impact Assessment Study of the
Watershed Development Programme
a compendium**

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Prepared for

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FOREWORD

The Area Development Programmes of the Department of Land Resources (DoLR), namely Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP) and Integrated Wastelands Development Programme (IWDP) are implemented through the watershed approach, in accordance with the Guidelines for Watershed Development with effect from 1st April 1995. These guidelines were revised in 2001 and to further empower PRIs, GoI issued the Hariyali Guidelines, w.e.f. 01.04.2003 for implementation of DPAP, DDP and IWDP. Presently, DPAP is under implementation in 972 blocks of 182 districts in 16 states. DDP is being implemented in 235 blocks in 40 districts of 7 states. The projects under IWDP are generally sanctioned in areas other than DPAP/DDP of all the states. The project period of watershed development projects is generally 4–5 years. Though the focus of these programmes may be different, their basic objective is to ensure efficient land and water resource management for sustainable production.

A total number of 146 projects under IWDP, 1190 projects under DDP and 4805 projects under DPAP were sanctioned during the period 01.04.1991 to 31.03.1998 in 16 states covering 230 districts. Although project based evaluations were taken up in some cases, impact assessment studies were not undertaken for these three programmes. An impact assessment study of the watershed projects sanctioned under the DPAP, DDP and IWDP during the period 01.04.1991 to 31.03.1998, on sample basis, was, therefore commissioned by the Ministry of Rural Development in March 2001, with a view to find out, inter alia, how far these projects have contributed to the improvement of the socio-economic conditions of the resource poor and the disadvantaged sections inhabiting the programme areas. The fieldwork for the study was assigned to 20 professional agencies, who were required to collect information on the projects in the districts assigned to them, and 14 agencies were also required to prepare a State specific report on the study. The results as can be expected, have been varying from modest to great success stories.

Following the completion of the Impact Assessment Study in 16 states, DoLR felt the need for getting a summary of the 16 states reports prepared. Accordingly, TERI was assigned to prepare a compendium on the Impact Assessment Studies.

The Compendium is based on the findings of the impact assessment studies of watershed projects undertaken in 16 states of the country. The expertise of TERI in preparing this Compendium in a lucid and presentable form is worth appreciating. The contribution from all the senior officers of the Department of Land Resources in developing the methodology and schedules has been very valuable. I equally appreciate the efforts of the officers in Monitoring Section of Department of Land Resources who played a major role in bringing out this compendium.

I am sure that this compendium of Impact Assessment Studies of the Watershed Development Programme will prove to be a useful document in dissemination of achievements and provide direction to policy makers and planners in future strategy.



New Delhi
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LIST OF ABBREVIATIONS

BDO	Block Development Officer
BPL	Below Poverty Line
DDP	Desert Development Programme
DLAC	District-level Advisory Committee
DoWD	Department of Wastelands Development
DoLR	Department of Land Resources
DPAP	Drought-Prone Area Programme
DRDA	District Rural Development Agency
GCA	Gross Cropped Area
GoI	Government of India
GP	Gram Panchayat
HYV	High-Yielding Variety
IA	Impact Assessment
IRDP	Integrated Rural Development Programme
IWDP	Integrated Wastelands Development Programme
MoEF	Ministry of Environment and Forests
MoRD	Ministry of Rural Development
NGO	Non-Governmental Organization
NWDB	National Wasteland Development Board
O&M	Operation and Maintenance
PIA	Project Implementation Agency
PMGSY	Pradhan Mantri Gram Sadak Yojana
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution
SHG	Self-Help Group
UG	User Group
WA	Watershed Association
WC	Watershed Committee
WDAC	Watershed Development Advisory Committee
WDP	Watershed Development Programme
WDT	Watershed Development Team
ZP	Zilla Parishad

Watershed Development Programme in India

The strategy for agricultural development in the first two decades after India's independence hinged on large-scale development of irrigation. This was a necessity because irrigation was a key component of the new agricultural production system incorporating HYVs, the success of which led to the Green Revolution and resulted in India achieving a status of food self-sufficiency. However, this strategy of the Green Revolution with the HYVs obviously only benefited areas within the river plains and ushered in prosperity for the farmers there. This led to grave regional disparities between this region and the upper watershed areas, which were not able to reap the benefits of the revolution in agricultural practices. A series of severe droughts in the 1960s and the 1970s exacerbated the urgency of rethinking at the highest policy levels and called for a more balanced growth strategy, which would take into account regional disparities and natural resource conditions. The WDP was thus conceived to address these national issues and concerns.

Over the years, there have been significant land-use changes in the country, primarily through agriculture, urbanization, and industrial development. The steadily worsening land-person ratio, which has had a critical impact on food and nutritional security in the country, has attracted the attention of planners over successive Plan periods. The experience of severe shortfalls in food production over 1956-66 reinforced the necessity of addressing the issue of sustainability as a top priority. Nearly 70% of India's area falls in the dry zone, resulting in high vulnerability of the agricultural production systems. Equally vulnerable is the issue of landmass degradation under intensive cultivation in marginal areas. There are varying opinions of the estimates of the extent and causes of land degradation. It has been estimated by the Ministry of Agriculture (1985) that about 173.64 mha (million hectares) of land, including

19.49 mha of forestland, suffers from some degree of degradation. These degraded areas also report high levels of poverty.

Consequent to this understanding, the last two decades have witnessed significant shifts in thinking and policy-making at the highest level regarding strategies to promote the WDP in India. The larger goals of the WDP have been poverty alleviation and sustainable management of natural resources. In 1985, the NWDB was set up under the MoEF, GoI, with the specific mandate of addressing the issues of land degradation, restoring the ecological balance, and meeting the growing demand for fuelwood and fodder. In 1992, the NWDB was transferred to the DoWD in 1992 within the MoRD. In 1999, the DoWD was renamed the DoLR. The DoLR is implementing the following three watershed programmes.

1 DPAP (Drought-Prone Areas Programme)

This programme was initiated in 1973/74 in response to the effects of widespread drought in the country in the 1960s and early 1970s. It focuses particularly on areas subject to chronic drought. It now covers 972 blocks in 182 districts of 16 states in the country.

2 DDP (Desert Development Programme)

Following the report of the National Commission on Agriculture in 1976, the DDP was set up a year later in the states of Gujarat, Haryana, and Rajasthan and in the cold deserts of Jammu and Kashmir and Himachal Pradesh. In 1995/96, it was extended to parts of Andhra Pradesh and Karnataka. The DDP now covers 235 blocks in 40 districts of seven states in the country.

3 IWDP (Integrated Wastelands Development Programme)

Launched in 1989/90, the IWDP is extended to areas not covered under either the DPAP or the DDP. A total of 374 districts of the country have so far been covered under this programme.

The WDP is one of the most ambitious initiatives of the GoI to address the issue of poverty alleviation through conservation and development of land and water resources. A paradigm shift in implementing these schemes on a watershed basis with people's participation came with the promulgation (with effect from 1 April 1995) of the *Common Guidelines for Watershed Development*. On the recommendation of the Hanumantha Rao Committee, the DPAP, the DDP, and the IWDP were brought under the purview of a single set of guidelines, and collectively referred to as

Common Guidelines for Watershed Development. Also of considerable significance are the adoption of the recommendations of Mohan Dharia High-Level Committee on Wastelands Development (1994) creating, inter alia, a separate DoLR to deal with the three area development programmes: IWDP, DPAP, and DDP.

Following the experience of implementing watershed development projects under these guidelines, suggestions were made to render them contemporary, transparent, and easy to follow. The need to introduce greater degree of flexibility in the guidelines in view of the large variations in local conditions, needs, and social structures was also felt. Detailed consultations were organized with the state governments, PIAs, NGOs, and other experts involved in the implementation of the WDP.

The *Guidelines for Watershed Development* (revised in 2001) provide primary indicators for assessment of the impact of the WDP of the MoRD and the Ministry of Agriculture. Improvements in the 2001 guidelines over those of 1995 relate to evolving a programme-specific approach, enabling greater flexibility in implementation, defining institutional roles, removing overlaps, putting projects on 'probation', encouraging PIAs to develop an exit protocol, adopting a 'twin track' approach, supporting NGOs as PIAs, enhancing the role of women, SHGs, and PRIs, providing credit facilities, increasing transparency, and using technical data (such as that from the National Remote Sensing Agency) in planning.

In 2003, the DoLR issued a revised set of guidelines called *Hariyali*. The significant difference between the 2001 guidelines and *Hariyali* was that the latter aimed at empowering PRIs both administratively and financially to implement the WDP in the country. Gram Panchayats under the supervision of PIAs would thus be the institutions for implementing the WDP at the village level.

Under *Hariyali*, an intermediate Panchayat may be the PIA for all the projects sanctioned to a particular block or *taluka*. If these Panchayats are not adequately empowered, then the ZP can either act as the PIA itself or appoint a suitable line department like agriculture, forest, soil conservation, etc., or an agency of the state government, university, or institute as the PIA. Failing these options, the ZP / DRDA may consider appointing – after thorough examination of its credentials – a reputed NGO from the district, with adequate experience and expertise in the implementation of watershed or related projects.

The role of the PIAs would be to provide necessary technical guidance to the Gram Panchayat for preparation of watershed development plans, undertake community organization and training for the village

communities, supervise watershed development activities, manage project accounts, encourage adoption of low-cost technologies, build upon local indigenous knowledge, monitor and review overall project implementation, and set up institutions for post-project operations and maintenance of the assets created.

