From Hariyali to Neeranchal

Report of the Technical Committee on Watershed Programmes in India

Department of Land Resources
Ministry of Rural Development
Government of India

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Cover Photos: *Courtesy Dr. Debashis Banerji, Samaj Pragati Sahayog*

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Foreword

I have great pleasure in submitting the report of the Technical Committee on DPAP, DDP, IWDP Programmes and related set of issues referred to the Committee.

The Committee was constituted by the Department of Land Resources, Ministry of Rural Development (MoRD), Government of India vide its Order No. S-16011/1/2004-DPAP dated 14 February 2005 (for Terms of Reference see Appendix IV of this report). The Committee was required to submit its report by 31 October 2005 but a spill over beyond that date was necessary to complete the report. A two-month extension was granted until December 31, 2005 for the submission of the report. The draft report was circulated to the members of the Committee on 2 January 2006 and a final Committee meeting was held on 16 January 2006 to approve the report, following which it was edited and printed.

At the outset, I would like to set down briefly the procedures outlined by me to enable us to gain a fuller understanding of all the complex issues involved in this significant intervention in rural development. I felt that a better understanding would emerge through an absorption of learnings from a wide range of implementation models ranging from Government-implemented programmes to insights from a significant sample of NGO initiatives, and donor-implemented programmes. This would be supplemented by a study of research findings of which there is considerable literature as one can see from the citations at the end of each chapter.

Apart from these varied sources, the Committee received responses (upon request) from various state governments on the terms of reference set for the Committee. Special consultations were held with research institutions, NGOs, donors, etc., besides papers on specific issues sought from those with expertise in respective areas.

This foreword is intended to set down the impressions gained from a wide array of sources and distill some important principles upon which this report rests. I must add at the very outset that the Committee has followed the lead of its distinguished predecessor the Hanumantha Rao Committee of 1994. Like the Hanumantha Rao Committee we have deferred categorisation of DDP and DPAP and prioritisation of IWDP blocks (our first two terms of reference) for a separate stage of work. This involves the collation and analysis of massive amounts of block-level data from across the country. This work has started and the MoRD has very kindly agreed to our suggestion that this exercise be delinked from the main report of the Committee that has now been prepared and printed.

In the current generation of watershed programmes there has been a serious effort to move away from a purely engineering and structural focus to a deeper concern with livelihood issues. The shift in approach is epitomized in the phrase “watershed plus”. This change is more clearly seen in the voluntary sector where, not surprisingly, the approach is driven at all stages by the intensity of people’s involvement in various activities of the watershed. This people-centred focus is more visible, pervasive and clearly articulated in the voluntary sector than in some of the more mechanically implemented, bureaucratically driven programmes, which are characterized by an obsession with “outlays rather than outcomes” and “accounting rather than accountability”. This observation may sound somewhat ungenerous and harsh but is nonetheless true in general of the implementation ethos in government-

implemented programmes. This does not imply that I have not seen some excellent examples of government watersheds marked by requisite commitment and enthusiasm comparable to the best that we see in other sectors.

It is probably now part of received wisdom to say that good results are seen to flow when people are involved in every stage of the programme from concept to commissioning. WOTR and HST in Maharashtra, MYRADA in Karnataka, and the Andhra Pradesh and Orissa livelihood programmes of DFID are a few outstanding examples of agencies and projects with a significant people-centric approach. I was particularly impressed by the Participatory Net Planning (PNP) method of WOTR where each holding is visited by the planning team to survey and decide proposed improvements along with the concerned farmer, thus developing a sense of ownership. The benefits of weaving in gender at all stages of the development process also enhances the capacity of women to participate and contribute to decision-making. They thereby become full-fledged citizens of the community in their own right.

I have been similarly impressed by projects where the fruits of science and technology have been harnessed to plan out a set of interventions. A sense of fairness always prevails when objective data, say from imageries and maps in conjunction with ground truthing, are used as a basis for implementation. Many state governments are now using satellite data for mapping natural resources and for preparing micro-watershed plans. In particular the methodology developed for geo-referencing of village maps has been used by the state governments of Maharashtra and Chhattisgarh, with each village contributing through the Gram Panchayat for this activity. The wider use of satellite data contributes to a more transparent defence against political and other pressures, which more often than not are the drivers of priority in development programmes across the country.

Transparency in programme implementation is another area of concern. One comes across some interesting ways in which this is enforced, for example, when details of the programme are posted on the walls of buildings in villages, and the programme itself gains in credibility and acceptance. This is now a widespread phenomenon cutting across programmes whether they are governmental or voluntary. I saw excellent examples of this in Gujarat, Maharashtra, Madhya Pradesh, Orissa, Karnataka, Tamil Nadu, Andhra Pradesh, to name a few states. Yet another significant fallout of display of watershed maps and programme details (including sometimes quality information like “Below Poverty Line” families covered, etc.) is that they have a favourable impact on the community’s understanding of what is grounded as a development programme. Expenditure details in particular enforce accountability of leaders and committees to the community at large. I was pleasantly surprised to see that the technical details of a watershed, like gully-plugging, nala-training, contour bunds, check-dams, etc., were being handled with a flourish by the so-called illiterate villagers, including women, who had no trouble understanding the technical nuances. This indeed amounts to bringing science to the doorstep of the villager in imaginative ways, which will in due course enable them to be part of a scientific discourse.

Similarly, participatory monitoring and evaluation systems (PMES) are gaining significance. We have to move, in the words of Crispino Lobo of WOTR, from regarding monitoring and evaluation as not merely a surveillance mechanism, but to viewing it as a management tool; not to prove but to improve efficiency, effectiveness, and

sustainability of interventions. Notable work has been done by WOTR on improving PMES as a decision-support system, and to generate key learnings with the participation of all stakeholders, with focus on capacity building and empowerment. Apart from the concurrent monitoring and qualitative assessment matrix of WOTR, innovative work has been done in other projects as well, as may be seen in the process benchmarking of Andhra Pradesh Rural Livelihood Project (APRLP) and WASSAN; monitoring of 10 poorest families adopted by DANIDA; besides a number of tools adopted by different agencies such as MYRADA, KAWAD, AKRSP, BAIF, etc. There is need for reworking national guidelines on this subject, to make it more of a learning process rather than a reporting requirement relating to financial releases.

One of the recurring debates in the watershed programme is about the "local contribution" that is required from the community before projects are taken up. This aspect is often handled mechanically and in somewhat disturbing ways whereby the landless end up paying a price for the larger development of a village, and in the end are deprived of a meaningful share in the outcomes. In some voluntary sector projects, however, this is handled more imaginatively in terms of a commitment from the community right at the start by way of some *shramdaan*, which often results in useful assets for the people living in the village. In many NGO projects no work is taken up unless a firm commitment from the community is available before the programme commences, in the form of voluntary effort or *shramdaan*. In other words, there is no "free-lunch". This type of approach is seen in work done by agencies like WOTR, HST, Premji Bhai Patel and MYRADA.

Coming to the often debated subject of community capacity building, I met many women's SHGs across the country in order to understand their dynamics. It was an eye-opener to see the phenomenon growing in scale and significance, and rapidly assuming the character and potential of a mass movement. It is still too early to gauge its full significance or predict its future course. One thing is clear: rural women are finding a "voice" as one landless and illiterate woman expressed graphically in one of the meetings; they are rapidly freeing themselves from male dominance within the household, and the stranglehold of the money lender without, and wherever this movement is strong and well-organized, the money lender has shifted his operations and disappeared from the village. Women are learning to save and borrow to meet their household and micro-enterprise needs, and doing this with some skill and business sense. The banks are interestingly zeroing in on these organizations to whom they realize, money can be lent without risk, since their repayment record is nearly always impeccable. SHGs in some states, where the development environment is congenial, have grown into federations, and in due course will go on to assume the leadership of larger and diversified development programmes at the village level. In the OUTREACH projects in Chittoor district (Andhra Pradesh), collective marketing by federation of SHGs looked promising for the future since SHGs beyond a particular threshold are unable to market their products.

I saw the work done by Aga Khan Rural Support Programme (AKRSP) in Gujarat where women's SHGs have assumed the entire responsibility for land management, water conservation and watershed programmes including their accounting and technical aspects, thus demonstrating that these responsibilities are not beyond the capabilities of these women. Similar examples are legion in many parts of the country. All these developments are heartening to see and in this lies more than a ray of hope for the future of watersheds.

On the increasingly important issue of groundwater and its usage, communities which are well organized and have the right type of leadership are increasingly turning to self-regulation of critical resources. The whole issue of groundwater regulation and usage which is of critical importance to the future of the community is being handled very well by some communities. In many of the projects, where people's initiative is pronounced, no pumping is allowed, no water intensive crops are allowed to be grown, priority is given in summer to the drinking water needs of the community including their livestock, and reliance on water tankers has ceased. In these communities there is a better understanding of how this precious and dwindling water resource is to be used. Policy makers and programme implementers need to grapple with this issue now in a serious manner, considering the happy results that have flowed from self-regulation by the community of conserved water resources. When things are handled this way and livelihoods prosper in the village, one gets to see that rare phenomenon of reverse migration, of people returning from the city to the village (Hivre Bazar, Ahmednagar district, Maharashtra, is one example that was cited, where people have drifted back into the village from Mumbai sensing greater opportunities in a dynamic watershed setting).

Training is a much talked about but neglected aspect of watershed programming. We saw some excellent efforts in Darewadi Training Centre (WOTR), Samaj Pragati Sahayog (SPS), and Rural Development Trust (RDT) in Anantpur, to quote a couple of examples of places where trainees from all over the country are flocking to get trained in various aspects of watershed programmes. Where the training centres are located in the watershed itself, there is a greater opportunity for practical on-site learning and absorption. At SPS tribals are being trained in the vernacular and in esoteric accounting procedures such as double-entry bookkeeping! It is time we made a list of outstanding institutions imparting meaningful training and supported them under this programme.

There has been a wide-ranging debate on the role of PRIs, especially in the context of the Hariyali guidelines. I have seen excellent examples of able panchayat presidents, vibrant gram panchayats, active and growing bodies like SHGs, watershed committees, etc. But the debate on the choice of implementing agencies is a never-ending one. We have tried to steer a balanced, middle way in the relevant chapter of this report. However, the impression that I got was that gram panchayats are overburdened with budgetary allocations, their hands are full, and that watershed implementation is best handled through watershed committees on which the gram panchayat could well be represented. One also veered around to the view that accountability in the village is best enforced in and through the gram sabha as it has a grandstand view of all that happens in a village. I was also inclined to share the view presented in some expert consultations that gram panchayats are best equipped to handle fiscal, regulatory and enforcing functions, and that programmes like watersheds involving the entire community are best left to the so-called "General Assembly" of the village (i.e., the gram sabha) and its elected committees. One was also inclined to support an emerging view in some watersheds that women SHGs could well be entrusted with larger development programmes including programmes with a technical content like watershed works. There is need in this debate to marry the requirements of democracy with programme imperatives and settle for what is practical and reasonable in the village context. In other words, the rational and the real have to be imaginatively melded.

Convergence of various programmes at the village is another issue, which is widely debated in development circles. I saw an excellent example in Orissa of a Block Development Officer achieving seemingly effortless convergence of all programmes in the watersheds, clearly through a well-coordinated effort. I feel that given a

necessary commitment on the part of implementers and implementing agencies, this can be achieved even at less imposing levels of hierarchy as in the example cited above. It is, however, clear to me that there is a strong case for making watershed the framework and umbrella for uniting all development programmes that are implemented in the village. It is high time this grand unification takes place, and all the moneys spent in the village by various departments are brought together under a unifying and integrated framework with suitable accountability to the gram sabha.

Apart from some of these hardcore issues underlying watershed programmes, one had occasion to see what was really happening on the ground, the clash of classes and interests. Take, for example, the issues stemming from dependence of small, marginal, and landless farmers on common property resources, such as fodder and water for meeting their grazing requirements. In Seva Mandir, Rajasthan, one saw the continuing and grim struggle that was going on to gain control over these resources under stiff opposition from the local bureaucracy. One saw the dilemma of the small livestock holder depending on these resources and yet being unable to access it given the obstructive and harassing ways of the revenue bureaucracy. It is time that policy makers address these issues. Some legislative initiatives, I gather, are underway in Karnataka for a clearer legislative articulation of issues governing the usage of what they call "common pool" resources. However, there is great need to educate users about their rights vis-à-vis natural resources, and enable them to understand the underlying administrative process and eventually move to a state of command and control of that process.

Yet another useful learning in this context was the meeting on livestock, environment, and development in watersheds, organized at the initiative of Dr Marcella D'Souza (WOTR). From this meeting one understood the implications of reduced access to common land resources (including forests and their environmental implications), the need to enable people to develop a greater stake in protecting and using them, the importance of giving rights to the poor, and giving them more space in decision-making relating to the whole question of access to common resources.

Some of the good practical examples of this approach were seen in Anantpur district in Andhra Pradesh, where the experience of Ananta Paryavarana Parirakshana Samiti on sustainable development of biomass in common lands is a significant one where enhanced livelihood opportunities for the poor have been ensured in collaboration and coordination with the forest department.