Impact Assessment Study of Watershed Development Programme

Study objectives

An impact assessment study was conducted by MoRD (Ministry of Rural Development) in 16 states covering the IWDP (Integrated Wastelands Development Programme), the DPAP (Drought-Prone Areas Programme), and the DDP (Desert Development Programme) with the following objectives.

- To assess the economic development of the village community that is directly or indirectly dependent on the watersheds, through
 - optimum utilization of the watershed's natural resources like land, water, and vegetation that will mitigate the adverse effects of drought and prevent further ecological degradation, and
 - employment generation and development of the human and other economic resources of the village to promote savings and other income-generating activities.
- To assess the impact of the WDP on the restoration of ecological balance in the village, through
 - sustained community action for the operation and maintenance of assets created and further development of the potential of the natural resources within the watershed, and
 - simple, easy-to-use, and affordable technological solutions and institutional arrangements that make use of, and build upon, local technical knowledge and available materials.
- To assess the impact of the project in terms of improvement of economic and social conditions of the poor and the disadvantaged sections of the community such as the landless and women, through
 - more equitable distribution of the benefits of community lands and water resource development and consequent biomass production, and

- greater access to income-generating opportunities and greater focus on their human resource development.

Methodological approach

The impact assessment study was assigned to assess projects between 1991 and 1998. Over this period, 6141 projects were sanctioned, of which 4805 were under the DPAP, 1190 under the DDP, and 146 under the IWDP, covering 230 districts in 16 states of India.

The study was initiated in March 2001 by the Monitoring Division of the MoRD, GoI. A total of 16 states were identified, within which fieldwork was undertaken in 221 districts. Twenty professional agencies were hired to undertake the collection of empirical field data, of which 14 were assigned the task of producing state-level analytical reports.

The methodological approach involved a survey-based data collection exercise comprising close-ended questionnaires. Three independent sets of questionnaires were developed.

- 1 District schedule
- 2 Watershed schedule
- 3 Individual schedule (beneficiary and non-beneficiary)

The sampling design to determine the districts, watersheds, and villages to be covered in each state was developed by the Monitoring Division, MoRD. Prior to the commencement of the fieldwork, a workshop was held to finalize the methodological approach of the study. In addition, agencies employed their own sampling criteria in their respective states and methodological approaches that included the following.

- Structured interviews
- Semi-structured interviews
- Group and informal discussions
- Observations
- Direct participation in specially organized meetings
- Collection of secondary information
- Surveys
- Case studies.

Details of the 16 states, the number of districts covered in each state, and the agencies that undertook the assignment are given in Table 1.

Table 1 States and districts covered under the impact assessment study and agencies undertaking the study

Sl. No.	State	Number of districts covered	Programmes and districts covered	Agency for impact assessment study
1	Andhra Pradesh	17	DPAP: Adilabad, Chittoor, Cuddapah, Karimnagar, Khammam, Kurnool, Mahabubnagar, Medak, Nalgonda, Nizamabad, Rangareddy, Srikakulam DDP: Anantapur IWDP: Visakhapatnam,	Pragna Research and Consultancy Services, Hyderabad
2	Bihar	8	DPAP: Bhabua, Jamui, Madhubani, Nawada, Rohtas, Sitamarhi IWDP: Gaya, Nawada	International Institute of Sustainable Development and Management, Ahmedabad
3	Chhattisgarh	7	DPAP: Bastar, Bilaspur, Sarguja IWDP: Raigarh, Raipur DPAP and IWDP: Durg, Rajnandagaon	Development Communication India, New Delhi
4	Haryana	9	DDP: Bhiwani, Jhajjar, Sirsa DDP and IWDP: Hisar, Mahendragarh, Rewari IWDP: Karnal, Panipat, Yamunanagar	CMI Social Research Centre, New Delhi
5	Himachal Pradesh	7	DPAP: Solan, Bilaspur, Una IWDP: Chamba, Hamirpur, Kangra, Sirmour	CMI Social Research Centre, New Delhi
6	Jharkhand	12	DPAP: Bokaro, Dhanbad, Dumka, Godda, Hazaribagh, Pakur, Sahebganj IWDP: Lohardaga DPAP and IWDP: Chatra, Deogarh, Garhwa, Palamau	Anandmay Engineers and Consultants Pvt. Ltd, New Delhi
7	Karnataka	16	DPAP: Bangalore, Belgaum, Bidar, Chickmagalur, Dharwad, Hassan, Kolar, Mysore DDP: Bagalkot, Bijapur, Raichur IWDP: Mandya DPAP and IWDP: Chitradurga, Gulbarga, Tumkur DDP and IWDP: Bellary	Kerala Statistical Institute, Thiruvananthapuram
8	Kerala	3	IWDP: Idukki, Malappuram, Palakkad	Centre for Management Development, Thiruvananthapuram

Continued...

Table 1 States and districts covered under the impact assessment study and agencies undertaking the study (*continued...*)

Sl. No.	State	Number of districts covered	Programmes and districts covered	Agency for impact assessment study
9	Madhya Pradesh	29	DPAP: West Nirmar, East Nirmar, Ratlam, Shajapur, Rajgarh, Betul, Chhindwara, Bhind, Shivpuri, Damoh, Raisen, Dewas, Rewa, Sidhi, Jabalpur, Panna, Shahdol IWDP: Bhopal, Mandsaur, Ujjain, Indore, Tikamgarh, Datia, Narsingpur, Mandla DPAP and IWDP: Jhabua, Dhar, Guna, Seoni	Centre for Advanced Research and Development, Bhopal
10	Maharashtra	22	DPAP and EAS: Chandrapur, Gadchiroli, Nasik, Ahmednagar, Akola, Amravati, Nagpur, Yavatmal, Buldhana, Jalgaon, Dhule, Parbhani, Aurangabad, Pune, Sangli, Satara, Latur, Solapur, Beed, Nanded, Jalna, Osmanabad	Marathwada Institute for Training, Research, Education and Employment, Aurangabad *
11	Orissa	13	DPAP: Boudh, Naupada, Phulbani IWDP: Koraput, Malkangiri, Mayurbhanj DPAP and IWDP: Bolangir, Dhenkanal, Jharsuguda, Kalahandi, Nabrangpur, Bargarh, Sonepur	RITES Ltd, New Delhi
12	Rajasthan	26	DPAP and DDP: Banswara, Baran, Dungarpur, Udaipur, Ajmer, Bharatpur, Kota, Sawai Madhopur, Tonk, Jhalawar, Hanumagarh, Pali, Rajsamand, Sirohi, Barmer, Bikaner, Churu, Jalore, Jhunjhunu, Nagaur IWDP: Jaipur, Jaisalmer, Jodhpur, Bhilwara, Pali, Sikar, Udaipur, Ajmer, Tonk	Taylor Nelson Sofres MODE Pvt. Ltd, New Delhi

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Table 1 States and districts covered under the impact assessment study and agencies undertaking the study (*continued...*)

Sl. No.	State	Number of districts covered	Programmes and districts covered	Agency for impact assessment study
13	Tamil Nadu	14	DPAP: Tirunelveli, Tuticorin, Sivaganga, Pudukottai, Karur, Tiruchirapalli, Perambalur, Nemekkal, Salem IWDP: Erode, Tiruvannamalai DPAP and IWDP: Dindigul, Vellore, Coimbatore	Centre for Management Development, Thiruvananthapuram
14	Uttaranchal	5	DPAP: Almora, Chamoli, Pauri-Garhwal, Pithoragarh DPAP and IWDP: Tehri-Garhwal	CNF Social Development Centre, New Delhi
15	Uttar Pradesh	28	DPAP: Allahabad, Bahraich, Banda, Jalaun, Lakhimpur kheri, Lucknow, Mahoba, Mirzapur, Sitapur IWDP: Agra, Azamgarh, Etawah, Farrukhabad, Fatehpur, Firozabad, Jaunpur, Kanpur, Mainpuri, Mathura, Rae Bareli, Unnao, Varanasi DPAP and IWDP: Hamirpur, Lalitpur, Sonbhadra	WIZMIN Management Consultants, Kanpur
16	West Bengal	5	DPAP: Birbhum, Midnapore IWDP: Darjeeling DPAP and IWDP: Bankura, Purulia	Development and Research Services, New Delhi

Compendium

Following the completion of the impact assessment study for the 16 states, the DoLR felt the necessity of preparing a summary of the 16 state reports that had been submitted. TERI was therefore assigned this job. This compendium prepared by TERI consolidates the findings of the impact assessment studies of 16 states (Annexe 1) and is based exclusively on the state reports and other information made available by the DoLR.

Chapter 1 provides a background to the watershed development programme in India, how it has evolved and the various sets of guidelines issued at various stages to facilitate the process.

Chapter 2 gives an overview of the study undertaken in 16 states on impact assessment of the WDP. It includes the objectives, methodological approach, and lists of the agencies that conducted the impact assessment study in each state and watershed programmes in the sample districts covered by them.

Chapter 3 provides a summary of the key findings across the states on various parameters related to the WDP including impact on land, water, and biomass, socio-economic impact, capacity building, and people's participation.

Chapter 4 contains a profile of each state covered under the impact assessment study and highlights of the major findings reported from each state.