Another useful learning was from a visit to the DFID Livelihood Projects in Orissa. Several useful lessons could be absorbed beginning from targeting the poorest, participatory micro-planning approaches, livelihoods diversification and asset maintenance, equity in benefit sharing, capacity building, watershed selection criteria, and so on. Their strength appears to lie in their planning process and rigour in implementation having regard to various sensitivities that should be part of any development programme. The field visit to PRADAN watershed in West Bengal was equally instructive in terms of plantation work, addressing drinking water requirement, individual farm ponds for irrigation, etc. In Uttaranchal, one saw an imaginative handling of drinking water requirements with women groups leading the way. This was particularly interesting in view of the fact that drinking water droughts were a common feature in these areas even though they had adequate rainfall. The watershed programme in Uttaranchal is managed by a separate watershed development department. In this state a collective marketing of produce by CBOs (federation of SHGs) has been integrated as a part of the watershed

programme. Also at the village level Garima (habitation sabha) has managed the whole watershed programme. The Sarpanch played the role of patron under this EU funded programme. Based upon this experience, the World Bank is now upscaling the above institutional mechanism in the entire state. Under this approach, the panchayat shall receive the funds but will transfer it to a number of village-based watershed committees elected by village sabha under its jurisdiction (in this state, each gram panchayat has a number of revenue villages and hence as many village sabhas).

In Himachal Pradesh we saw excellent self-reliant development and management of drinking water system by women groups. This has happened essentially due to good support provided by People's Science Institute to the district administration in organising women's groups. This work was a part of the MoRD-funded watershed programme. In Haryana, communities were seen working in close association with the Forest Department to create irrigation facilities (after a dialogue lasting for more than a year) and innovative outsourcing of maintenance arrangements, which would take care of their sustainability after a check-dam was successfully built. In Punjab, one came across in the World Bank implemented projects an emphasis on restoring traditional water harvesting structures. In case of Punjab and Haryana, the programme was implemented essentially through adoption of indigenous innovations even in designing of the water harvesting structures. The farmers have paid contribution even for construction of community-oriented water harvesting structures. Also the entire responsibility for subsequent utilization of water resource as well as for repair and maintenance of the structure has been taken over by the users' group (which is a body separate from the gram panchayat). The concept of user's charges has now been institutionalised properly. The income from this is used for carrying out repair and maintenance of water harvesting structure besides meeting other community oriented needs.

Traveling swiftly down to Andhra Pradesh, the visit to Anantpur proved to be very useful. One saw an excellent initiative by the Forest Department for protection of reserve forests through community participation and policing. In another place, one saw interesting results from what could happen over a period of 30-40 years if the community agreed to a self-imposed ban to not enter a forest area and allow complete natural regeneration. The result was in stark contrast to what we saw in the neighbourhood where no such regulation was in place. The entire success of this experiment was attributable to a village leader who was backed up by the community and supplemented by a punitive system voluntarily enforced by the village elders for violation of rules and procedures. Interestingly, no one is allowed to carry a sickle into the naturally vegetating areas and fines are imposed in cases of violation. In the RDT donor-funded projects in Anantpur, one saw an excellent training institution which could be put to good use by state governments in this region.

This foreword would not be complete without a reference to the contentious issue of the Hariyali guidelines. Many implementation issues with reference to these guidelines were brought to our notice during discussions and field visits by state governments and project implementing agencies alike. Some states, notably Andhra Pradesh, have sought to overcome these difficulties by evolving state-specific process guidelines within the overall Hariyali guidelines and getting on with the implementation of programmes. A separate chapter (Chapter 4) has been devoted to the issue of guidelines that have now been reworked in the light of the main recommendations of this committee. We hope that this will resolve the much-debated issue of the Hariyali guidelines. We have

recognized that flexibility and adaptability need to be incorporated into these guidelines as situations and the context through the country differ widely and any implementation needs to accommodate this factor.

I could go on in this vein and narrate in greater detail all that I have managed to see and absorb but I have to draw a line somewhere! It remains for me to thank those who were instrumental in assisting me in finalizing this report, and in gaining an understanding of the many facets and dimensions of this important programme. I must thank Shri Anil Shah and the Development Support Centre, Ahmedabad for the excellent presentations by various resource-persons made at the Centre for the benefit of the Committee. Our grateful thanks to him, and to Prof. Khandwalla (formerly Professor at IIM, Ahmedabad) for researching and preparing a basic paper on the institutional design of watershed programme which was the starting point for the work in Chapter 3 of this report. Similarly, I owe a deep debt of gratitude to *Forum for Watershed Research and Policy Dialogue* for preparing an excellent set of papers for the Committee, and for bringing together the research initiatives bearing on this programme at a special meeting organized at Pune for this purpose. Likewise, DFID at our request prepared a set of papers containing an analysis and collation of lessons learnt from the DFID-supported watershed development projects in various states (notably through KAWAD, APRLP and WORLP), and capture the best practices thereof. Very useful information was also generated by their consultants on British institutional innovations in the area of public management. I am deeply grateful to them and in particular Dr Virinder Sharma, Livelihoods and Environment Adviser, DFID-India and their team, for arranging a one-day workshop at New Delhi on this subject.

To some of the NGOs I owe a similar debt of gratitude for educating me in the nuances of public participation and other such sensitive elements of watershed programmes. First and foremost I must mention Dr Crispino Lobo of WOTR, who enriched my understanding; Dr Marcella D'Souza for arranging a dialogue with Lead Advocacy Network on livestock issues, related to environment and development.

Shri Aloysius Fernandez of MYRADA, who is a distinguished Member of the Committee from the NGO community, took us on a visit to his watershed project in Karnataka, which showcases what a "Lead NGO" can do to handle programmes with a significant geographical spread, besides demonstrating the sustainability of partnership mode of working with diverse and challenging partners like the state government and donors. It is one project where the withdrawal from watershed at the conclusion of the project has been handled without hurting the community, by continuing post-watershed professional support. This must surely be a unique project in the country where radio stations operated by women are broadcasting useful messages to the rural community; it is rightly called a community resource center.

Also to Deep Joshi of PRADAN, Ravi Chopra of PSI, Dehradun, Dr. Y.V. Malla Reddy of RDT, and Neelima Khaitan of Seva Mandir – to mention a few among the many NGOs that I interacted with – I owe my enhanced understanding of this complex program.

I thank Dr. J. Venkateswarlu, ex-Director of CAZRI, for giving us written submissions on the unique challenges of the North-East as also the problems of cold/hot deserts, a subject on the fringe of the development debate. I thank Dr. N.K. Sanghi of WASSAN for helping me put together field visits to watersheds and not to miss out anything significant from what is happening in the country. In the many discussions and in the visits that he

accompanied me, he shared his wide and critical understanding of this programme and thereby enriched my own learning.

I owe a debt of gratitude to the various state governments listed in Appendix III for their studied and learned response to the terms of reference of the Technical Committee and for having facilitated and coordinated our travel to various watershed projects in their jurisdiction. I have indeed learnt a great deal from these visits and discussions.

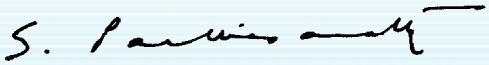
This report would not have been possible without the unstinted support given by Dr. Mihir Shah of Samaj Pragati Sahayog (SPS), who went far beyond his call as Honorary Advisor to the Committee, and willingly assumed onerous responsibility. He has managed to integrate into a flowing and limpid narrative a vast amount of information in the form of submissions and reports that I had gathered from my visits, the research insights gleaned from a decade or more of published academic outputs, besides drawing upon his own vast experience of running similar projects with disadvantaged sections of the tribal community in remote central India. He has synthesized the learning in a way that makes the report eminently readable, and at the same time ensures that it never falls short of requisite standards of erudition. I am sure this report will be used both by practitioners and the academic community with profit. I would like to thank Dr. Mihir Shah and his research team at SPS for an outcome that is characterized by a sense of balance and moderation considering the passions that this programme so easily provokes in many quarters. The report, at the same time, is shot through with a sense of deep commitment and urgency about what is required to be done by policy makers and implementers alike.

I must thank lastly the fellow Members of the Committee, the Member Secretary Shri Anoop Badhwa, and the Additional Secretary, MoRD, Shri V.S. Sampath for their continuous support and understanding. Thanks are also due to the National Institute of Rural Development, Hyderabad for undertaking the production of this report and to Ms. Sheila Vijayakumar for meticulous editing.

Dr. Raghuvansh Prasad Singh, Hon'ble Minister for Rural Development evinced keen interest in the report throughout our work and encouraged us to think out of the box, to provide a new direction to the watershed programme in India. I am grateful to him for his unstinting support.

I read in a foreword to a book recently something that aptly sums up my dilemma. The author says "Lists of thank yous are always dangerous since the risk of leaving someone important is a very real one." I would like to record an unreserved apology here if that is the case. Making a complete list would probably be hard both on the reader and my power of recall alike.

I would like to record my heartfelt thanks to the Ministry of Rural Development (Department of Land Resources) and in particular Shri M. Shankar, former Secretary (Rural Development) for entrusting me the rather awesome responsibility of chairing this important committee. It has been a vast education for me at this stage of my life when learning new things and gathering fresh insights is a rare happening. I hope that the outcome will benefit the vast number of rural communities engaged in a daily struggle for livelihoods throughout this country.



26 January 2006
Hyderabad

S. Parthasarathy, IAS (Retd.)
Chairperson
Technical Committee

Acronyms

AER	agro-ecological region
AESR	agro-ecological sub-region
AFARM	Association for Agricultural Renewal in Maharashtra
AFRI	Arid Forest Research Institute
AKF	Aga Khan Foundation
AKRSP	Aga Khan Rural Support Programme
ANANDI	Area Networking and Development Initiative
APRLP	Andhra Pradesh Rural Livelihood Project
BAIF	Bharatiya Agro-Industries Foundation
BCR	benefit-cost ratio
BDO	Block Development Office
BPL	below poverty line
CAPART	Council for Advancement of People's Action and Rural Technology
CAZRI	Central Arid Zone Research Institute
CBO	community-based organisation
CDS	Current Daily Status
CEO	Chief Executive Officer
CESS	Centre for Economic and Social Studies
CIDA	Canadian International Development Agency
CII	Confederation of Indian Industries
DANIDA	Danish International Development Agency
DANWADEP	DANIDA Watershed Development Programme
DDP	Desert Development Programme
DFID	UK Department for International Development
DHAN	Development of Humane Action (DHAN Foundation)
DLR	Department of Land Resources
DPAP	Drought Prone Areas Programme
DR	disintegrated rock
DRDA	District Rural Development Agency
DSC	Development Support Centre
DWD	Department of Wastelands Development
DWDA	District Watershed Development Agency
DWMT	District Watershed Management Team
EAP	Externally Aided Project

EAS	Employment Assurance Scheme
EEC	European Economic Commission
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FICCI	Federation of Indian Chambers of Commerce and Industry
FPR	Flood Prone Rivers
FRL	full reservoir level
GIA	Gross Irrigated Area
GIS	Geographical Information System
GWD	groundwater development
HDR	Human Development Report
HM	hard mooram
HST	Hind Swaraj Trust
IARI	Indian Agricultural Research Institute
ICAR	Indian Council of Agricultural Research
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFAD	International Fund for Agricultural Development
IGWDP	Indo-German Watershed Development Programme
IIM	Indian Institute of Management
I-JRY	Innovative Jawahar Rozgar Yojana
IRR	Internal Rate of Return
IT	Information Technology
IWDP	Integrated Wastelands Development Programme
IWMI	International Water Management Institute
KAWAD	Karnataka Watershed Development Society
KSSP	Kerala Shastra Sahitya Parishad
LCC	land capability class
LEISA	low external input sustainable agriculture
LGP	length of growing period
M&M	major and medium
MLA	Member of the Legislative Assembly
MoRD	Ministry of Rural Development
MoU	Memorandum of Understanding
MTO	Master Trainer Organisation
MWC	Milli-Waterhed Council

MYRADA	Mysore Resettlement and Development Agency
NABARD	National Bank for Agriculture and Rural Development
NARS	National Agricultural Research System
NASDORA	National Authority for Sustainable Development of Rainfed Areas
NBSS-LUP	National Bureau of Soil Survey and Land Use Planning
NCMP	National Common Minimum Programme
NDDB	National Dairy Development Board
NE	North-East
NEHU	North Eastern Hill University
NGO	non-government organisation
NREGS	National Rural Employment Guaratee Scheme
NRM	natural resource management
NRSA	National Remote Sensing Agency
NSS	National Sample Survey
NTFP	non-timber forest produce
NWDPRA	National Watershed Development Programme for Rainfed Areas
PET	potential evapo-transpiration
PIA	Project Implementing Agency
PIDOW	Participative Integrated Development of Watershed
PM	Project Manager
PMES	Participatory Monitoring and Evaluation Systems
PNP	Participatory Net Planning
PRA	Participatory Rural Appraisal
PRADAN	Professional Action for Development and Networking
PRI	Panchayati Raj Institution
PRM	Participatory Resource Mapping
PSI	People's Science Institute
RDT	Rural Development Trust
RVP	River Valley Projects
SC	Scheduled Caste
SHG	Self-Help Group
SIDA	Swiss International Development Agency
SIDBI	Small Industries Development Bank of India
SoR	Schedule of Rates
SPS	Samaj Pragati Sahayog

SRI	System for Rice Intensification
ST	Scheduled Tribe
SVO	Support Voluntary Organisation
TARU	The Action Research Unit
UH	undulating and hilly
UNDP	United Nations Development Programme
UNIFEM	United Nations Development Fund for Women
UPA	United Progressive Alliance
VRTI	Vivekananda Research and Training Institute
VWC	Village Watershed Committee
WA	Watershed Association
WASSAN	Watershed Support Services and Activities Network
WDF	Watershed Development Fund
WDPSCA	Watershed Development Project in Shifting Cultivation Area
WDT	Watershed Development Team
WORLP	Western Orissa Rural Livelihood Project
WOTR	Watershed Organisation Trust
WTCER	Water Technology Centre for Eastern Region
WWC	Women's Watershed Council
ZP	Zilla Panchayat

Executive Summary

Chapter 1

- ★ The report begins in Chapter 1 by building the case for an enlarged and reformed watershed programme in India.
- ★ For the first time since the mid-sixties, the 1990s witnessed a rate of growth of foodgrain production that was lower than the rate of growth of population.
- ★ While irrigated agriculture appears to be hitting a plateau, dryland farming has suffered neglect.
- ★ In Chapter 1, we argue that an increased thrust to rainfed areas through greater emphasis on a reformed watershed programme may hold the key to meeting this challenge.
- ★ Our review shows that the limits to further expansion of surface and groundwater irrigation through big dams and tubewells are being reached rapidly. This makes the urgency of a different strategy for India's drylands even greater.
- ★ Such a strategy needs to recognise the location-specific characteristics of different parts of India and also needs to be sensitive to the limits set by the eco-system. This, we believe, is the broad strategy of watershed development.
- ★ The watershed approach represents a win-win situation. For the life of our irrigation sources themselves, whether they are dams (big, medium or small) or wells/tubewells, depends crucially on the treatment of their catchments to reduce rates of siltation, and on groundwater recharge works, which are both key ingredients of watershed development.
- ★ We provide evidence to show that while it is the rainfed parts of Indian agriculture that have been the weakest, they are also the ones that contain the greatest unutilised potential for growth.
- ★ We also show that the productivity of dryland agriculture needs to be developed if food security demands of the year 2020 are to have a realistic chance of being met.
- ★ It is our considered view that the growth elasticity of poverty (the response of poverty to growth) would be the highest if growth were to be focused on these neglected regions of India.
- ★ We argue that a more intensive and improved watershed development programme holds the key in this regard.
- ★ At the current level of outlay, it would take around 75 years for watershed treatment to be completed. For the work to be completed by the year 2020, the government needs to allocate around Rs. 10,000 crores per annum every year for the next 15 years.

★ In our view, this amount could come from two main sources: doubling of current programme outlays on watershed development that would yield around Rs. 5,000 crores and an allocation of around Rs. 5,000 crores from the National Rural Employment Guarantee Scheme (NREGS) specially earmarked for watershed programmes. This makes perfect sense since the NREGS is already primarily focused on watershed-related activities.

Chapter 2

★ Chapter 2 outlines the lessons learnt from the watershed programme in the country so far and the ways in which the programme needs reform.

★ Perhaps the most critical weakness of watershed programmes in India is that they operate almost as if groundwater does not exist. It enters only as something to be recharged and replenished. But it appears to play almost no role at all in watershed planning. Watershed planners forget that just as there is a surface water catchment, there also exists a groundwater catchment.

★ We always define a watershed with reference to the surface water catchment alone. Even if we continue to do this, there is a need to recognise and study the contours of the groundwater catchment and variations in hydrogeology, at the earliest stages of planning a watershed project. This is important for several reasons – location of structures, ensuring equity and sustainability of the resource and developing a sustainable groundwater use plan as an integral part of the watershed action plan.

★ We summarise the lessons learnt on issues of participation, transparency and equity. Informed participation is the ideal we propose. Here participation is seen as a two-way process of intense dialogue between the local people and the outside agency, be it government, NGO or professionals. We see the watershed action plan as neither a romanticisation of people's knowledge nor a debunking of the expert, rather a process of demystification of expertise in the process of valorising popular understanding, through a creative dialogue between the two.

★ The principles of equity must extend to conflict resolution, beneficiary selection, benefit sharing, etc.

★ Special provisions must be made for the landless and the Dalits. Close attention needs to be paid to developing common lands and making sure that landless/Dalit access to them is not reduced as in many watershed projects so far.

★ One of the most important arguments of this Committee for integrating a 2-year Phase III in the watershed programme is to be able to carry forward livelihood support initiatives that can take care of the interests of the landless.

★ Mere lip-service to the interests of women will not do. We are suggesting 50% representation of women in the Village Watershed Committee (VWC) and a separate Women's Watershed Council (WWC) that will be a vehicle for mobilizing women and articulating and protecting their interests in the watershed programme.

- ★ We have suggested suitable modifications in the Schedule of Rates to ensure that statutory minimum wages are paid to all workers while ensuring adherence to productivity norms.
- ★ Voluntary contributions need to be genuine and made progressive according to differential capabilities of watershed families.
- ★ Transparency and accountability must be ensured. For this we suggest mandatory presentation of the action plan for approval at the Gram Sabha meeting. All labour payments must be made in public, regular *jan sunwayis* (public hearings) must be held where detailed accounts are presented to the people, including all documents – sanction and release letters, pass books, cheque books, muster rolls, vouchers, etc.; boards should be put up in public places and at each major site, which display details of work done, costs, volume of water harvested, employment generated, etc.
- ★ There has to be clear prioritisation of objectives – drinking water and protective irrigation, along with fodder and fuel must come first.
- ★ Watershed development in India has been one-sidedly preoccupied with supply augmentation. Little attention has been paid to the end-uses of harvested rainwater. In this respect it has failed to break with the dominant development paradigms of the 20th century, all of which are characterised by supply-side solutions. These solutions are caught in the infinite regress of forever trying to catch up with ever-expanding demand.
- ★ What is required is to find ways of not just increasing water supply but much more critically reducing demand and regulating end-uses. For this a package of sustainable dryland agriculture practices must be mandatorily incorporated into the watershed programme.
- ★ A great deal of promising work in this direction has already been done at ICRISAT and centres belonging to the network of Agriculture Universities spread all over the hinterlands of India; also by field research stations of the ICAR and IARI. The problem is that these centres work in isolation from the farms for which their research is meant. The packages developed by these scientists are in a crying need of field-testing. Without this they remain ideal-types lacking the cutting edge of real-world trials.
- ★ In spite of its importance for the poor, watershed programmes in India have not systematically integrated livestock management as one of the central interventions.
- ★ Experience of many projects shows that with the implementation of watershed programmes, the village share of small ruminants kept by the poor decreased and that of milch animals and cross-breds increased.
- ★ Watershed investments should incorporate activities such as development of fodder banks in order to meet the increased demand for stall-feeding. This could also involve promotion of leasing arrangements of common lands to the landless for cultivation of fodder crops.

★ With the demand for milch animals increasing, dairying emerges as a major 'watershed plus' activity. The existing marketing networks of milk and other dairy products need to be strengthened during watershed implementation. Marketing is an activity that farmers' cooperatives and the SHG Federations can take up in Phase III of the watershed programme.

★ Along with livestock, improving the productivity of other land-based livelihoods should also be brought into the focus of watershed programmes. Fisheries in newly created water sources is one such land-based activity.

★ One of the main criticisms of the Hariyali Guidelines has been that they completely do away with the concept of the VWC which had till then been designated as the main implementing agency of the programme. The Hariyali Guidelines hand over the VWC's role to the Gram Panchayat. And the Watershed Association's role is taken up by the Gram Sabha.

★ Let us first try and understand the spirit behind the change introduced by the Hariyali Guidelines. As stated in the Preface, "The Ministry of Rural Development is committed to empower Panchyati Raj Institutions (PRIs) and has been impressing upon the State Governments to devolve necessary financial and administrative powers to the PRIs for self-governance particularly in planning, implementation and management of economic development activities in rural areas. Watershed Development has been included in the list of subjects to be devolved to the PRIs." It is also stated that Gram Panchayat and Gram Sabha are "equipped with statutory rights and mandate for natural resource planning, potentially equipped with the powers to impose local taxes or user charges and are committed to "reservations" for representation of women and weaker sections as per the Constitutional provision."

★ We believe that these constitute very powerful arguments in favour of involving Gram Panchayat/Gram Sabha in the watershed programme. We also believe that one of the most important issues that arises in the case of watershed projects is that of conflict resolution and equity. For this the implementing agency needs to be equipped with necessary legal and administrative powers to enforce its decisions. The central role of PRIs ensures this.

★ The only question that exercises us is: "What is the best way to involve PRIs in watershed development?" The experience we reviewed of the working of the watershed programme all over the country since the Hariyali Guidelines provides overwhelming evidence that the institutional arrangement as devised is not working well. The Gram Panchayat members are not able to discharge their responsibilities towards the watershed programme. The biggest weakness is that the Panchayat Secretaries are already overloaded with so many diverse responsibilities of revenue, development and administration that it is completely unreasonable to expect them to find the time required for a quality and process-intensive programme like watershed development.

★ It is also not clear how the Gram Sabha can "form User Groups/SHGs" and the large number of functions devolved upon it by the Hariyali Guidelines. As a result the watershed programme has suffered a very big

setback. The high expectations raised by the programme are not being fulfilled. There is great disaffection at the village-level among the people at large.

★ We have applied our minds to finding a solution to this problem. We fully share and endorse the spirit and will expressed in the Hariyali Guidelines towards empowerment of PRIs. We believe this holds the key to the future of democratic governance in India and to realizing Gandhiji's dream of Gram Swaraj. But as the Mahatma would have advised in such a situation we must look for a practical solution.

★ We must find a way of empowering PRIs while at the same time getting work done and meeting the goals of this critical and ambitious programme. Our submission is that we need to restore the key role of VWCs in each micro-watershed, but at the same time we also need to position them as one of the committees of the Gram Panchayat. In many states, Gram Panchayats have been strengthened and further democratized by designating committees elected in Gram Sabha meetings to carry out many of the functions devolved upon the panchayat. This is a way of making more effective the functioning of Gram Panchayats and also widens their democratic base.

★ Thus, the VWC should be elected in the meeting of the Gram Sabha and function as a committee of the Gram Panchayat.

★ We also strongly believe that the Panchayat Secretary must not be the Secretary of the VWC. The Panchayat Secretary is already a highly over-burdened functionary who has so many roles to perform. There is no way she/he can do justice to the huge responsibilities of the watershed programme.

★ At the same time, we believe that the designation by the Hariyali Guidelines of the Gram Sabha as effectively the Watershed Association (WA) is quite acceptable. Our review of the experience of the watershed programme clearly shows that most WAs were defunct and we also believe that there is really no need to designate a separate WA when in effect it is no different in concept from the Gram Sabha which is an existing constitutional body. Even if the milli-watershed spans more than one Gram Sabha, each VWC will answer to its own Gram Sabha, which is the constitutional body it is anyway answerable to.

★ Watershed development is not merely a matter of harvesting rainwater. Its success crucially entails working out collective protocols of equitable and sustainable use of surface water and groundwater, bringing together of scientists and farmers to evolve a dryland agriculture package and a host of other livelihood options, detailed land-use planning at the micro-watershed level and the mobilisation of rural communities in the direction of the disadvantaged. Many NGOs in India have set examples in one or more of these challenges.

★ We, therefore, tend to agree with the National Advisory Council that the role of NGOs can be very important. But it is clear that two problems need to be addressed: how to find genuine NGOs with quality and how to ensure that NGOs do not end up becoming mere oases of excellence.

★ A very interesting innovation in this regard has been attempted by CAPART through its Support Voluntary Organisation (SVO) programme. SVOs have also set up an excellent system for capacity building and field-support.

★ Our review of training institutions all over India shows that the training input has suffered from the following deficiencies: training is conducted at locations completely cut off from the context where it is to be applied; these institutes are run by personnel who speak a language which is largely incomprehensible to the people and whose attitude is didactic rather than dialogic; a very serious lacuna has been the absence of any kind of follow-up to ensure that the benefits of training are materialised at the field-level for which it was meant.

★ The CAPART SVO programme is an exception in this regard. Of course this a very small initiative. For it to be able to cover the national watershed programme would need a major upscaling of the SVO concept. A major effort in this direction was initiated by the Ministry of Rural Development, Government of India in 1999 through the formation of a National Committee on Watershed Training. The Committee was engaged in working out the precise modalities of extending CAPART's innovative SVO concept to the national watershed programme.

★ The idea was that each state would have one or more (depending on training needs) SVOs who could help develop one or more Master Trainer Organisations (MTOs) at the district-level. MTOs would in turn take up the responsibility of training PIAs within the district.

★ Each MTO could cater to the training and support requirements of about 5-10 new PIAs each year. These MTOs must have a proven record in terms of social mobilisation and technical competence. The intermediary rung of MTOs would ensure that training is achieved at the requisite scale without compromising on the uniform standards of performance within each state.

★ These ideas must be carried forward so that a national initiative for training all levels/kinds of functionaries at different stages of the programme in specific subjects (already worked out in detail by the Eswaran Committee) can be carried out on a war-footing, so that the watershed programme can attain requisite quality within a reasonable time-frame.

★ Our review of the watershed programme all over the country and a large number of representations we received, all point to the fact that lack of a proper monitoring system is one of the key weaknesses of the programme.

★ We were shocked to find that in most states there was no system of regular physical and social monitoring of the work being carried out in the field.

★ Some kind of financial audit was taking place and PIAs were being asked to send regular written reports. But it was not at all clear to us that there was any kind of system in place to check the veracity of these reports by actual verification of physical works in the field. Nor did we find any system of social audit.

★ For a programme on which thousands of crores of public money are being spent every year, this is a very major weakness that cannot be condoned in any way. The situation needs to be urgently remedied.