Chapter 5 is a compilation of the suggestions and recommendations reported from each state on the WDP and is organized under major headings including impact on natural resources, impact on livelihoods and local economy, capacity building, and people's participation.

Summary of Impact Assessment Studies

Impact on land, water, and biomass

Land use

Overall improvement in land use was reported from all states following the implementation of the WDP. Increase in the net sown area, gross cropped area, and area sown more than once was reported from Andhra Pradesh, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, and Uttar Pradesh.

Irrigation

The number of irrigation options was enhanced in all the areas where watershed projects were undertaken. This was especially the case in Andhra Pradesh, Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttaranchal, Uttar Pradesh, and West Bengal.

Fuelwood and fodder availability

Fuelwood and fodder availability increased, especially in the areas under the IWDP, where considerable attention was paid to wasteland development and catchment area treatment. Several states including Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu, and Uttar Pradesh reported positive changes in the availability of both fuelwood and fodder.

Livestock

While some states reported changes in the actual numbers of livestock owned, there was a marked preference for improved breeds after the project. Some states also reported the emergence of fishery potential following the development of tanks and other water bodies.

Socio-economic impact

Cropping pattern

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

Only a few states have recorded pre- and post-project yields for dominant crops in the annual cropping cycle. Where data has been available, an increase in yields has been reported.

Income and employment generation

Several states reported an increase in agriculture-related employment opportunities among beneficiaries and in other sectors for non-beneficiaries. These included trade, dairy, poultry, masonry, etc. Physical works carried out under the WDP provided varying numbers of man-days of work in nearly all states. Changes in household income levels varied from none at all in some states to over 50% compared to pre-project levels in other states.

Capacity building and people's participation

Institutional arrangements

All states reported having established institutional arrangements to undertake the WDP. Watershed Development Advisory Committees were set up at the district level in all the watershed districts. It was preferred that government departments acted as PIAs and a range of line departments including forest, agriculture, animal husbandry, soil conservation, planning, revenue, rural development, and minor irrigation assisted in project implementation. In some states, NGOs were also used as PIAs.

People's participation

User groups/self-help groups were set up only in some states. Similarly WCs and WAs also were established in most watershed areas but some areas were still left out. This was attributed in some states to the lack of familiarity of government agencies in dealing with social and institutional issues without adequate orientation and training. In other states, the non-availability of NGOs also hampered the efforts at engaging with the people in a meaningful way.

Capacity building

All the states reported investing in capacity building at various levels including the levels of beneficiaries, WC and WA members, and PIAs. In some states, this led to positive outcomes. In others, it was felt that the quality of training received as well as the frequency of the training programmes needed improvement. Mostly state agriculture departments and universities and, in some cases, NGOs were also engaged in delivering capacity building programmes.

State-wise Impact Assessment Studies

Andhra Pradesh

Andhra Pradesh has a total geographical area of 27.5 mha (million hectares) and a population of about 75 million (Census of 2001). Its 23 districts are divided amongst three regions—Coastal (9 districts), Rayalseema (4), and Telangana (10). It has 4.4 mha (million hectares) of forest cover, which is 16.2% of its geographical area (State of Forest Report 2001). Impact assessment studies were undertaken in 17 districts covering 261 projects under DPAP, 31 under IWDP, and 27 under the DDP.

Impact on land, water, and biomass

Land use

In the watershed areas, the percentage of arable landholding with beneficiaries has improved on the whole. In the non-beneficiary households, there has been hardly any change in the arable landholding pattern.

Irrigation

There has been an increase of about 50% in the number of landowning beneficiaries possessing up to two or three wells. The number of those without any wells has meanwhile declined by 3%. In general, there has been an increase in the number of wells and coverage of water sources in the watershed areas.

Cropping patterns and productivity

Following the implementation of the WDP, a significant move towards the adoption of irrigated dryland crops was perceived. In particular, the production of onions and oilseeds increased significantly. In the watershed areas, the total area under improved paddy varieties increased by 277.8% with a 393% growth in production and a 480.4% increase in revenue generated.

Fuelwood and fodder availability

About 90% of the landowning beneficiaries and 60% of the landless households reported an increase in biomass availability.

Livestock

There was a general increase in the livestock population among the landowner households, with a predominance of local breeds. Amongst the landless beneficiaries, high-yielding milch animals and animal husbandry were popular. Except for a marginal decrease in the number of bullocks, the overall number of livestock registered an increasing trend. With regard to non-beneficiaries, it was observed that there was an overall steep increase in the livestock population, especially with regard to improved varieties of milch animals.

Socio-economic impact

Employment generation

The WDP in Andhra Pradesh contributed to employment generation through an increase in agricultural production activities, agricultural and non-agricultural labour, trade, dairy farming, poultry/piggery, masonry, and other activities. Landless households also reported an increase in employment opportunities, especially through masonry, trading, and dairying activities and an increase in income thus generated.

Impact on different categories of farmers

The number of landowners with no arable land declined by 50% and the medium arable landowning segment increased by 5.5%. The number of marginal farmers remained unchanged.

Change in numbers of people below the poverty line

The WDP has led to impressive changes in the number of persons living BPL. More than 86% of landowning households in the watershed areas

have moved above the poverty line following the implementation of the WDP while another 65% of the landless beneficiaries have also come above the poverty line. Among non-beneficiary landowning households, 68% are reported to have moved above the poverty line.

Capacity building and people's participation

People's participation

The WDP required the establishment of various institutional arrangements by the state, through the district to watershed and community levels. The study used the opening of bank accounts as an indicator to assess people's participation in the WDP. As many as 90% of the WCs under the DPAP and 84% of the WCs under the IWDP were able to open and operate their bank accounts. Under the DDP, the WCs were able to have representation from UGs, SHGs, Gram Panchayats, WDTs, and women's associations.

Bihar

Bihar has a total geographical area of 9.4 mha with a total population of 82 million. The state has 37 districts and a forest cover of 0.57 mha, which is 6% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in eight districts of Bihar covering six projects under the DPAP and two under the IWDP.

Impact on land, water, and biomass

Land use

An overall increase was reported in the land under cultivation in the watershed areas. There has also been a marginal improvement in the size of arable landholding of farmers (from 1.112 to 1.116 ha [hectares]). In the DPAP areas, this changed from 1.353 to 1.364 ha. The GCA increased by 3.21% in the DPAP areas and 1.71% in the IWDP areas.

Irrigation

The WDP enabled significant improvement in irrigation facilities, leading to a 45.19 % increase in the area under irrigation. In the DPAP areas also, the study reported a significant increase in irrigated area from 16.5% to 50.5%.

Cropping patterns and productivity

Rice productivity improved in the watershed areas of the state through an increase in the number of farmers utilizing improved seed varieties, fertilizers, and other technical inputs. Similar results were also reported for horticultural crops like mango. In the DPAP areas, 46.87% of the beneficiaries reported an increase in crop (paddy, wheat, others) yields while 20.82% of the non-beneficiaries also reported an increase in yields.

Livestock

Implementation of watershed development projects in the state has led to an increase in the availability of fodder, agricultural residues, and grazing areas, encouraging 25.89% of the beneficiaries to increase their livestock resources.

Consolidation of natural resources

Land development has been Bihar's single largest activity, followed by water resource development. Extensive areas have been brought under plantations in the WDP. This has been responsible for the successful control of soil erosion and the rehabilitation of degraded land in its watershed areas. Construction of water harvesting structures, including reservoirs and small irrigation channels, has benefited the local communities by catalysing an increase in the availability of water for both irrigation and domestic use. Construction of percolation tanks and well water harvesting structures has contributed to the recharging of groundwater resources in almost all WDP areas.

Socio-economic impacts

Employment generation

Beneficiaries of the WDP reported an increase in income up to 56.28% where activities had been completed. However, for the landless and assetless in the watershed areas, no significant change was reported in the context of improvement in people's skills and capacities and promotion in savings or income generation opportunities.

Income generation

Beneficiary households under the WDP reported a significant increase in incomes (up to 87.24% in Rohtas district) compared to non-beneficiary households (up to 15% in Bhabua district).

Capacity building and people's participation

Institutional arrangements

A state-level watershed implementation and review committee has been formed and meets twice a year to monitor and review the progress of the WDP across the state. At the district level, WDACs have been formed and have reportedly met regularly in most districts.

For the implementation of the watershed programme under the DPAP at 138 locations, 31 NGOs and 14 government departments have been engaged. The IWDP was being implemented exclusively by the forest department.

Representation of the Gram Panchayats in the WCs was reported to be poor. Representation of women in the WCs was reported in only 52 out of 138 projects. WDTs have been unable to attract subject matter specialists.

People's participation

Community mobilization under the WDP in Bihar included activities such as the formation of WAs and WCs in most project areas. However, the opening of the watershed development fund bank account was reported only in about 50% of the areas. On an average, representation of Gram Panchayat members in the WCs was poor (at one person per project). This was attributed to the fact that Bihar had not held panchayat elections for several years. Watershed projects reported the formation of UGs in 38% and SHGs in 41% of the cases.

Chhattisgarh

Chhattisgarh has a total geographical area of 13.5 mha with a population of 20.8 million (Census of 2001). The state has 16 districts and forest cover of 5.64 mha, which is 41.75% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in 7 districts covering 37 projects under the DPAP and eight under the IWDP.

Impact on land, water, and biomass

Land use

The net sown area increased in the areas under the WDP. Area sown more than once and GCA have also been reported to have increased, especially in the IWDP areas. This has especially benefited poor farmers.