★ We agree with the National Advisory Council that a separate provision must be made for time and money to be allotted for social, physical and financial audit of the programme.

Chapter 3

★ One of the major problems with the watershed programme in India is that at each level it is administered by people who have many other responsibilities. This is true at all levels but especially at the district level where the Collector or the CEO, Zilla Panchayat (ZP) or DRDA are expected to look after the programme. Similarly, under the Hariyali Guidelines it is the Panchayat Secretary who is the CEO of the programme at the micro-watershed level. These are officials with many responsibilities who are unable to do full justice to the requirements of this quality- and process-intensive programme.

★ There are also policy and executing discontinuities because of the frequent transfers of these officials.

★ Coordination between transient actors pursuing departmental agendas is another problem.

★ The sharp focus needed to implement watershed programmes is often absent because they have many other competing priorities. With many competing priorities and insecure tenures, agency heads cannot follow any endeavour that calls for focused, long-term engagement.

★ As the Hon'ble Prime Minister Dr. Manmohan Singh has repeatedly emphasised, there has been a lack of focus on outcomes. Merely utilizing outlays has been the norm. As a result, government agencies at different levels have not felt challenged to develop a problem-solving culture and practices marked by flexibility, pro-action, goal orientation and open-ended engagement with rural communities and potential resource agencies within and outside the government.

★ The National Advisory Council has correctly observed: "There are, at present, a multiplicity of programmes for rehabilitation of degraded lands through watershed development run by different Ministries. There has been a proposal in the government to bring all these programmes under a single Ministry – a necessary condition for implementing them on a Mission Mode. While the concerned departments are in agreement about the desirability of bringing together all the watershed programmes under one umbrella with a view to implementing them on a Mission Mode, serious differences persist among different Ministries regarding the ownership of the unified programme. It is of utmost importance to resolve this issue at the earliest so that the different programmes are merged and run on a mission mode by a single nodal ministry, as promised in the NCMP." Similar concerns have been voiced by many state governments.

★ This Committee, therefore, is convinced that the present management structure of the programme needs to be replaced by an All-India Authority.

- ★ Such an Authority must be functionally focused, operationally integrated and attuned to collaborate with a diverse set of stakeholders.
- ★ It must be endowed with the autonomy and flexibility to respond innovatively to local needs and must have clear accountability for performance. It must be willing and able to invest in building human and institutional capacity at different levels to carry forward its agenda.
- ★ The proposal is for setting up a totally new professional and output-oriented organizational structure geared to meet these requirements. The proposed design draws on successful international innovations in governance as well as experience with the enabling management structure that has been evolved in India vis-à-vis Central Government owned enterprises.
- ★ In his address to the nation on 15 August 2005, the Hon'ble Prime Minister Dr. Manmohan Singh announced the intention of the government to set up a Rainfed Areas Authority. We believe that a National Authority for Sustainable Development of Rainfed Areas (NASDORA) needs to be set up as a quasi-independent authority to manage the entire primarily Central Government funded watershed programme.
- ★ The overarching goals of this Authority would be to ensure access to safe drinking water to the local population, provide them sustainable livelihoods and secure freedom from drought for the vast rainfed regions of the country by 2020.
- ★ The Authority would address the challenge of bringing prosperity to these regions through the sustainable development of their natural resource base.
- ★ The Authority will be endowed with professionals, and the freedom and flexibility of operations necessary to perform its functions effectively.
- ★ It is envisaged that NASDORA will identify, finance and monitor action programmes in a systematic and time-bound manner. It will adopt an enabling strategy of fostering, nurturing and identifying decentralized implementing structures/organizations, financing action programmes through such decentralized constellations and monitoring such programmes.
- ★ To ensure freedom and flexibility in its functioning, the Authority will be registered as a Society under the Societies Registration Act, 1860. Over time as it matures in functioning, a proposal for converting it into a statutory body could be seriously considered. This was the institutional trajectory followed by the National Dairy Development Board (NDDB).
- ★ A two-tier governance and management structure is envisaged to ensure broad policy support as well as operating oversight. NASDORA will be managed by an Apex Governing Board consisting of a competitively selected professional as CEO, one representative each from Ministry of Rural Development, Ministry of Agriculture and Ministry of Environment and Forests, Government of India, three competitively selected full-time professionals representing the functions of operations, finance, and human and institutional

development, two eminent experts in the field of watershed management, and two eminent members from civil society.

★ An Apex Rainfed Areas Stakeholders Council will provide overall policy support and guidance to the Apex Board and review the performance of NASDORA. It will be chaired by the Prime Minister, with the Minister of Rural Development, the Minister of Agriculture and the Minister of Environment and Forests as Vice-Chairpersons. The CEO of NASDORA will be the Member Secretary of the Council. The Council will include the Chief Minister of each state covered by NASDORA, Secretaries of the Ministries of Agriculture, Rural Development and Environment and Forests, Government of India, eminent national and international experts on watershed management, representatives of facilitating agencies of high standing, and representatives of the farming community.

★ NASDORA will have a lean operating setup, with personnel experienced in developing action programmes. The recommendations of search committees consisting of two eminent professionals connected with watershed management and a senior government official as chairperson will be the route for selecting the non-government members of the Apex Board. The CEO and the professionals will be appointed to the Apex Board by the Government of India following the recommendations of a search committee consisting of the Cabinet Secretary as the chairperson, and two eminent professionals connected with watershed development programme of the stature of Dr. M.S. Swaminathan, Dr. Y.K. Alagh, Dr. A. Vaidyanathan and Dr. C.H. Hanumantha Rao.

★ The state governments will set up boards with a structure similar to the one at the apex level. Each State Board will have a CEO and professionals appointed on the basis of recommendations of appropriate search committees.

★ A separate dedicated body will oversee the implementation of the watershed programme within each district. This body may be termed the District Watershed Development Agency (DWDA). The DWDA will be a branch of NASDORA at the district level. The DWDA will be answerable to the ZP.

★ The DWDA will be headed by a full-time CEO. The CEO will sign a 5-year MoU with the ZP that will spell out well-defined annual goals, against which the performance of the CEO will be monitored each year by the Collector and ZP.

★ The CEO will be competitively selected from the open market in a fully transparent manner. The CEO, DWDA could be a serving government officer on deputation, a person from the NGO or corporate sector or an independent professional. Preference will be given to women in appointment of the CEO, DWDA.

★ The CEO, in turn, will constitute a District Watershed Management Team (DWMT). This team will again comprise professionals competitively selected from the open market in a fully transparent manner. They would represent various disciplines involved in running a watershed programme. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals.

Preference will be given to women in appointment to the DWMT. The DWDA will sign a 5-year MoU with each member of the DWMT that will spell out well-defined annual goals, against which the performance of the member will be monitored each year by the DWDA.

★ The DWMT would be responsible for overseeing the implementation of the watershed programme in the district.

★ The DWMT will identify the remaining untreated milli-watersheds in the district, ranging from a minimum of 4,000 to a maximum of 10,000 ha. We believe that anything less than 4,000 ha makes it impossible for institutional overheads and the monitoring and research expenses to be met for this programme. Also the larger the watershed the more it is able to take into account the issues related to groundwater flows. And the watershed plus activities that we are proposing for Phase III make sense only at a certain scale. But anything more than 10,000 ha makes it administratively unwieldy and not amenable to people-centred processes.

★ Since we believe the watershed programme is primarily a social programme, and also because VWCs within each Gram Panchayat are to be the ultimate implementing agency, the final selection of implementation area must be according to the Gram Panchayat boundaries, to which milli-watershed boundaries are to be approximated. These milli-watersheds will comprise a number of micro-watersheds that ideally should be but need not necessarily be absolutely contiguous to each other. Broadly, we would suggest that the micro-watersheds may lie within a sub-basin of 25,000 ha.

★ At the milli-watershed level there will be a Milli-Watershed Council (MWC) that will consist of nominated members from each VWC. The MWC is the Stakeholders Council at the milli-watershed level. It is an advisory body that will give overall direction to the programme. It will also help resolve conflicts that may arise across micro-watersheds. It will monitor and review progress and carry out social audits of the programme. Each MWC will be registered with the DWDA.

★ Once the milli-watersheds are demarcated, the DWMT will select Project Managers (PMs) for each of these milli-watersheds. The PMs will be competitively selected from the open market in a fully transparent manner. They will sign a 5-year MoU with the DWDA that will spell out well-defined annual goals, against which the performance of each PM will be monitored each year by the DWDA. PMs will be professionals with experience of implementing watershed projects. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals. Preference will be given to women in appointment of PMs.

★ These PMs would be in-charge of overseeing implementation of each milli-watershed project. They will constitute the Watershed Development Team (WDT) at the milli-watershed level. Each WDT should have at least four members from veterinary science/animal husbandry, civil/agricultural engineering, agriculture/life sciences and social sciences. At least one member of the WDT should be a woman. PMs should be encouraged to constitute all-women WDTs or at least maximise the number of women in the WDT.

- ★ Each milli-watershed will consist of one or more micro-watersheds. Since social mobilisation is the key to the success of this people-centred programme, selection of micro-watersheds for treatment will also keep village boundaries in mind. Around these village boundaries contiguous micro-watersheds will be demarcated. The attempt may be to cover one or more Gram Panchayats in each milli-watershed, keeping the maximum limit of 10,000 ha as the size of the milli-watershed.

- ★ For each village there will be a VWC that will implement the watershed project with the technical support of the WDT in their village. The VWC will be a committee of the Gram Panchayat that will be elected at a meeting of the Gram Sabha. Each VWC should have a maximum of 20 members. It must mandatorily have at least 50% members as women and at least 33% SC/ST community members. The VWC must also ensure that each hamlet gets a representation proportionate to its size. It should include 3-4 members each from User Groups and SHGs and one member each from the Gram Panchayat and the WDT. Representation must also be given to the landless, with a minimum of two members being accommodated in the committee. Each VWC will be registered with the DWDA.

- ★ The VWC will be answerable to and work under the control of the Gram Sabha.

- ★ The Secretary of the VWC will be the paid CEO of the VWC. She/he will in no event be the Panchayat Secretary. She/he will be selected by the WDT on the basis of merit and experience. Preference will be given to women candidates. The appointment of the Secretary of the VWC will have to be approved in the meeting of the Gram Sabha. In view of the administrative costs, PMs may like to explore the possibility of one Secretary handling more than one VWC.

- ★ To facilitate real participation of women, we propose the formation of a separate Women's Watershed Council (WWC) within each village. The duty of the WDT will be to mobilise women to actively participate in meetings of the WWC. The aim of the exercise is to ascertain and give requisite weight to women's perceptions and priorities in the formation of the watershed action plan. Every effort must be made to ensure that these perceptions are adequately reflected in the watershed action plan finally devised by the VWC. The aim is also to ensure that the WWC acts as an effective watch-dog protecting women's interests during the implementation of the action plan. Similar arrangements may be worked out to give requisite weightage to the interests of the Dalits, Adivasis and landless wherever they are in a minority or where there is acute danger of their interests being overlooked.

- ★ We are proposing that the duration of the programme be increased from 5 years to 8 years. This is because most of the limits of the currently implemented programme strongly suggest the need for such an upward revision. The most important weaknesses of the programme all stem from the fundamental shortcoming that durable village-level institutions have not been set up and the crucial participatory processes have not had sufficient time to be put into place. As a result, the qualitative dimensions of the programme have suffered. At the same time, it has not been possible to realise the livelihoods potential of the programme, which is widely seen as a major weakness.

★ In order to provide sufficient time to overcome these weaknesses, we propose an 8-year programme divided into 3 phases.

★ Phase I may be termed the Preparatory Phase of the programme. In this 2-year period, the main activities will include socio-economic and engineering participatory baseline surveys needed for preparation of action plan, selection of sites and beneficiaries and impact assessment; hydrogeological survey of the watershed to map out zones of potential groundwater recharge and potential sustainable groundwater utilisation; putting in place impact assessment protocols; capacity building at all levels; building up network of technical support agencies, preparation of the detailed watershed action plan, including activities to be carried out, selection of beneficiaries and work-sites and design and costing of all works; ensuring that the interests, perceptions and priorities of women, Dalits, Adivasis and the landless are adequately reflected in the action plan. Institutions like the WWC will be developed for this purpose in this phase; working out in a participatory manner detailed resource-use agreements (for surface water, groundwater and common/forest land usufructs) among User Group members, based on principles of equity and sustainability; working out in a participatory manner protocols for voluntary contribution for different types of activities and across different sections of the community, based on the principles of equity; and entry point activities focused on the urgent needs of the local communities such as drinking water. Activities that reflect the interest of women such as bio-gas plants, toilets and baths must be taken up in this phase; initiating the development of village-level institutions that are to form the backbone of the programme. These include VWC, SHGs and User Groups. Evaluation of the action plan and work done in Phase I will be undertaken by an external agency towards the end of Year 2.

★ Phase II may be termed the Resource Augmentation and Institution Building Phase. This 4-year period is the heart of the programme. This is when the watershed action plan (if approved by the external agency towards the end of Phase I) is implemented. This is also when the institutions that provide the bedrock of the programme mature. The work done in this phase is evaluated at the end of every year. The next release is made only in the event of a positive appraisal. The end of Phase II also involves developing the action plan for Phase III on the basis of techno-economic feasibility studies, involving comparative assessment of both technologies and market potential of various income-generating options.

★ Phase III may be termed the Sustainable Livelihoods and Productivity Enhancement Phase. In this 2-year phase the resources augmented and economic plans developed in Phase II are made the foundation to create new livelihoods and raise productivity levels. This is the Watershed Plus phase. Here income-generating activities such as lift irrigation schemes, livestock improvement, agro-processing units, medicinal plants, local natural resource based energy generation units, jatropha oil-processing units, etc. can be taken up. Detailed land-use planning can be attempted on private lands with drip irrigation. Farmers may also be encouraged to develop organic farms and links developed with export firms to fetch a stable market and competitive price.

★ In these activities, the subsidy element will be lower than in Phase II and bankability of activities will be attempted, increasing the loan element.

- ★ At the same time, it is Phase III when local-level institutions mature and exit protocols become operative for the WDT and PM. SHGs are coalesced into Federations and begin to operate as community-based organisations (CBOs), learning how to leverage public funds and bank loans for development of their area. The VWCs begin to use the WDF for repair and maintenance of structures created in Phase II.

- ★ The most important element of Phase III is the benefit that can accrue to the resource-deprived sections, such as the landless whose livelihoods can be placed on a firm footing in this phase through many value-addition activities.

- ★ Of course, many of these Phase III activities may also be started in Phase II itself in many watersheds. There should be rigid demarcation of activities across phases.

- ★ When the Ministry of Rural Development initiated its watershed programme in 1995 the upper limit of expenditure was Rs. 4000 per ha of land treated. At that time this was a 4-year programme. The per-year per-ha norm worked out to Rs. 1000. This norm was raised by the Ministry to Rs. 6000 per ha with effect from 1 April 2000. At that point the duration of the programme was also increased to 5 years. The per-year per-ha norm, thus, rose to Rs. 1200.

- ★ In the course of our tour of watershed programmes across the country, we received repeated representations from various state governments urging an upward revision of the cost norm. We are now proposing that the programme be of an 8-year period and the norm be raised to Rs.12000 per ha. The per-year per-ha norm becomes Rs. 1500.

- ★ This rise of 25% over the figure for the year 2000 is certainly warranted by the annual rate of inflation (4%) in this period. To put it another way, if we take into account the rate of inflation between 2000 and 2006, Rs. 6000 per ha amounts to Rs. 7500 per ha. This is for 5 years. For 8 years this value amounts to over Rs. 12,000 per ha.

- ★ Also we must note that since the norm will be frozen for 8 years, we are already discounting for inflation in this 8-year period.

- ★ Finally, we must also remember that Rs. 12,000 is a maximal figure. The projects will be funded as per the actual cost of the action plan. The tendency of PIAs to simply multiply the area of the watershed with the per-ha norm is to be very strongly discouraged. The norm only sets a ceiling and is no way indicative of the actual budget, which must be determined on the basis of ground realities – the needs and possibilities inherent in each watershed.

- ★ We are also proposing a separate head of expenditure – Impact Assessment, Monitoring and Research. These are deeply neglected and extremely important aspects of the programme for which 2% of total expenditure can by no stretch of imagination be regarded as excessive. The importance of this head lies in the fact that releases of each instalment will take place only if the report of the assessment is positive. Especially after the first phase of two years, it is likely that many projects are shut down if they do not come up to the mark. Thus, monitoring is to be given due time and resources, within the programme.

★ As compared to the Hariyali Guidelines we have increased the expenditure on training and community organisation (now termed institution building) from 5% to 8%, since these two are also highly neglected dimensions of the programme. This demand was placed before this committee by a large number of state governments and NGOs.

★ The total amount shall be divided amongst the following project components subject to the percentage ceiling mentioned against each:

(i) Watershed Treatment/ Development Works/ Activities 80%

(ii)Training 4%

(iii) Institution Building 4%

(iv) Impact Assessment, Monitoring and Research 2%

(v) Administrative Overheads 10%

Total 100%

★ Finances for the activities of NASDORA would be drawn from the Central and State Governments, various aid agencies, contributions from philanthropies and corporate houses, loans from financial institutions and people's own contributions. All funds meant for the watershed programme will be converged in the NASDORA.

★ These funds will flow to the State Boards and from there to each DWDA. From the DWDA they will move to the VWC and the MWC.

★ Funds for watershed works will move to the account of the VWC. The VWC Secretary and one member of the WDT will jointly operate the VWC Account. The money for "other expenses" of the watershed project will move to the account of the MWC. The PM who is the Member-Secretary of the MWC and one member of the MWC will jointly operate the MWC Account.

Chapters 4 and 5

★ In Chapter 4 we attempt the formulation of a new set of guidelines that should henceforth steer this programme.

★ One of our terms of reference is "to identify the areas under DPAP, DDP and IWDP where existing watershed approach is not feasible for implementation and suggest alternative mechanism to suitably introduce special provisions in the Guidelines for Watershed Development". In Chapter 5 we provide an indicative list of areas that fall under such a category. We summarise the unique features of these regions and also provide an indication of why special provisions are required here.

★ To take what we have done in this report forward, special sub-committees may be set up by each concerned state government, which may be entrusted with the task of formulating precise guidelines that need to be adopted in each of these regions. More such regions may also be identified and approval sought for special treatment in the manner indicated in this report.

Key Recommendations – Action Points

★ Rs. 150,000 crores to be spent in rainfed areas over the next 15 years (Rs. 10,000 per year). This will cover 125 million ha of land @ Rs. 12,000 per ha.

★ This amount could come from two main sources: doubling of current programme outlays on watershed development that would yield around Rs. 5,000 crores and an allocation of around Rs. 5,000 crores from the National Rural Employment Guarantee Scheme (NREGS) specially earmarked for watershed programmes. This makes perfect sense since the NREGS is already primarily focused on watershed-related activities.

★ One of the major problems with the watershed programme in India is that at each level it is administered by people who have many other responsibilities. This is true at all levels but especially at the district level where the Collector or the CEO, Zilla Panchayat (ZP) or DRDA are expected to look after the programme. Similarly, under the Hariyali Guidelines it is the Panchayat Secretary who is the CEO of the programme at the micro-watershed level. These are officials with many responsibilities who are unable to do full justice to the requirements of this quality- and process-intensive programme. There are also policy and executing discontinuities because of the frequent transfers of these officials. Coordination between transient actors pursuing departmental agendas is another problem. The sharp focus needed to implement watershed programmes is often absent because they have many other competing priorities.

★ As the Hon'ble Prime Minister Dr. Manmohan Singh has repeatedly emphasised, there has been a lack of focus on outcomes. Merely utilizing outlays has been the norm. In his address to the nation on 15 August 2005, the Hon'ble Prime Minister announced the intention of the government to set up a Rainfed Areas Authority.

★ We believe that a National Authority for Sustainable Development of Rainfed Areas (NASDORA) needs to be set up as a quasi-independent authority to manage the watershed programme. It must be endowed with the autonomy and flexibility to respond innovatively to local needs and must have clear accountability for performance. The proposal is for setting up a totally new professional and output-oriented organizational structure geared to meet these requirements.

★ The overarching goals of this Authority would be to ensure access to safe drinking water to the local population, provide them sustainable livelihoods and secure freedom from drought for the vast rainfed regions of the country by 2020. The Authority would address the challenge of bringing prosperity to these regions through the sustainable development of their natural resource base.

★ To ensure freedom and flexibility in its functioning, the Authority will be registered as a Society under the Societies Registration Act, 1860. Over time as it matures in functioning, a proposal for converting it into a statutory body could be seriously considered. This was the institutional trajectory followed by the National Dairy Development Board (NDDB).

★ A two-tier governance and management structure is envisaged to ensure broad policy support as well as operating oversight. NASDORA will be managed by an Apex Governing Board consisting of a competitively

selected professional as CEO, one representative each from Ministry of Rural Development, Ministry of Agriculture and Ministry of Environment and Forests, Government of India, three competitively selected whole time professionals representing the functions of operations, finance, and human and institutional development, two eminent experts in the field of watershed management, and two eminent members from civil society.

★ An Apex Rainfed Areas Stakeholders Council will provide overall policy support and guidance to the Apex Board and review the performance of NASDORA. It will be chaired by the Prime Minister, with the Minister of Rural Development, the Minister of Agriculture and the Minister of Environment and Forests as Vice-Chairpersons. The CEO of NASDORA will be the Member Secretary of the Council. The Council will include the Chief Minister of each state covered by NASDORA, Secretaries of the Ministries of Agriculture, Rural Development and Environment and Forests, Government of India, eminent national and international experts on watershed management, representatives of facilitating agencies of high standing, and representatives of the farming community.

★ The state governments will set up boards with a structure similar to the one at the apex level. Each State Board will have a CEO and professionals appointed on the basis of recommendations of appropriate search committees.

★ A separate dedicated body will oversee the implementation of the watershed programme within each district. This body may be termed the District Watershed Development Agency (DWDA). The DWDA will be a branch of NASDORA at the district level. The DWDA will be answerable to the ZP.

★ The DWDA will be headed by a full-time CEO. The CEO will sign a 5-year MoU with the ZP that will spell out well-defined annual goals, against which the performance of the CEO will be monitored each year by the Collector/ZP. The CEO will be selected from the open market in a fully transparent manner. The CEO, DWDA could be a serving government officer on deputation, a person from the NGO or corporate sector or an independent professional.

★ For each village there will be a Village Watershed Committee (VWC) that will implement the watershed project with the technical support of the WDT. The VWC will be a committee of the Gram Panchayat that will be elected at a meeting of the Gram Sabha. Each VWC will be registered with the DWDA. The VWC will be answerable to and work under the control of the Gram Sabha. The Secretary of the VWC will be the paid CEO of the VWC. She/he will in no event be the Panchayat Secretary.

★ To facilitate real participation of women, we propose the formation of a separate Women's Watershed Council (WWC) within each village. The aim of the exercise is to ascertain and give requisite weight to women's perceptions and priorities in the formation of the watershed action plan. The aim is also to ensure that the WWC acts as an effective watch-dog protecting women's interests during the implementation of the action plan.

★ We are proposing that the duration of the programme be increased from 5 years to 8 years. This is because most of the limits of the currently implemented programme strongly suggest the need for such an upward revision. The most important weaknesses of the programme all stem from the fundamental shortcoming

that durable village-level institutions have not been set up and the crucial participatory processes have not had sufficient time to be put into place. As a result, the qualitative dimensions of the programme have suffered. At the same time, it has not been possible to realise the livelihoods potential of the programme, which is widely seen as a major weakness.

★ In order to provide sufficient time to overcome these weaknesses, we propose an 8-year programme divided into 3 phases. Phase I (2-years) may be termed the Preparatory Phase of the programme. Phase II may be termed the Resource Augmentation and Institution Building Phase. This 4-year period is the heart of the programme. This is when the watershed action plan is implemented. This is also when the institutions that provide the bedrock of the programme mature. Phase III may be termed the Sustainable Livelihoods and Productivity Enhancement Phase. In this 2-year phase the resources augmented and economic plans developed in Phase II are made the foundation to create new livelihoods and raise productivity levels. This is the Watershed Plus phase.

★ We are proposing that the cost norm for the programme be raised to Rs. 12000 per ha. The per-year per-ha norm becomes Rs. 1500. This rise of 25% over the figure for the year 2000 is warranted by the annual rate of inflation in this period.

★ The total amount shall be divided amongst the following project components subject to the percentage ceiling mentioned against each:

(i) Watershed Treatment/ Development Works/ Activities 80%
(ii) Training 4%
(iii) Institution Building 4%
(iv) Impact Assessment, Monitoring and Research 2%
(v) Administrative Overheads 10%
Total 100%

★ Finances for the activities of NASDORA would be drawn from the Central and State Governments, various aid agencies, contributions from philanthropies and corporate houses, loans from financial institutions and people's own contributions. All funds meant for the watershed programme will be converged in the NASDORA.

★ A new set of Neeranchal guidelines for watershed development has been formulated.

★ One of our terms of reference is "to identify the areas under DPAP, DDP and IWDP where existing watershed approach is not feasible for implementation and suggest alternative mechanism to suitably introduce special provisions in the Guidelines". An indicative list of areas that fall under such a category is provided. We summarise the unique features of these regions and also provide an indication of why special provisions are required here. To take what we have done in this report forward, special sub-committees may be set up by each concerned state government, which may be entrusted with the task of formulating precise guidelines that need to be adopted in each of these regions. More such regions may also be identified and approval sought for special treatment in the manner indicated in this report.

CHAPTER ONE

National Significance of the Watershed Programme

With impressive macro-economic rates of growth and a booming stock market, India is one of the most exciting economies in the world today. India has reportedly displaced the United States as the second most attractive destination for foreign direct investment in the world after China (Business Standard, 2005, p. 1). This spectacular overall performance, however, hides one dark spot that the people of India exposed through Verdict 2004. The benefits of this growth have not been evenly distributed. Large parts of India do not find a place on the development map of the country. In a pioneering study on the Domestic Product of States of India, the Economic and Political Weekly Research Foundation found that many "low-income and poorly-performing major states have not only persisted with their low-growth syndrome but have also experienced further deceleration in growth rates in the 1990s" (EPWRF, 2003, p. 26). World Bank economists Datt and Ravallion (2002) find that "the geographic and sectoral pattern of India's growth process has greatly attenuated its aggregate impact on poverty" (p. 1). A study carried out for the Ministry of Finance, Government of India and the United Nations Development Programme (UNDP) (Mihir Shah *et al*, 1998) provides massive statistical data to establish that there is a concentration of poverty and distress in the drylands of India as also its hilly and tribal areas. This phenomenon of regional imbalance in India's development finds official recognition in the recent (Planning Commission, 2005) that has developed a list of "170 most backward districts including 55 extremist affected districts". It is clear that extremist violence is also most frequently encountered in areas where backwardness is concentrated.