Irrigation

Water table levels are also reported to have increased by up to 2 metres in 74% of the wells in the watershed areas. An increase in the number of dug wells, ponds, and tanks as well as in the command area of at least some of these water harvesting structures and water bodies has substantially increased the irrigation potential in these areas.



A dugout village pond

Cropping pattern and productivity

Both beneficiaries and non-beneficiaries have reported an increase in area under cultivation and yields of both *rabi* and *kharif* crops.

Biomass

Nearly 70% of respondents (both beneficiaries and non-beneficiaries) reported an increase in fuelwood and fodder availability following the implementation of the WDP.

Socio-economic impacts

Equity

Medium and large farmers are reported to have benefited the most under the WDP as a consequence of the size of their landholdings. Small and marginal farmers benefited to a lesser degree. Few opportunities were created for landless households.

Employment

There was an increase in the number of man-days of work available during the implementation phase of the WDP at an average of 202 days for non-beneficiaries and 291 days for beneficiaries. Some changes in savings and income-generating activities were also reported, which led to an increase in income of 1686 rupees per annum for non-beneficiaries and 4736 rupees per annum for beneficiaries.

Capacity building and people's participation

Institutional arrangements

The DRDAs acted as PIAs in areas under the WDP with little NGO involvement. Often, the transfer of officials hampered the progress of the programme. In the absence of adequate documentation and handing over procedures, there was considerable discontinuity at the PIA and community levels as a result of these transfers. Community involvement was also low with less than five SHGs being formed per watershed on an average. WCs and PIAs are reported to be unsure of the abilities of UGs and SHGs in managing funds and undertaking works in a planned manner.

Capacity building

Considerable investment was made in training and capacity building as part of the WDP but there is much scope for improvement as the results were often found to be less than satisfactory. Inadequate emphasis was reported on mobilization, appreciation of soil conservation, afforestation, fodder development, and PRA tools. However, there was appreciable emergence of leadership skills at the community level.

Haryana

Haryana has a total geographical area of 4.42 mha with a population of about 21 million. The state has 19 districts and 0.17 mha of forest cover, which is 4% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in nine districts covering seven projects under the IWDP and 101 projects under the DDP.

Impact on land, water, and biomass

Land use

Interventions under the WDP have helped contain desertification in some districts while also increasing moisture content and vegetative cover. Canals, irrigation channels, and pipelines to supply water have helped increase net sown area, area sown more than once, GCA, and net irrigated area.

Afforestation and pasture development

Interventions under the WDP have helped increase the area under forest cover as well as the availability of fodder and fuelwood. Survival rate of plantations was reported at 20%–35%, which leaves much room for improvement.

Livestock

Increases in livestock numbers and better breeds were reported as outcomes of the availability of improved fodder and drinking water for the livestock.

Socio-economic impacts

Crop yields

Cropping patterns are reported to have changed and there has been an increase in horticultural output as well as the output of paddy and wheat, at least in some districts.

Employment and income

An increase of 54.67% was reported in the annual income of beneficiaries from agricultural production alone while the average annual income of beneficiary households increased by 25.83% compared to pre-project levels. Non-beneficiaries reported an increase of only 7.23% in average annual income.

Employment generation was also weak at only 1.13% for non-beneficiaries.

Capacity building and people's participation

People's participation

Entry-point activities were undertaken in the watershed areas to promote community mobilization that helped in the formation of SHGs and UGs.

However, only 0.53% of the beneficiaries were actually reported to be members of SHGs and UGs and 1.5% were members of WAs. Exclusive implementation by line departments was identified as a possible cause for low people's participation. The involvement of both NGOs and women was limited in the WDP.

Himachal Pradesh

Himachal Pradesh has a total geographical area of 5.56 mha with a population of 6 million. The state has 12 districts and 1.43 mha of forest cover that is 25.8% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in seven districts.

Impact on land, water, and biomass

Land use

An increase has been reported in net sown area, area sown more than once, GCA, land under tree crops, and forest cover.

Irrigation, soil, and water conservation

Irrigation facilities are reported to have improved through drought-proofing measures leading to an increase in the command area of water bodies. Physical works have included soil erosion control measures, arrest of run-off, improvement of in-situ soil, and moisture conservation.



Trapping water by checkdam

Afforestation and pasture development

Extensive areas have been brought under plantations leading to an increase in forest cover and fodder and fuelwood availability. The survival rate of plantations is reported to be high, with communities keenly involved in their protection. This has partly been made possible by the utilization of the forest department as the PIA. In spite of the increase in the availability of fodder and water, there has been no significant change in livestock breeds or numbers.

Socio-economic impacts

Crop yields

The WDP has led to a significant increase in horticultural production, including tomato, ginger, and potato. It has catalysed an increase in the yields of maize and wheat.

Employment and income

There was only minor improvement in additional employment generated for both beneficiaries and non-beneficiaries. However, for beneficiaries under the WDP, a 65.83% increase in annual income was reported from agriculture and a 23.23% increase in average household income compared to pre-project intervention levels. Among non-beneficiaries, the increase in average household income was only 5.97%.

Capacity building and people's participation

Institutional arrangements

The PIAs in Himachal Pradesh were all from government agencies including DRDAs, BDOs, the Soil and Water Conservation Department, the District Horticulture Department, and the Himachal Pradesh Forest Department. The absence of NGOs has been attributed to low community mobilization. However, establishment of UGs, SHGs, WCs, and WAs has been reported. The PRIs were also not engaged with watershed projects; in some cases, they were in conflict with the watershed development process. Infrastructure for training in WDP-related roles and responsibilities was also reported to be inadequate in the state.

People's participation

Only 5.7% of the beneficiaries covered under the assessment were members of SHGs and UGs, while 16.15% were reported to be BPL.

Jharkhand

Jharkhand has a total geographical area of 7.97 mha with a population of 26.9 million (Census of 2001). The state has 18 districts and 2.26 mha of forest cover, which is 3.4% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in 12 districts covering five projects under the IWDP and 187 under the DPAP.

Impact on land, water, and biomass

Land use

The net sown area is reported to have increased by 4%, the GCA by 10%, while current fallows decreased by 9% and unused culturable land decreased by 16%. Cropping intensity prior to the project was recorded at 57.9% and increased to 63.8% following the implementation of the WDP.

Irrigation

Water availability was enhanced under the WDP through an increase of 97% in the number of ponds and an increase of 69% in the irrigation command area through treatment of *nalas* and streams. The water table is reported to have increased between 0.60 and 1.82 metres compared to pre-project levels.

Livestock

The numbers of cows and bullocks remained roughly the same after the project but the numbers of buffaloes increased by 15%, goats by 18%, sheep by 25.6%, pigs by 22.7%, and poultry by 31%. Fisheries increased almost by 159.5%, which is attributed to the increase in area under water bodies such as ponds and tanks.



Livestock rearing

Socio-economic impacts

Change in operational holdings

There was little perceptible change in the operational holdings of beneficiaries. Minor variations in arable and non-arable holdings were reported in the post-project period. There was an 8.4% increase in the number of wells owned by beneficiary households. Both beneficiaries and non-beneficiaries reported an improvement in the area irrigated and in the depth of water table.

Cropping pattern and yields

An increase of 39% in annual agricultural coverage was reported (28% in *kharif*, 74% in *rabi*, and 41% in summer crops). The area under paddy in *kharif* increased by 31% compared to pre-project levels; the area under wheat increased by 88% in *rabi*; while the area under maize increased by 43% in summer. Other crops such as *arhar*, groundnut, mustard, potato, gram, and vegetables also recorded improvements. The increase in seasonal coverage over annual coverage, when rainfall is scanty and crops require assured irrigation, was attributed to increased scope for irrigation in the watershed areas.

Change in income

After the project, the per capita income generation among beneficiaries increased by 1.16% and among non-beneficiaries by 0.29%. These figures represent accumulated totals covering agricultural production, agricultural labour, non-agricultural labour, trade, livestock-related activities, and other non-farm income generation options.

Karnataka

Karnataka has a total geographical area of 19.2 mha with a population of 52 million. The state has 27 districts and a forest cover of 3.7 mha, which is 19.3% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in 16 districts covering 192 projects under the DPAP, 75 under the DDP, and nine under the IWDP.

Impact on land, water, and biomass

Land use

Among beneficiaries, the share of irrigated land increased from 44% to 49% while among non-beneficiaries, it increased from 27% to 28%.

At least one soil conservation measure was adopted by 39% of the beneficiaries (covering an area of 53%) and 6% of the non-beneficiaries (covering an area of 26%). At least one water conservation measure was adopted by 34% of the beneficiaries (covering an area of 45%) and 3% of the non-beneficiaries (covering an area of 7%).

Irrigation

Sources of irrigation like dug wells, tube wells, and ponds are reported to have increased in number as well as the area they are now able to irrigate. The average depth of the water table has risen from 38.39 to 33.71 metres (a change of 12%).



A well-preserved village pond

Biomass

An increase in fodder availability was reported by 69% of the beneficiaries and 39% of the non-beneficiaries, while an increase in fuelwood availability was reported by 64% of the beneficiaries and 38% of the non-beneficiaries.

Socio-economic impacts

Employment generation and income

About 30% of the IWDP areas (increase of 5%), 9% of the DPAP areas (increase of 57%), and 19% of the DDP areas (increase of 38%) reported an enhancement in the employment opportunities. Also 58% of the DDP beneficiaries and 48% of the non-beneficiaries; 48% of the DPAP beneficiaries and 38% of the non-beneficiaries; and 33% of the IWDP beneficiaries and 31% of the non-beneficiaries reported increases in income.

An increase in agricultural income from Rs 5711 to Rs 7686 per ha (35% increase) was reported from the watershed areas.

Capacity building and people's participation

Institutional arrangements

District Watershed Committees had been set up in all districts with an average membership of 12 persons. In seven districts, 50% of the membership comprised government officials. In most districts, three to six people's representatives were also included. NGOs were represented in 50% of the districts. Watershed projects are being implemented by DRDAs, Zilla Parishads, Gram Panchayats, and NGOs.

People's participation

All WAs have been registered as societies and WCs are reported to have opened bank accounts. Watershed development micro-plans have been prepared.

Kerala

Kerala has a total geographical area of 0.38 mha and a population of 31.8 million (Census of 2001). The state has 14 districts and 1.5 mha of forest cover, which is 40% of its geographical area (State of Forest Report 2001). The impact assessment study was carried out in three districts under the IWDP.

Impact on land, water, and biomass

Land use

Under the IWDP, the arable land increased by 4.3% for beneficiary farmers, whereas the increase for non-beneficiaries was 3.1%. There was a

marginal change in the operational landholding of farmers of various categories following project implementation, though it did increase for small and medium farmers. Arable land also increased marginally by 0.98 ha compared to 0.97 ha before the project.

Conservation

Land and water conservation works included the construction of stone bunds, contour graded bunding, the development of contour vegetative hedges, drainage line treatment, trenches, well renovation, agro-forestry, and horticulture. In Idukki district, 18.82% of the beneficiaries reported a preference for contour/graded bunding and 50% for afforestation, while in the other two districts none of these works were reported by the beneficiaries.

Water

Beneficiaries reported a rise in the average depth of the water column from 1.73 metres to 2.13 metres as well as the use of dug wells, streams, and other sources of irrigation.

Livestock and fodder

Farmers reported a decrease in the preference for local livestock breeds and an uptake of improved breeds. Also, 86.36% of the respondents reported a post-project increase in fodder availability.

Socio-economic impacts

Cropping pattern and crop yields

Cropping patterns largely remained the same before and after the project. *Kharif* crops included tapioca, ginger, and green peas. Banana, a water-intensive crop, was reported to have been preferred after the project.

Perennial crops such as pepper, coconut, cocoa, cardamom, rubber, coffee, areca nut, and cashew reported no significant change in the cropping pattern in the pre- and post-project periods.

Employment generation

Non-agricultural labour was reported as the main source of employment after the project with an average annual increase of 126 man-days. However there was a state-wide decline in employment in the agricultural sector that affected the watershed areas as well.

Capacity building and people's participation

Institutional arrangements

The Peermedu Development Society and the Centre for Water Resource Development and Management were the PIAs in one district while the district collectors were in-charge of the project overall.

Departments such as forest, agriculture, planning, revenue, rural development, and minor irrigation assisted in the implementation of the project.

WDTs were established in each assessed district and included persons from plant sciences, animal sciences, social sciences, and civil/agricultural engineering. Also, seven- to 15-member WCs were reportedly formed for the project implementation.

Capacity building

In Idukki, 54.55% of the respondents reported having received training in agriculture while 27.27% reported having received training in other activities. The other two districts reported a lack of adequate training programmes.

People's participation

While in Idukki, 77.27% of the beneficiaries were also members of UGs/SHGs and 36.36% were members of WAs, people's participation was reported to be low in the other two districts.

Madhya Pradesh

Madhya Pradesh has a total geographical area of 30.8 mha, with a population of 60.4 million (Census of 2001). The state has 48 districts and 7.7 mha of forest cover, which is 25% of its geographical area (State of Forest Report 2001). The impact assessment study was undertaken in 29 districts covering 349 projects under DPAP and 23 projects under IWDP.

Impact on land, water, and biomass

Land use

Under the DPAP, the average net sown area increased in most districts after the project while it decreased in some due to desertification and prolonged

drought conditions. Average area sown more than once and average GCA also increased in most of the watershed districts assessed. On an average, the net sown area increased by 24 ha while the area sown more than once increased by 21 ha. Current fallows decreased by 8 ha and cultivable, barren, and uncultivable lands by 8 ha each.

About 27440 ha of irrigated area is reported to have increased across the state while wastelands have reduced by 18844 ha over the project period. Following the WDP, 790 villages reported a rise in the water table.

Irrigation

A majority of the DPAP districts and half the IWDP districts reported satisfactory conservation and augmentation of water resources.

Afforestation and fodder production

The area under fodder production increased substantially by 11708 ha, thereby producing an additional 10817 tonnes of fodder. Also, 11907 ha of land has been brought under fuelwood plantations and 7076 ha under horticulture. However, the green cover was reported to be on the decline in all districts.

Socio-economic impacts

Cropping pattern and yields

While there has been some change in the pattern of crops and productivity following the WDP, there seems to have been little diversification of crop types. Several districts reported a shift from a single *kharif* crop to farmers taking both *kharif* and *rabi* crops where irrigation facilities have been developed. The impact of the WDP was positive in terms of cropping patterns and productivity in the majority of DPAP districts and only half of the IWDP districts.

The area under *kharif* increased by 26% while the areas under *rabi* increased by 18%. The per hectare yield also increased from 9.54 to 13.29 quintals per hectare for *kharif* crops and from 11.56 to 16.76 quintals per hectare for *rabi* crops.

Income and employment generation

Over 8.7 million man-days (55% for men and 45% for women) of employment were generated under the WDP, at an average of 21000 man-days (DPAP) and 55000 man-days (IWDP) per watershed.

The average annual income for beneficiary households increased by 2000 rupees through agricultural production and non-farm activities.

Capacity building and people's participation

Institutional arrangements

The DRDA was the nodal agency for programme implementation in all districts. DLACs were set up in all districts under the WDP. The Rajiv Gandhi Watershed Mission had recommended the utilization of NGOs as PIAs. However, it was reported from a number of districts that competent NGOs were simply not available. In general, the DRDAs and ZPs reported that institutional structures established under the project – including WCs, SHGs, and UGs – were functioning reasonably well in most districts. However, the assessment study reported little evidence for genuine community empowerment.

Capacity building

Numerous training programmes were offered under the project for several categories of persons. A significant number of women are reported to have participated in these training programmes. However, members of several PIAs, WCs, and UGs were not covered; also important tools for planning were missed out. For instance, many PIAs reported their inability to use PRA techniques because they had no exposure on the method or its applications.

People's participation

Inadequate representation of women in the WCs appears to have been a common phenomenon. Distant political forces (such as leaders and members of legislative assemblies) were able to influence the representative nature of WCs. The representation of disadvantaged sections was complied with, but only to meet guideline requirements and not to increase their options and opportunities. The WDP in Madhya Pradesh is reported to have provided power to limited people to control and share resources. It also seemed that the government PIAs lacked confidence in the technical and institutional abilities of the people.

Maharashtra

Maharashtra has a total geographical area of 30.8 mha with a population of 96.8 million (Census of 2001). The state has 35 districts and 4.74 mha of forest cover, which is 15.43% of its geographical area (State of Forest Report 2001). The impact assessment study was carried out for watershed programmes implemented in 148 blocks of 22 districts under the DPAP and 20 blocks in 14 districts under the IWDP.

Impact on land, water, and biomass

Land use

Changes in post-project land-use patterns indicate increases in forest cover, net sown area, permanent pasture land, grazing land, and current fallow. The GCA increased by 4%. Of the watersheds assessed, 78% reported an increase in agricultural productivity and 82% showed an increase in water availability.

Irrigation

A 2.25% increase in the overall irrigated area was reported in the districts covered under the WDP. There was a 31% increase in the number of dug wells, tube wells, and other sources of water. Thus, the WDP increased irrigated area from 23732 ha (pre-project) to 41733 ha (post-project). A comparison of the total geographical area of watershed villages to the percentage of irrigated area showed an increase of 9% (pre-project) to 16% (post-project).

In 40% of the watersheds assessed, the water table rose by more than 2.13 metres whereas in 29% of the watersheds, it rose between 1.21 metres and 1.82 metres.

Biomass

While 62% of the beneficiaries reported an increase in fodder production, 52% reported an increase in fuelwood availability.

Livestock

A 59% increase in the number of cross-bred cows and a 52% increase in the buffalo population was observed in the watershed areas.

Socio-economic impacts

Change in cropping pattern

A shift was reported from *kharif* to *rabi* crops, especially manifested in the replacement of jowar and rice by wheat, gram, and cotton. An increase in the area, production, and yield per hectare in crops like wheat, gram, and *arhar* were also reported.

Employment and income generation

Nearly 11745 persons (or 30 per watershed per year) could get 100 days of employment at the wage rate of 40–45 rupees per day. A total of 4.09 million man-days of work were generated across 408 watershed projects in the project period against an expenditure of 420 million rupees. The programme provided an additional income of 5000–8200 rupees per beneficiary per district for 100 days of employment in a year. The overall increase in the average income of all beneficiaries was of the order of 5851 rupees per annum. Non-agricultural labour and dairy and other occupational areas reported a 40%–60% increase in man-days.