With 74% of India's 'under-three' children being officially declared as anaemic and 50% of them suffering from moderate to severe malnourishment, 87% of our pregnant women anaemic and scores of starvation deaths across the country, we could be said to be passing through a "nutritional emergency". More than 25 lakh children die in India every year. One in every five children who die the world over is Indian. Infant mortality rates in India are now even higher than in Bangladesh (UNDP, 2005). It has been claimed on the basis of latest unpublished National Sample Survey (NSS) data that "half our rural population or over 350 million people are below the average food energy intake of sub-Saharan Africa countries" (Patnaik, 2005). Suicides by nearly 10,000 farmers in recent years across the country (Ghosh, 2005) and deaths of thousands of children in Maharashtra this year, have only served to highlight the depth of the problem.

The problem of unemployment also appears to be gaining alarming proportions. Results of the 55th Round of the NSS show that there has been a dramatic decline in the rate of employment generation in the latest period. The rate of growth of employment, in terms of the Current Daily Status (CDS) declined from 2.7 percent per year in the period 1983-94 to only 1.07 percent per year in 1994-2000 for all of India. In both rural and urban areas, the absolute number of unemployed increased substantially, and the rate of unemployment (CDS) in rural India as a whole went up from 5.6 percent in 1993-94 to 7.2 percent in 1999-2000 (NSSO, 2000). A major reason for the low rate of employment generation was the decline in the employment elasticity of agricultural growth, which declined from 0.70 in 1983-94 to only 0.01 in 1994-2000 (Ghosh, 2005). Thus, providing employment to the growing millions of unemployed has to clearly be the foremost national priority.

At the heart of all these symptoms is the poor performance of Indian agriculture, which appears to be in the throes of a crisis. For the first time since the mid-1960s, foodgrain production grew slower than population in the 1990s. While irrigated agriculture appears to be hitting a plateau, dryland farming has suffered neglect.

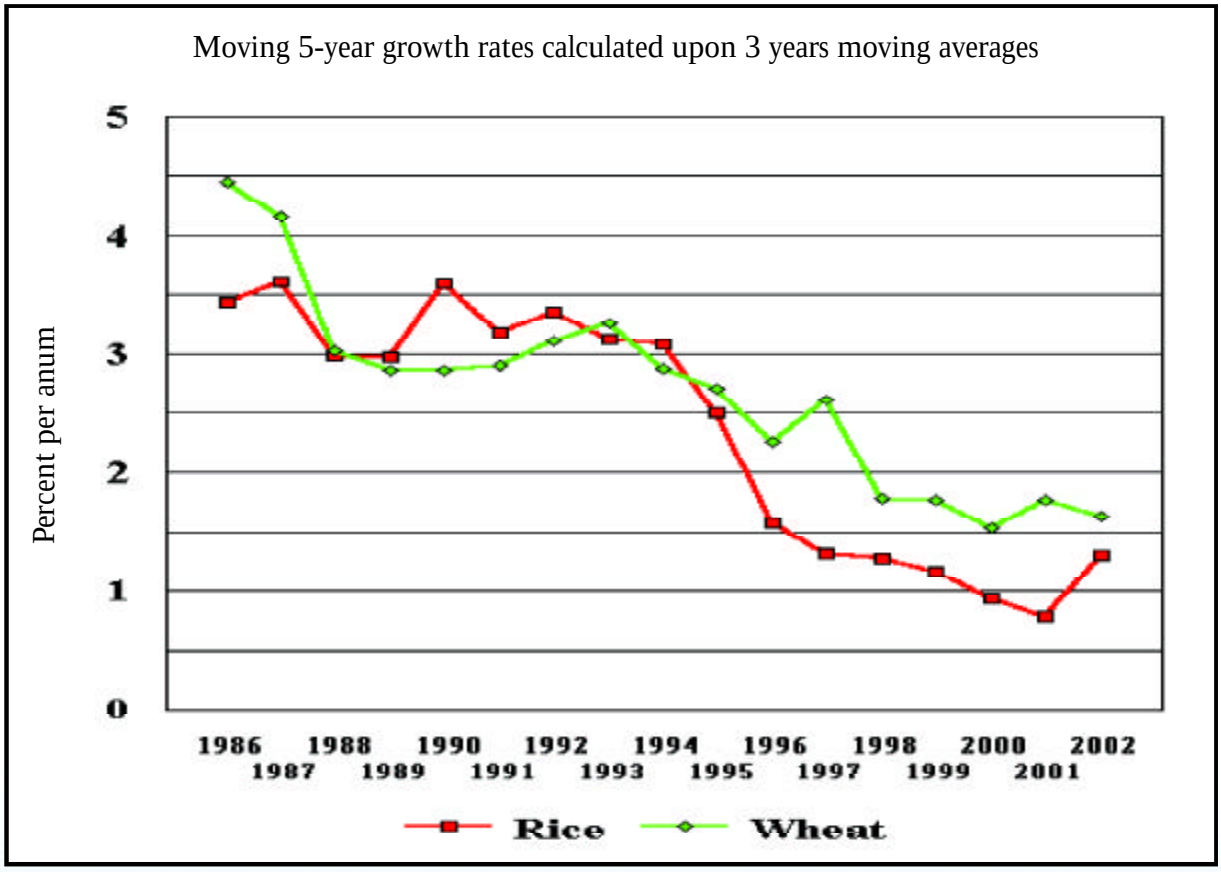
In this chapter, we argue that an increased thrust to rainfed areas through greater emphasis on a reformed watershed programme may hold the key to meeting this challenge. We provide evidence to show that while it is the rainfed parts of Indian agriculture that have been the weakest, they are also the ones that contain the greatest unutilised potential for growth, and need to be developed if food security demands of the year 2020 are to have a realistic chance of being met. The growth elasticity of poverty (the response of poverty to growth) would be the highest if growth were to be focused on these neglected regions of India. We argue that a more intensive and improved watershed development programme holds the key in this regard.

1.1 Agriculture in the Nineties

Available data shows that 1990-2000 was not a happy decade for Indian agriculture. The overall growth rate of crop production declined from 3.72% per annum in the previous decade to 2.29% in the 1990s and that of crop productivity fell from 2.99% per annum to 1.21% during the same period (Planning Commission, 2002). Average yield levels of rice and wheat have more than halved between 1986 and 2002, indicating a plateauing of productivity in these two major foodgrains (Figure 1.1).

Figure 1.1

Rates of Growth of Yields per Unit Area



Source: Report of the High Level Committee on Long Term Grain Policy, 2001

The output of crops grown and eaten by the poorest of the poor (coarse grains, pulses and oilseeds) and grown largely in the drylands, actually declined during this decade and the rate of growth of their yields decelerated considerably (Table 1.1).

TABLE 1.1: RATE OF GROWTH (%) OF PRODUCTION AND YIELD OF FOODGRAINS IN INDIA, 1962-2003

Crop	1962/65 to 1970/73	1970/73 to 1980/83	1980/83 to 1990/93	1990/93 to 2000/03
Production				
Rice	1.52	2.23	3.56	1.24
Wheat	10.85	4.51	3.81	2.13
Coarse Cereals	0.61	1.32	0.91	(-) 0.60
Pulses	-0.33	0.38	1.38	(-) 0.93
All Foodgrains	2.28	2.26	2.92	1.08
Oilseeds	1.17	1.82	5.62	(-) 0.62
Yield				
Rice	1.05	1.60	3.01	1.00
Wheat	6.26	2.66	3.19	1.45
Coarse Cereals	0.89	-0.15	1.63	1.18
Pulses	0.69	1.88	2.70	0.14
All Foodgrains	1.82	1.86	3.22	1.55
Oilseeds	0.74	0.93	2.47	0.64

Source: Indian Agricultural Statistics, various issues

The rate of growth of foodgrain production also fell steeply from 2.92% recorded between 1980/83 and 1990/93 to 1.08% during 1990/93 to 2000/03. For the first time since the mid-sixties, the 1990s witnessed a rate of growth in foodgrain production, which was lower than the rate of growth of population. As a result, both per capita foodgrain production and availability were lower in 2000-03 than their pre-Green Revolution (1960-63) levels. The decline has been the sharpest in the 1990s (Table 1.2). Consumption data based on NSS surveys show that foodgrain consumption and calorie intake has declined substantially during the 1990s in aggregate and for the poorest deciles in terms of expenditure (Ghosh, 2005).

TABLE 1.2: PRODUCTION AND PER CAPITA AVAILABILITY OF FOODGRAINS IN INDIA, 1960-2003

Year	Foodgrain output (million tonnes)	Net per capita output (kg/year)			Net per capita availability (grams/day)		
		Cereals	Pulses	Total	Cereals	Pulses	Total
1960-63	82.0	158	29	187	400	69	469
1970-73	103.5	144	17	162	418	51	469
1980-83	130.8	149	14	163	417	38	455
1990-93	174.8	163	13	176	468	42	510
2000-03	194.3	152	10	162	391	26	417

Source: Indian Agricultural Statistics, various issues

A major reason for the slowdown in agriculture seems to be the precipitous fall in public investment in agriculture (Figure 1.2). The decline has been quite sharp in absolute terms (Figure 1.2) and as a proportion to gross capital formation in agriculture and overall public sector gross capital formation (Table 1.3).

TABLE 1.3: GROSS FIXED CAPITAL FORMATION IN AGRICULTURE 1970-71 TO 2000-01, AT 1993-94 PRICES

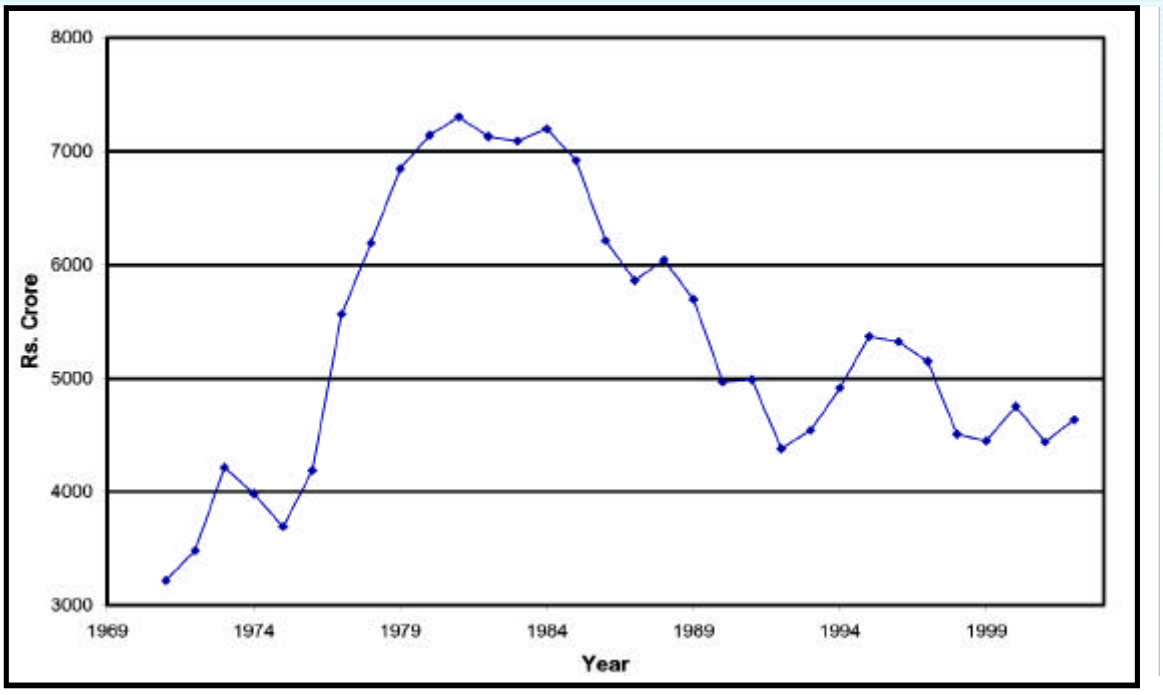
	GCFA/GCF (%)	PGCFA/GCFA (%)	PGCFA/PGCF (%)
1970-71	14.3	37.5	13.8
1980-81	15.4	51.3	17.7
1990-91	9.9	30.4	7.1
2000-01	7.8	22.7	5.7

Source: EPWRF (2004)

Note: GCF = Gross Capital Formation; GCFA = Gross Capital Formation in Agriculture; PGCF = Public Sector GCF; PGCFA = Public Sector GCFA

Figure 1.2

Public Investment in Agriculture at 1993-94 Prices



Source: EPWRF (2004)

1.2 Stagnation of Irrigation Development in India

Two major planks of India's water policy since independence have been construction of large irrigation projects and intensive tapping of groundwater through tubewells. Adoption of the water intensive Green Revolution package was made possible by substantial public investment in irrigation. According to one estimate, total outlay in irrigation since independence till 2000-01 amounts to Rs. 79,055 crores at current prices (Rs. 1,98,952 crores at 1996-97 prices). As a result of an investment of this magnitude, the gross irrigated area went up by over 300%, from 22.56 million ha (mha) in 1950-51 to 75.14 mha in 2000-01. At present, India has the largest irrigated agriculture in the world.