Capacity building and people's participation

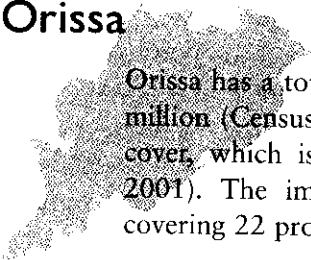
Institutional arrangements

DLACs comprised 59% representation from the government, 31% from NGOs, and 10% from academic institutions. About 65% of the DRDAs covered under the assessment reported inadequate staff and non-technical manpower that hindered programme implementation. WDTs and secretaries were appointed in most watersheds but due to delays in sanctions and project implementation, they were non-functional in 90% of the watersheds assessed.

People's participation

At the beneficiary level, there appears to have been limited knowledge of project-related processes. Only 16% of the beneficiaries covered were aware of the existence of WCs and WAs.

Orissa



Orissa has a total geographical area of 15.6 mha with a population of 36.7 million (Census of 2001). The state has 30 districts and 4.8 mha of forest cover, which is 31.4% of its geographical area (State of Forest Report 2001). The impact assessment study was carried out for 13 districts, covering 22 projects under the IWDP and 127 under the DPAP.

Impact on land, water, and biomass

Land use

Under the DPAP, the net sown area increased by 7.62% while the GCA increased by 6.25%. Under the IWDP, the increases were 8.1% and 8.3%, respectively. The area sown more than once increased by 6.7% under the DPAP and by 13% under the IWDP.

Irrigation

Overall, the area under irrigation increased by 16.7% under the DPAP and by 32% under the IWDP.

Biomass

The DPAP reported an increase in grass cover of 85% in the watershed areas and of 180% in the IWDP areas.

Socio-economic impacts

Cropping pattern and crop yields

A shift in favour of high-value crops was reported from the watershed areas with increases in area under various crops ranging from 10% to 84%. The average *kharif* yield increased from 1380 to 1833 kg per ha in the DPAP areas and from 758 to 977 kg per ha in the IWDP areas. *Rabi* yields increased from 1235 to 1824 kg per ha for the DPAP areas and from 738 to 774 kg per ha in the IWDP areas. Perennial crop yields increased from 1012 to 1305 kg per ha for the DPAP areas and from 400 to 660 kg per ha for the IWDP areas.

Employment generation

A total of 3.29 million man-days were generated (IWDP 1.29 million and DPAP, 2 million). Of these, 61.5% accrued to men while 38.5% accrued to women.

Change in farmer categories

The numbers of small and marginal farmers increased by 2.9% and 0.9%, respectively, following watershed development under the DPAP. This suggests that landless households took to agriculture, to some extent. Under the IWDP, the number of marginal farmers increased by 10.2% and that of medium farmers by 30.7%, while the number of large farmers decreased by 30%.

Capacity building and people's participation

Institutional arrangements

DLACs had been set up in 90% of the districts assessed and primarily comprised government department representatives. In comparison, there were fewer representatives of NGOs, research institutions, and other civil society organizations. Of the watersheds, 68% had the soil conservation department as the PIA, 19% had NGOs, and 13% had the DRDA. While 71% of the WAs were registered under the DPAP, 61% were registered under the IWDP.

Capacity building

As many as 84% of the watersheds surveyed reported that training programmes were held for beneficiaries. These were organized by NGOs, state agricultural departments, and DRDAs.

Rajasthan

Rajasthan has a total geographical area of 34.22 mha, with a population of 56 million. The state has 29 districts and 1.6 mha of forest cover, which is 4.8% of its geographical area (State of Forest Report 2001). Impact assessment studies were undertaken in 26 districts spread over 65 blocks of the state, covering 142 projects under the DPAP, 302 under the DDP, and 18 under the IWDP.

Impact on land, water, and biomass

Land use

The net sown area increased from 345.06 to 386.21 ha, up by 12%, across the state. There was no change in operational landholdings or irrigated land.

Irrigation, soil and water conservation

On an average, in each watershed, the number of dug wells increased from 26 to 30, tube wells from 11 to 14, ponds from two to five, and streams with moisture from 10 to 17. The water level in wells, which was at an average of 44.50 metres prior to the WDP, came up to 42.06 metres afterwards. The command area under various sources of irrigation also increased.

Biomass and livestock development

The average area under trees and vegetation increased in all the watershed areas. Post-project increase in fodder availability was reported by 72% of the beneficiaries and 57% of the non-beneficiaries. A 2.2% increase in the number of cows and a 63.7% increase in the number of buffaloes was recorded but significant efforts were not made to improve livestock breeds. Also, 50% of the beneficiaries and 36% of the non-beneficiaries reported an increase in fuelwood availability.

Socio-economic impacts***Cropping pattern and yields***

There was no change in the dominant crops grown in the watershed areas. A 73% increase was reported in pulse yields and a 5% increase in mustard yield. The area under dominant crops also increased significantly but for *jowar*, which recorded a 10% decline.

Employment and income

Over 19.2 million man-days were generated under the WDP in 12 districts at an average of 0.25 million man-days per watershed. Following the WDP, annual household incomes increased from 44549 rupees to 62493 rupees for beneficiaries and from 25652 rupees to 38194 rupees for non-beneficiaries.

Capacity building and people's participation***Institutional arrangements***

WDACs were established in all districts covering 115 PIAs, 1650 WAs, and 1575 WCs. The forest department and the watershed development and soil conservation department were the main PIAs. WDT appointed by the PIAs assisted the WC in planning and implementation. The WAs and WCs were reported to maintain assets such as *nala* bank stabilization structures,

contour-graded bunds, boulder check dams, gully control measures, and earthen check dams.

Capacity building

Training was provided to all functionaries in the WDP for varying durations: PIA (six days), WC (five days), and beneficiaries (21 days).

Tamil Nadu

Tamil Nadu has a geographical area of 13 mha, 30 districts, and a population of 62.1 million. It has 2.1 mha of forest cover, which is 16.5% of its geographical area. Impact assessment studies were undertaken in 14 districts covering five projects under IWDP and 163 under DPAP.

Impact on land, water, and biomass

Irrigation

Groundwater recharge was reported from all areas under the WDP except those districts that faced prolonged drought. An increase in drinking water availability and irrigated landholding among beneficiaries suggested a positive impact of the programme.



Recharging of old well

Biomass

In all, 13 districts reported an increase in fuelwood and 14 districts an increase in fodder availability across the watershed areas.

Livestock

In the watershed areas, an increase in the number of livestock (both local and improved) was reported. Poultry, shēep, and cow breeding beneficiaries also increased during the project period.

Socio-economic impacts***Landholdings and crop yields***

Across the state, the DPAP beneficiaries reported an increase in average operational holding (0.3 ha), arable land (1.11 ha), and irrigated holding (1.54 ha). All districts reported a post-project increase in *kharif* and *rabi* yields. Cotton recorded the maximum increase in yield followed by millets, groundnut, maize, and paddy.

Employment and income generation

The DPAP watersheds generated an average annual employment of 5819.73 man-days per project while the IWDP generated an annual average of 44299 man-days across all projects. The average annual income was reported to be around 20000 rupees following implementation of the WDP.

Capacity building and people's participation***Institutional arrangements***

WDACs were established in most districts with an average of 13 members. WDTs, WAs, and WCs were also reported to have been set up in all districts. NGO involvement was limited with DRDAs exclusively implementing projects in most districts. 469 UGs and 324 SHGs were reported to have been set up across all watersheds.

Capacity building

Between one and three training sessions were organized in all DPAP watersheds. These were undertaken by agricultural universities, Krishi Vigyan Kendras, the State Agriculture Department, and NGOs.

People's participation

Almost all watersheds committees reported opening of bank accounts and timely disbursements were reported from most areas. This enabled the achievement of up to 90% of the proposed physical targets in the project period.

Uttaranchal

Uttaranchal has a total geographical area of 5.3 mha with a population of 8.5 million (State of Forest Report 2001). The state has 13 districts and 2.3 mha of forest cover, which is 44.8% of its geographical area (State of Forest Report 2001). The impact assessment study was carried out in five districts covering a total of 370 projects under the DPAP and one under the IWDP.

Impact on land, water, and biomass

Land use

During the project, the net sown area decreased from 7640.91 ha to 7576.96 ha, the area sown more than once increased from 5295.59 ha to 5327.32 ha, the GCA increased from 10 297.93 ha to 10 385.4 ha, and the current fallow and unused culturable land decreased from 2620.95 ha to 2347.2 ha.

Biomass

Vegetative cover through tree plantation increased from 1587 ha to 2060 ha. Also, 18% of the households reported an increase in fodder availability and 12% reported an increase in fuelwood availability.

Socio-economic impacts

Cropping pattern and yields

After the project, the area under *kharif* crops increased from 2084.6 ha to 2619.83 ha for paddy, from 601.92 ha to 621.25 ha for maize, and from 979.65 ha to 999.45 ha for ragi. The area under *rabi* crops increased from 1371.86 ha to 1436.05 ha for wheat and from 938.72 ha to 1100.22 ha for barley. The yields of these crops also registered changes. Those of paddy and wheat decreased from 337.38 to 330.94 kg per ha and from 352.41 to 341.33 kg per ha, respectively. The yields of maize, ragi, and

barely increased from 18.69 to 24.94 kg per ha, from 321.93 to 323.52 kg per ha, and from 351.06 to 355.20 kg per ha, respectively.

Employment and income generation

The average annual income increased by 14.5% in the post-project period. Increases in crop prices, non-agricultural labour, trade, dairying, and poultry and goat rearing also contributed to increased income levels.

Change in numbers of farmers

After the project, the number of marginal farmers in the watershed areas increased from 64 464 to 64 612 while the number of small farmers increased from 4013 to 4099.

Capacity building and people's participation

Institutional arrangements

WDACs were established in all districts. WCs were also constituted and bank accounts opened in all cases. However, 88% of the WAs were yet to be registered at the time of assessment, with few reporting regular meetings. Only 50% of the watersheds had formed UGs and 31% had formed SHGs.

Uttar Pradesh

Uttar Pradesh has a total geographical area of 29.4 mha, with a total population of 166.05 million. Spread across 70 districts, the state has 13 746 km² of forest cover, which is 5.7% of its geographical area (State of Forest Report 2001). Impact assessment studies were undertaken in 28 districts, covering 22 projects under the IWDP and 199 projects under the DPAP.

Impact on land, water, and biomass

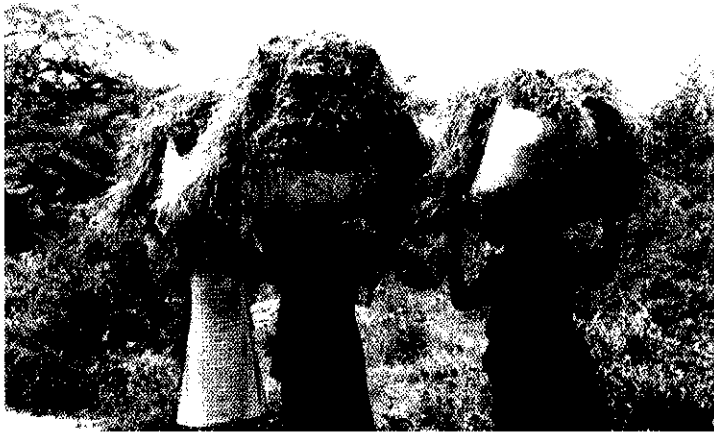
Land use

Following the WDP, the state's GCA increased by 20%, the net sown area by 14.89%, and the area sown more than once by 34.05%. Culturable land not in use reduced by 48.34%, suggesting that the provision of water for irrigation was encouraging farmers to bring more land under cultivation. Gross area under irrigation also increased by 6.66% in the

watershed areas. The water table in these areas is reported to have risen by about 17%.

Biomass

In the IWDP areas, the forest cover increased by 30.93% while in the DPAP areas, it actually declined marginally. This has been attributed to the forest department being the PIA in the IWDP watersheds. Biomass levels increased in 69.2% of the watersheds.



Carrying fodder for stall feeding

Livestock

An overall improvement of 24.67% in livestock numbers was reported. Water availability also enhanced the potential for fisheries in the watershed areas.

Socio-economic impacts

Cropping pattern and yields

The area under all crops improved significantly after the project, with barley increasing by 53.08%, wheat by 24.43%, and paddy by 19.17%. Cropping intensity increased by 4.42% in the watershed areas, which is above the state average of 1.49%. Wheat yields have increased by 67.06% per unit area, maize by 41.48%, and mustard by 47.22%.

Of all farmers, 34.56% reported a cropping intensity of less than one crop, 55.81% of more than one crop but less than two a year, and only 9.63% reported being able to take more than two crops a year. Marginal

farmers reported an increase in cropping intensity by 10.4%. The usage of hybrid seeds has gone up by 265.56%

Employment and income generation

The annual number of man-days per household increased from 392.46 to 463.16—an increase of 18%. (The DPAP generated more employment than the IWDP.) Agricultural activities contributed to a 12% increase in man-days though relatively more man-days were obtained from non-agricultural labour. Overall, the annual average household income increased by 72%. Between beneficiaries and non-beneficiaries, the increase in income was 73.52% and 66.25% respectively.

Capacity building and people's participation

Institutional arrangements

More than half (55.35%) of the beneficiaries reported being members of UGs and SHGs, 11.84% of WAs, and 5.58% of WCs. The Agriculture Department was the PIA in 44.59% of the cases while the Soil Conservation Department was the PIA in 16.22% of the cases. Also, 3.15% were NGOs and 4.95% each were DRDAs and the Forest Department. Only 6.31% of the WAs had been registered as societies, while 42.34% had been able to appoint secretaries.

People's participation

The assessment revealed that despite the existence of guidelines, the PIAs did not really attempt to elicit people's participation in the programme. It was reported that due to the absence of a culture of engaging with the local people and due to the inherent mistrust of people's abilities and intentions, the PIAs did not put in much effort in trying to concretize people's participation.

Capacity building

Training was given low priority even though its need was acute in managing various aspects of the WDP. Of all the watersheds, 35.59% had rendered training to PIAs, 24.77% to WCs, 32.88% to beneficiaries, 4.05% to trainers, and 9.01% to others. Training was confined to agriculture-related activities and provided by state agriculture officers and scientists from agricultural universities.

West Bengal

West Bengal has a total geographical area of 8.8 mha with a population of 80.2 million. The state has 18 districts and 1.06 mha of forest cover, which is 12% of its geographical area (State of Forest Report 2001). The impact assessment study was carried out in four projects under DPAP and five under IWDP.

Impact on land, water, and biomass

Land use

Increases were reported in total operational holding of beneficiaries (up to 48% in one district), arable area (up to 45% in one district), and irrigated area (2300% in one district). Decrease was reported in non-arable land (37.8% in one district). These changes were only among beneficiaries; there was little change in the status of non-beneficiaries.

Biomass

In all the IWDP watersheds, there was a marked increase in biomass and vegetative cover. This was due to the emphasis placed on sericulture, land development, grass production, agro-forestry, and forestry under the programme. In Darjeeling district, extensive work had been undertaken on timber plantation and fuelwood and fodder enhancement through silvipasture.

Livestock and fodder

While there was no change in the variety of livestock maintained, an increase in numbers was reported. However, some change in fodder availability was perceived.

Socio-economic impacts

Employment and income generation

Nearly 91% of the respondents assessed under the DPAP watersheds reported that their sources of income ended with the project. Sericulture proved to be popular in Darjeeling and made a contribution to enhancing household incomes of beneficiaries. Agricultural activities contributed to providing additional man-days of work and increasing household incomes.

Cropping pattern and yields

While crop yields are reported to have increased, especially in the IWDP areas, there was little change in crop variety or in the rate of adoption of new crops.

Capacity building and people's participation

Institutional arrangements

At the district level, the DRDA was responsible for the coordination of all programmes. A district-level watershed committee was constituted, chaired by the Sabhadhipati from the ZP. At the block level, the Panchayat Samiti was assisted by the advisory committee with the Sabhapati as chairman. The Panchayat Samitis were the PIAs in all projects under the WDP.

People's participation

The involvement of people through participatory processes was very low and there was little collective discussion or decision-making at the village level. However, there was considerable support for the programme once it was under implementation. In most cases, the members of created institutions, such as WCs and WAs, were mere political appointments. It was reported that Panchayats perceived UGs and SHGs to be alternative power centres and therefore hampered their development.

Suggestions and Recommendations

The 16 state impact assessment reports have made suggestions and recommendations to improve the design, content, delivery, participation, and sustainability of the WDP. Several of these were common in spirit with some variations in content depending on local conditions in each state. Besides the broad categories used to describe the programme at the state level, certain other categories have also been added to cover the range of suggestions and recommendations. These are as follows.

- Project planning
- Project management
- Impact on land, water, and biomass
- Socio-economic impact
- Capacity building and people's participation
- Post-project sustainability.

Project planning

Programme versus Mission

Chhattisgarh reported the need to review watershed development as a programme and consider its implementation under a 'mission' mode. This would delineate clear responsibilities, ensure personnel selection criteria, enable institutional learning, develop mechanisms for tracking fund flows, and provide in-house advisory and monitoring support.

Data-based planning for watershed development

Almost all states – especially Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, and Rajasthan – indicated the need

to improve the level of planning for watershed development. It was also suggested that the guidelines should be more explicit on the tools, techniques, and indicators in planning, including participatory approaches involving local people and PRIs in the process.

A need was felt to enhance understanding of the geography, geomorphology, geology, and terrain aspects of the state and districts and to integrate these into the selection criteria to determine the specific watersheds to be covered. Information on several socio-economic indicators was also considered important, including aspects of land use, acuteness of water scarcity, poverty, resource dependence, social composition, local economy, agricultural practices, and yields.

It was also suggested by the Orissa study that techniques such as remote sensing could be used for data collection and planning. At the watershed level, Bihar expressed the need for strategic plans that would address the issues of flood control, water harvesting, and assessment of the potential for aquifer recharge. In Maharashtra, it was felt that systematically collected information would help in adhering to the 'Ridge to Valley' approach.

Differential area and cost norms

Uttaranchal reported that the unique terrain and geography of the hills requires differential cost norms. In Orissa, it was felt that the cost of treating lands belonging to small and marginal farmers should be increased to 7000 rupees per hectare while the revolving fund for SHGs should be increased from 0.1 million to 0.3 million rupees.