However, a remarkable fact is that since the mid-1970s, the rate of expansion of irrigated area has undergone a global decline. According to the Food and Agriculture Organization (FAO, 2003), the global rate of expansion of irrigated area, which was 2.17% between 1961-63 and 1971-73, steadily came down in the subsequent periods, reaching 1.23% between 1990-93 and 1997-99. Incremental irrigated area reached its maximum (4.01 mha/year) between 1971-73 and 1981-83 (Figure 1.3). It came down to 3.19 mha/year between 1991-93 and 1997-99 (Table 1.4).

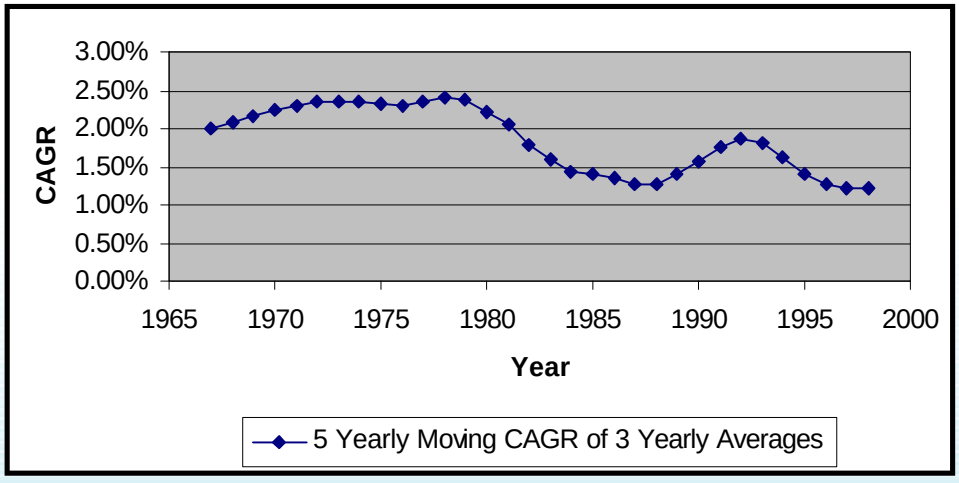
TABLE 1.4: GROSS IRRIGATED AREA IN THE WORLD AND INDIA, 1960-2000

	Gross Irrigated Area (mha)	Increment (mha/year)	CAGR (%)
WORLD			
1961-63	141.7		
1971-73	175.6	3.40	2.17
1981-83	215.7	4.01	2.08
1991-93	251.7	3.60	1.56
1997-99	270.9	3.19	1.23
INDIA			
1960-63	28.6		
1970-73	38.6	0.99	3.02
1980-83	51.0	1.25	2.84
1990-93	65.0	1.40	2.45
1999-2000	76.5	1.28	1.83

Source: FAO (2003) and Indian Agricultural Statistics, various issues

Figure 1.3

Rate of Growth of World Irrigated Area

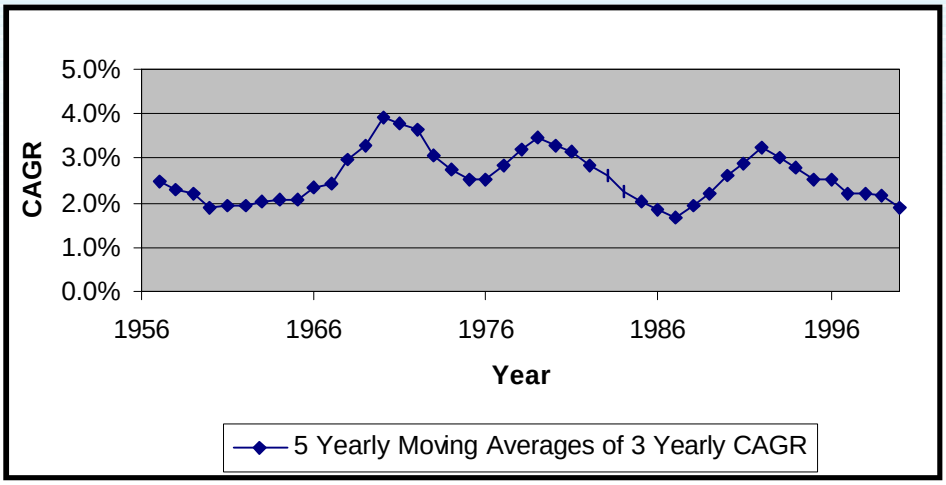


Source: Graph prepared on the basis of data given in FAO (2003)

Note: CAGR = Compound Annual Growth Rate

Figure 1.4

Rate of Growth of World Irrigated Area in India



Source: Graph prepared on the basis of data given in Indian Agriculture Statistics, 2004

The expansion of irrigated area in India also follows a similar pattern (Figure 1.4). The rate of growth of irrigated area (1.83%) was the lowest in the period 1990-93 to 1999-2000, compared to earlier decades (Table 1.4). The reasons for the decline in the rate of growth of irrigated area can be traced to the number of problems faced by these two major thrust areas of water policy at present.

1.2.1 Surface Water Blues

It is estimated that 4400 (large, medium and small) dams have been constructed in India so far (CWC, 2002). The pace of dam construction reached its peak in the 1970s, subsequent to which it slowed down considerably. We must also note that there is a severe financial constraint that restricts the possibilities of growth in surface irrigation based on big dams. Due to delays in construction and consequent cost overrun, many of the projects taken up spill over from one plan to the next. At the beginning of the Tenth Plan, there were 410 ongoing major and medium (M&M) irrigation projects in the country, some of them dating back to the Fifth Plan period (Planning Commission, 2002). The Steering Committee on Irrigation for the Tenth Plan estimates that total spill over costs of previous projects to the Tenth Plan will be Rs. 1,77,739 crores. However, the total public sector allocation during the Tenth Plan for all irrigation and flood control was only Rs. 1,03,315 crores. The Steering Committee categorically states that "given the large number of projects taken on hand, the frequent changes in project scope, and the escalation of project costs due to a variety of reasons, there is little likelihood that the outlay

in the budgets can ever match the total demand". The Steering Committee, therefore, gives top priority to completion of ongoing projects and says, "New projects may be taken up selectively, keeping in view the necessity for removal of regional imbalances and development of drought prone and tribal areas" (Planning Commission, 2002).

Rapidly escalating cost of creating additional irrigation potential is a serious problem faced by M&M irrigation projects. This has happened because the best sites suitable for dam construction have already been covered and only progressively more expensive and socio-economically and ecologically less favourable sites are left for exploration. The cost of creating additional potential from M&M projects had already reached the fairly mind-boggling figure of Rs. 1,42,662 per ha by the end of the Ninth Plan (Planning Commission, 2002).

Evidence is also accumulating regarding the ill-effects of over-irrigation, which has become a feature of many irrigation commands. The Ministry of Water Resources estimated the area affected in irrigation project commands and came up with figures of 1.6 mha for waterlogging, 3.1 mha for salinity and 1.3 mha for alkalinity (Vaidyanathan, 1994). It should also be remembered that the track record of development projects in handling the problems of proper rehabilitation of displaced persons has been extremely poor (ILO-ARTEP, 1993); 75% of the displaced (an estimated 15 to 25 million people) have not been rehabilitated. These include the poorest of the poor in the country, such as the tribals. The proportion of tribals displaced by M&M projects could be as much as 40%. The problem of displacement imposes another serious constraint on the expansion of surface irrigation.[1]

1.2.2 Groundwater Scenario

Of course, the recent expansion in irrigated area owes much more to groundwater. Nearly 60% of the irrigation in the country is from groundwater. Moreover, of the addition to irrigated area of 25.7 mha between 1970 and 1990, groundwater accounted for over 85%. Table 1.5 shows that the area under canal irrigation has ceased to expand significantly since the

1 The current proposal to link Himalayan with the Peninsular rivers for inter-basin transfer of water is estimated to cost around Rs. 5,60,000 crores. It is not clear whether land submergence and R&R packages are included in this cost. There are no firm estimates available for running costs of the scheme, such as the cost of power required to lift water. In a country like India which gets seasonal rainfall from monsoons, the periods when rivers have "surplus" water are generally synchronous across the subcontinent. Another key issue is how the reasonable needs of the basin states, which will grow over time, will be taken into account while planning inter-basin transfers. Further, given the topography of India and the way links are envisaged, it might totally bypass the core dryland areas of Central and Western India, which are located on elevations of 300+ metres above MSL. It is also feared that linking rivers could affect the natural supply of nutrients through curtailing flooding of the downstream areas. Along the east coast of India, all major peninsular rivers have extensive deltas. Damming the rivers for linking will cut down the sediment supply and cause coastal and delta erosion, destroying the fragile coastal eco-systems. It is also pointed out that the scheme could affect the monsoon system significantly. Due to the presence of a low salinity layer of water with low density the sea-surface temperatures (greater than 28 degrees C) in the Bay of Bengal are high, creating low pressure areas and intensification of monsoon activity. Rainfall over much of the subcontinent is controlled by this layer of low saline water. A disruption in this layer could have serious long-term consequences for climate and rainfall in the subcontinent, endangering the livelihoods of a vast population (Rajamani, 2005).

mid-1970s while the area irrigated by tanks has actually declined. The annual extraction of groundwater in India is over 150 billion cubic metres (bcm), which is by far the highest in the world (Tushaar Shah *et al*, 2000).[2] The most dramatic change in the groundwater scenario in India is that the share of tubewells in irrigated area rose from a mere 1% in 1960-61 to 37% in 1999-2000. By the year 2000, tubewells had become the largest source of irrigation in India.

TABLE 1.5: SHARE OF VARIOUS SOURCES IN NET IRRIGATED AREA (NIA) IN INDIA, 1960-2000 (%)

Year	Tubewells	Wells	Tanks	Canals	Others	NIA (mha)
1960-61	1	29	19	42	10	24.7
1970-71	14	24	13	41	8	31.1
1980-81	25	21	8	40	7	38.7
1990-91	30	21	7	35	7	47.8
1999-2000	37	22	5	31	5	56.8
Area Irrigated (mha)						
Year	Tubewells	Wells	Tanks	Canals	Others	NIA
1960-61	0.2	7.1	4.5	10.3	2.4	24.7
1970-71	4.4	7.5	4.0	12.8	2.5	31.1
1980-81	9.5	8.2	3.2	15.3	2.6	38.7
1990-91	14.3	10.0	3.3	16.7	3.3	47.8
1999-2000	21.0	12.5	2.8	17.6	2.8	56.8
Increment (1970-2000)	16.6	5.0	-1.2	4.8	0.4	25.7
Share in Increments (%)	65	20	-5	19	1	100

Source: Indian Agricultural Statistics, various issues

Groundwater availability is dependent on the water storage and transmission characteristics of underlying geological strata. Tubewell technology was initially introduced in the alluvial tracts of Indo-Gangetic Plains, which had a favourable geology for this technology. Indiscriminate extraction of groundwater here has lowered the water table to such an extent that a serious question is being posed about the sustainability of such high levels of extraction in a low rainfall tract (HLC, 2001). Assessments by the Central Groundwater Board of the level of groundwater development (GWD)[3] provide a grim picture of an impending crisis in the core Green Revolution areas (Table 1.6).

2 Studies in India have shown that crop yield per cubic metre on groundwater irrigated farms tends to be 1.2-3 times higher than on surface water irrigated farms (Dhawan 1989,167).

3 Level of Groundwater Development (GWD) = Extraction / Utilisation * 100

TABLE 1.6: GROUNDWATER AVAILABILITY, NET DRAFT AND LEVEL OF DEVELOPMENT, 2003

States	BCM/yr	BCM/yr	BCM/yr	%
	(1)	(2)	(3)	(2)/(1)
Haryana	7.3	8.1	0.0	112.2
Punjab	16.8	16.4	0.4	97.7
Rajasthan	10.7	9.3	1.4	86.4
Tamil Nadu	22.4	14.5	7.9	64.4
Gujarat	17.3	9.6	7.7	55.2
Uttar Pradesh	69.0	32.3	36.7	46.9

Source: CWC (2002)

The table shows that the alluvial tracts of Haryana and Punjab have already reached the limit beyond which further extraction of groundwater becomes unsustainable. Rajasthan, Tamil Nadu and Gujarat are fast approaching it. This is also reflected in the numbers of critical blocks ("dark" and "overexploited" blocks with GWD >90%) in these states (Table 1.7). Nearly 60% of the blocks in Punjab and 40% of blocks in Rajasthan and Haryana are experiencing overextraction of groundwater.

TABLE 1.7: NUMBER OF DARK AND OVEREXPLOITED BLOCKS, 2002

States	Districts	Blocks/Mandals/Taluks/Watersheds				
		Total	Over exploited	Dark	Critical Blocks (3+4)	% (5/1)
	(1)	(2)	(3)	(4)	(5)	(6)
Punjab	17	138	72	11	83	60%
Rajasthan	32	236	74	20	94	40%
Haryana	17	108	33	8	41	38%
Tamil Nadu	27	384	64	39	103	27%
Gujarat	19	184	13	15	28	15%

Source: CWC (2002)

While these areas where groundwater is relatively plentiful face the threat of overextraction, about 65% of India (comprising mainly the continental shield) is underlain by formations usually referred to as "hard rocks". 'Hard rock' is a generic term applied to consolidated formations with aquifers of low primary intergranular porosity (e.g., granites and basalts). The specific yield[4] values of these formations are as low as 1 to 3% compared to that of unconsolidated, alluvial formations which are as high as 12 to 18% (GEC, 1984). Most of their groundwater potential comes from secondary porosity, created by the processes of weathering and fracturing. Groundwater resource in hard rocks is characterised by limited productivity of individual wells, unpredictable variations in productivity of wells over relatively short distances and poor water quality in some areas (Narasimhan, 1990). In contrast to alluvial areas (characterized mainly by relatively more pervious geological strata), the groundwater flow regimes in hard rock areas are extremely complex. Most productive aquifers in hard rock areas are located at shallow depths in the zone of water level fluctuations (the vadose and fractured zones). Deeper seated aquifers often have good initial yields, but a tubewell drilled here may be tapping groundwater accumulated over several hundreds of years. Once groundwater has been extracted from a deeper aquifer, its replenishment depends upon the inflow from the shallow system. The path this water has to traverse is characterized by relatively unfavourable media, which greatly slows down the rate of groundwater recharge. This also means that we must be very modest in the rate and depth of extraction of groundwater.