However, Andhra Pradesh also cautioned that PIAs needed to concentrate on meeting financial targets so that the extent of unutilized funds could be reduced through more effective planning.

Project management

Identification of project partners

The choice of partners was considered critical to determine the success of the WDP in most states. These include guidelines for selecting PIAs, district watershed committees (Maharashtra), and NGOs (Chhattisgarh, Madhya Pradesh, Maharashtra, and Rajasthan); recruiting WDTs; and setting up WAs and WCs.

Coordination with other institutions such as PRIs and line departments such as revenue and forest was also important to improve the efficiency of

programme implementation. Several states indicated that DRDA should play the key role in coordination.

Project phasing

In at least two states (Haryana and Himachal Pradesh), it was felt that the phase of community mobilization should be separated from the phase in which physical works were undertaken. In Maharashtra, it was felt that if high levels of participation and community mobilization could be achieved by PIAs, then it was possible to cover a watershed in three-and-a-half years as against five years as per the guidelines. However, Orissa and the hill states reported that the period of implementation varies depending on geographical conditions and cohesiveness of the community. The tenure of PIAs, as well as the directors of DRDAs, needed to be for five years to improve programme outcomes.

Fund flow mechanism

Virtually all the states covered in the assessment (Bihar, Chhattisgarh, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, and West Bengal) reported having problems with the fund flow mechanism between the state governments down to the DRDA and the watershed levels. This also includes states where NGOs were acting as PIAs. It was suggested that the DRDA should streamline procedures to issue sanctions and release funds to PIAs, thus overcoming a major bottleneck in successful programme implementation.

At the watershed level, it was pointed out from Rajasthan that delays in contribution of funds by landowners prevented the creation of a sense of ownership of the assets created under the programme. Orissa suggested that the WDF should also be made into a revolving fund that UGs and SHGs could access for loans. A greater role was sought for PRIs in the WDP, which would include financial contributions to ensure sustainability in the long term.

Concurrent monitoring

Significant improvements are needed in the monitoring mechanism of the WDP, according to most states (Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, and Orissa) covered under the assessment. It was felt that an internal monitoring system is essential for effective implementation of the watershed programme through the state-level committee, the district-level advisory

committee, the WAs, and the WDTs. Some states (Haryana, Himachal Pradesh, and Maharashtra) recommended the creation of a technical or monitoring cell or nodal agency while others felt that the DRDAs and subject matter specialists should monitor PIAs much more closely to assist in the implementation of the programme as per the guidelines. For instance, Andhra Pradesh considered it important to undertake water budget studies at the watershed level to monitor the number of wells being dug.

Madhya Pradesh also suggested the adoption of 'development audits' as participatory monitoring tools that would also involve beneficiaries in the process. Andhra Pradesh expressed a desire to improve the collection, dissemination, and communication of information related to the WDP and of the progress made at specific locations.

Technology selection and efficiency improvement of physical structures

The creation of physical structures is a key ingredient of the WDP. Andhra Pradesh, Bihar, and Uttaranchal reported that the water-bearing capacity of some structures such as storage tanks and check dams and the efficiency of gabion structures needed to be substantially improved through research and adaptation of design to local conditions. Where possible, indigenous knowledge and technologies were to be given preference in the choice of structures.

Impact on land, water, and biomass

Several states (Jharkhand, Madhya Pradesh, Orissa, and Rajasthan) suggested that physical works such as gully stabilization with vegetative checks, *nala* bank stabilization, percolation tanks, contour/ graded bunding with vegetative hedges, repairs of existing community assets, and bench terracing should be undertaken and maintained in watershed projects. While these would help conserve water, it was also felt that changes were required in agricultural practices of farmers to include cropping patterns and crop types to maximize the benefits of the WDP. Recharging the groundwater and then controlling access and use would be essential to ensuring sustainability of the benefits.

The treatment of catchments and enhancement of biomass were key objectives of the WDP. However, greater effort was required to achieve physical targets under horticultural and forestry activities and to ensure protection to achieve higher survival rates. In Rajasthan, it was recommended that biological measures / establishment of nurseries,

activities related to agro-forestry and horticulture development, double crop demonstration and development of livestock of improved breeds, and poultry and piggery development needed to be undertaken in the watershed project areas.

Socio-economic impact

Improvement of market linkages

Some states felt that the benefits of the WDP could be enhanced by creation of market linkages to help farmers increase returns from improved agriculture and consolidation of natural resources. Road connectivity in rural areas should also be improved to provide access to markets.

Employment generation

Concern was expressed at the paucity of options for landless persons covered under the WDP. States such as Maharashtra expressed the need to maintain proper records of man-days generated (with details of expenditure on labour) to ensure that the landless were being provided some returns from physical works. In Orissa, it was felt that agro-based industries in rural areas needed to be encouraged while the Forest Department could expand the scope for income generation options based on non-timber forest produce. In terms of total allocation, it was felt that up to 30% of the funds should be for non-farm activities to benefit the landless.

Capacity building and people's participation

Improvement of capacity at all levels

Given the complex nature of the WDP and its need for functioning with multiple stakeholders, each with unique roles and responsibilities, it was reported from virtually all states (Andhra Pradesh, Bihar, Himachal Pradesh, Haryana, Jharkhand, Maharashtra, Madhya Pradesh, Orissa, Rajasthan, Tamil Nadu, and West Bengal) that more attention needs to be paid to the capacity requirements of the programme.

At the village level, due support needs to be extended to UGs and SHGs to improve their functioning besides improving capacity for maintenance of records on various parameters related to the watershed programme. In Bihar, it was suggested that village panchayat members be co-opted into WCs to improve capacities in income generation and savings promotion, besides developing a role for PRIs in post-project O&M of assets and structures.

Capacity building needs to be strengthened with the identification of institutions and resource persons to improve training in a range of physical works and community-organization-related aspects. Training for community mobilization is especially required to enable the creation of Village Watershed Committees, SHGs, and UGs at the community level and thereafter to assist them in managing different aspects of the WDP. Participation of women in the WDP can also be addressed through adequate training and orientation.

In some states (Madhya Pradesh, Rajasthan, Tamil Nadu, and Uttaranchal), it was felt that PRA techniques brought in elements of ownership and transparency to the planning process. However, many government departments were unfamiliar with PRA and community mobilization and needed to be trained and orientated to the application of such methodologies. It was also felt that specialist training institutions should be engaged for the period of the project to undertake all tasks related to capacity building. The DRDAs were to be encouraged to release training and capacity building funds on priority.

Institutional arrangements

The WDP requires institutional arrangements that engage with existing institutions such as DRDAs, PRIs, and line departments as well as the creation of new institutions such as UGs, SHGs, WCs, WAs, and district watershed committees. Several states (Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Uttaranchal, and West Bengal) recommended the strengthening of institutional partnerships in the WDP.

It was suggested that the involvement of PRIs is essential right from the project formulation stage and that all works connected with land-and water-based activities in the area may be taken care of by the concerned Gram Panchayat. There was also a need to reduce conflict between the WCs and Gram Panchayats over availability of funding with each institution.

Greater autonomy and recognition of roles and responsibilities of DRDAs, PIAs, WDTs, WAs, and WCs are also required. The roles and functions of watershed secretaries, WCs, and WAs need to be reviewed to examine the scope of incorporating Gram Panchayats in watershed implementation. NGOs can be assigned to train PRI members in the techniques of surveying, planning, implementing, monitoring, and supervising.

People's participation

The poverty alleviation objective of the WDP mandates that planning and implementation be undertaken through people's participation. While considerable effort has been made in this regard, some states (Andhra Pradesh, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, and Uttaranchal) reported the need to strengthen this aspect further.

It was pointed out that at the moment, the WDP holds few benefits for landless agricultural workers and non-beneficiary households who are often the most impoverished. There is a need to integrate other programmes of the government such as the PMGSY with the WDP. The number of beneficiaries below the poverty line as well as the participation of women were extremely low in some states and needed to be addressed. It was even suggested that necessary agencies with requisite participatory skill be engaged to improve the level of people's participation.

Engagement with other sectoral experts

Some states (Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Kerala, Madhya Pradesh, and Uttaranchal) also recommended that DRDAs and PIAs need to be assisted by subject matter specialists in civil engineering, agricultural sciences, animal husbandry, economics, and marketing of agricultural produce. Involvement of experts and promotion of crop demonstrations will increase the uptake of new techniques by farmers. Inputs from experts from all streams – both from development organizations and academic and scientific institutions – needed to be integrated into the WDP. It was also felt that once the project yielded results, there should be development of forward linkages to ensure better marketing and optimum returns to the beneficiaries through associations with the cooperative and banking sectors.

Post-project sustainability

The assessment highlighted the importance of the issue of post-project sustainability of both physical and institutional structures (Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Orissa, Uttaranchal, and West Bengal).

Many agencies had not considered a withdrawal strategy and it was suggested that WCs need to be sustained beyond the project period by

setting aside land revenue funds from the government for O&M at the watershed level. It was suggested that training be provided to WCs and WAs for post-project functions with guidance from a government department or NGO. If properly engaged with the programme, the PRIs could also help provide some guarantee for O&M expenses. In Maharashtra, it was suggested that 10% of the total funds for WCs should be set aside as development funds to be used for O&M after the project period. In Jharkhand, the idea of a corpus fund was mooted. Set up with contributions from the sponsoring authority, the state government, and beneficiaries, it would be operated by the WC or the Gram Panchayat.

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