Thus, the crucial fact to be monitored in both areas, but even more so in hard rock regions, is the absolute number and share of tubewells in groundwater irrigation, which provides an indication of the rate and depth of extraction. Since their natural rate of recharge is low, great caution has to be exercised in the development of groundwater in hard rock areas. This poses a severe limit to expansion of tubewell technology to areas underlain by these strata.

1.2.3 Improved Life of Dams and Revival of Fallen Water Tables also requires Watershed Development

Our review thus far shows that the limits to further expansion of surface and groundwater irrigation through big dams and tubewells are being reached rapidly. This makes the urgency of a different strategy for India's drylands even greater. Such a strategy needs to recognise the location-specific characteristics of different parts of India and also needs to be sensitive to the limits set by the eco-system. This, we believe, is the broad strategy of watershed development. Of course, our intention here is not to raise any debate about alternative strategies. What we

4 Specific yield is an indicator of the extent of void space in a rock stratum. It refers to the volume of water per volume of rock strata that will flow into a well (Fetter, 1986).

would like to emphasise, however, is that the watershed approach represents a win-win situation. For the life of our irrigation sources themselves, whether they are dams (big, medium or small) or wells/tubewells, depends crucially on the treatment of their catchments to reduce rates of siltation, and on groundwater recharge works, which are both key ingredients of watershed development.

The Ministry of Agriculture estimated in 1985 that over 100 mha of India's geographical area is affected by soil erosion due to surface water runoff. Annual soil erosion due to water in India is estimated to be 5334 million tonnes (roughly 16.35 tonnes per ha per year) (Dhruvanarayana, 1993). About 10 percent of this is deposited in large dam reservoirs, representing loss of their storage capacity of about 1-2% every year. The Himalayan foothills, Western Ghats and North-Eastern States account for over 60 percent of the total soil erosion in the country. According to the Report of the Inter-Ministry Task Force on Integrating Ongoing Schemes, larger reservoirs in India have lost over one-third of their storage capacity due to siltation. This has resulted in a reduction in area irrigated as also lower electricity generation, thereby rendering the large investments in these projects unviable (Planning Commission, 2004). The problem of reservoir siltation, far in excess of rates estimated before construction, is threatening to lower the life of many large dams (Table 1.8). The siltation rate in Hirakud dam, for instance, is two and a half times more than the rate assumed and, therefore, the expected life of the dam has been reduced by more than half.

TABLE 1.8: SILTATION STATUS AND LIFE OF BIG DAMS IN INDIA

Name of Dam	Design Life (Years)	Annual Rate of Siltation (ham/1000 sq.km.)		Actual Life (Years)
		Assumed	Observed	
Bhakra Nangal	403	4.29	5.95	291
Tungabhadra	311	4.29	5.98	245
Matatila	357	1.33	4.33	108
Panchet	216	6.67	10.48	138
Maithon	210	9.05	12.39	153
Mayurakshi	872	3.75	16.48	198
Shivaji Sagar	5000	6.67	15.24	2200
Hirakud	386	2.52	6.60	147
Gandhi Sagar	930	3.61	9.64	348

Source: Hundred and Forty First Report, Public Accounts Committee (1982-83), Ministry of Planning, Planning Commission (Lok Sabha Secretariat), New Delhi, P. 103

By reducing siltation rates through control of the volume and velocity of surface water runoff, watershed programmes can make a big contribution to enhancing storage capacities of big dam reservoirs. They can similarly be also effective in restoring fallen water tables in areas that have seen massive groundwater over-exploitation.

1.3 History of Watershed Programme in India

Even though watershed programmes in India are relatively new, work on soil and water conservation by the Ministry of Agriculture had begun in the early 1960s (Planning Commission, 2004). After independence India relied on multi-purpose reservoirs for providing irrigation and generating hydro-electricity. To stabilize the catchments of reservoirs and to control siltation, a Centrally Sponsored Scheme of "Soil Conservation Work in the Catchments of River Valley Projects (RVP)" was launched in 1962-63. The Ministry of Agriculture started a scheme of Integrated Watershed Management in the Catchments of Flood Prone Rivers (FPR) in 1980-81. During the 1980s, several successful experiences of fully treated watersheds, such as Sukhomajri in Haryana and Ralegaon Siddhi in Western Maharashtra, came to be reported. The Ministry of Agriculture launched a scheme for propagation of water harvesting/conservation technology in rainfed areas in 19 identified locations in 1982-83. In October 1984, the Ministry of Rural Development (MoRD) adopted this approach in 22 other locations in rainfed areas. In these 41 model watersheds the Indian Council of Agricultural Research (ICAR) was also involved to provide research and technology support. The purpose of these Operation Research Projects was to develop "model watersheds" in different agro-climatic zones of the country.

With experience gained from all these, the concept of integrated watershed development was first institutionalised with the launching of the National Watershed Development Programme of Rainfed Areas (NWDPRA) in 1990, covering 99 districts in 16 states. Meanwhile, conservation work was ongoing in the Drought Prone Areas Programme (DPAP) launched by MoRD in 1972-73. The objective of this programme was to tackle the special problems of areas constantly affected by severe drought conditions. In 1977-78, the MoRD started a special programme for hot desert areas of Rajasthan, Gujarat and Haryana and cold desert areas of Jammu & Kashmir and Himachal Pradesh (which were earlier under DPAP) called Desert Development Programme (DDP).

These programmes were reviewed in 1973 by a Task Fore headed by Dr. B.S. Minhas, by another Task Force headed by Dr. M.S. Swaminathan in 1982 as well as by an Inter-Departmental Group in 1984. In 1988 the National Committee on DPAP and DDP was set up under the

Chairmanship of the Member, Planning Commission to appraise and review the DPAP and DDP. The committee was initially headed by Dr. Y.K. Alagh and later by Shri L.C. Jain who took over as Member, Planning Commission in charge of the subject. The committee submitted its report in August 1990.

In 1994, a Technical Committee under the Chairmanship of Prof. C.H. Hanumantha Rao was appointed to appraise the impact of the work done under DPAP/DDP; identification of the weaknesses of the programme and to suggest improvements. The Hanumantha Rao Committee felt that "the programmes have been implemented in a fragmented manner by different departments through rigid guidelines without any well-designed plans prepared on watershed basis by involving the inhabitants. Except in a few places, in most of the programme areas the achievements have been dismal. Ecological degradation has been proceeding unabated in these areas with reduced forest cover, reducing water table and a shortage of drinking water, fuel and fodder" (Hanumantha Rao Committee, 1994, Preface). The Committee, therefore, decided to revamp the strategy of implementation of these programmes, drawing upon the "the outstanding successes" of some ongoing watershed projects. It recommended that sanctioning of works should be on the basis of the action plans prepared on watershed basis instead of fixed amount being allocated per block as was the practice at that time. It called for introduction of participatory modes of implementation, through involvement of beneficiaries of the programme and non-government organisations (NGOs). It recommended that "wherever voluntary organizations are forthcoming, the management of watershed development should be entrusted to them with the ultimate aim of handing over to them one-fourth of total number of watersheds for development". The Committee also called for a substantial augmentation of resources for watershed development by "pooling resources from other programmes being implemented by the Ministry of Rural Development, e.g., Jawahar Rozgar Yojana, Employment Assurance Scheme, etc., and by integrating them with DPAP and DDP". The Committee recommended suitable institutional mechanism for bringing about coordination between different departments at the central and state levels with a view to ensuring uniformity of approach in implementing similar programmes for the conservation of land and water resources.

On the basis of these recommendations, the Hanumantha Rao Committee formulated a set of "Common Guidelines", bringing five different programmes under the MoRD, namely, DPAP, DDP and Integrated Wastelands Development Programme (IWDP), as also the Innovative-Jawahar Rozgar Yojana (I-JRY) and Employment Assurance Scheme (EAS), 50% of the funds of both of which were to be allocated for watershed works. The watershed projects taken up by

MoRD from 1994 to 2001 followed these Common Guidelines of 1994. In 2000, the Ministry of Agriculture revised its guidelines for NWDPRA, making them "more participatory, sustainable and equitable". These were called WARASA – JAN SAHABHAGITA Guidelines. The Common Guidelines of 1994 were revised by MoRD in 2001 and then again modified and reissued as "Guidelines for Hariyali" in April 2003. The watershed programme became the centerpiece of rural development in India. The Ministry of Environment and Forests as well as bilateral funding agencies are also involved in implementation of watershed projects in India. The ongoing watershed programmes are listed below.

1.3.1 Ministry of Agriculture (Department of Agriculture and Cooperation)

1. National Watershed Development Project for Rainfed Areas (NWDPRA): This project was launched in 1990. At present it covers all the 25 states and two Union Territories. The twin objectives of NWDPRA continue to be to improve production and productivity in the vast rainfed areas and to restore ecological balance. Till March 2005, 7.95 mha have been treated with a total expenditure of Rs. 2398.76 crores.

2. Soil Conservation in the Catchments of River Valley Projects (RVP): The Scheme was launched by the Ministry of Agriculture in 1962-63. Subsequently another scheme of Integrated Watershed Management in the Catchments of FPR was launched in 1980-81. These schemes are primarily aimed at treating catchment areas, extending over more than one state, with appropriate soil and water conservation measures and to cover degraded arable and non-arable lands on watershed basis. In the Ninth Plan, both schemes were merged together into a new scheme called Soil Conservation for Enhancing Productivity of degraded lands in the catchments of RVP and FPR. The Scheme is being implemented in 45 catchments spread over 20 states. About 6.09 mha have been treated with an expenditure of Rs. 1894.12 crores till March 2005.

3. Shifting Cultivation: The Watershed Development Project in Shifting Cultivation Area (WDPSCA) was first launched during the Fifth Plan as a pilot project with 100% financial assistance from the Central Government, covering the whole of North Eastern Region along with Andhra Pradesh and Orissa and later on was transferred to the state plan sector. But due to various reasons, the state governments discontinued the scheme with effect from 1991-92. On pressing demand from

North-Eastern states, the Planning Commission and Ministry of Agriculture relaunched the scheme on watershed basis from 1994-95 onwards in seven North-Eastern states. Till March 2005, 0.28 mha have been treated with a total expenditure of Rs. 236.35 crores.

4. Reclamation of Alkali Soils: The scheme for Reclamation of Alkali Soils was launched in 1974-75 in the states of Punjab, Haryana and Uttar Pradesh and extended to the states of Gujarat, Madhya Pradesh and Rajasthan in the Eighth Plan period. The main objective of the scheme is to reclaim land affected by alkalinity and improve land and crop productivity including development of horticulture, fuel wood and fodder species. About 0.56 mha have been treated under this programme with an estimated expenditure of Rs. 82.54 crores till March 2005.

5. Watershed Development Fund (WDF): This fund has been established in 1990-2000 at the National Bank for Agriculture and Rural Development (NABARD), with the objective of integrated watershed development in 100 priority districts through participatory approach. The total corpus of the fund is Rs. 200 crores, which includes Rs. 100 crores by NABARD and a matching contribution of Rs. 100 crores by the Department of Agriculture and Cooperation. The fund is to be utilized to create favourable conditions to replicate and consolidate the isolated successful initiatives under different watershed development programmes in the government, semi-government and NGO sectors.

6. Externally Aided Projects (EAPs): There are 17 EAPs on Watershed and Land Reclamation and Development in operation in 15 major states covering about 2.36 mha area with an estimated cost of Rs. 4756.26 crores.[5]

1.3.2 Ministry of Rural Development (Department of Land Resources)

1. Drought Prone Areas Programme (DPAP): Drought Prone Areas Programme (DPAP) was launched in 1972-73 to tackle the special problems faced by areas constantly affected by severe drought conditions. The main objective of the programme is to minimize adverse effects of drought on the production of crops, livestock and productivity of land, to promote overall economic development and improve the socio-economic condition of the resource-poor and disadvantaged sections of inhabitants. The scheme covers 961 blocks of 180 districts in 16 states. Total area treated under DPAP is 15.13 mha with an investment of Rs. 2623.40 crores.

5 This figure for EAP investment appears a little on the high side to us but on being questioned by us, the MoRD vouched for its accuracy.

2. Desert Development Programme (DDP): The programme aims to mitigate the adverse effects of desertification and adverse climatic conditions on crops, human and livestock population, for combating desertification through shelter-belt plantation, pasture development, soil moisture conservation and water resources development and also to restore ecological balance. At present, this programme covers 232 blocks of 40 districts in hot desert areas of Rajasthan, Gujarat, Andhra Pradesh, Karnataka and Haryana and cold desert areas of Jammu & Kashmir and Himachal Pradesh. Total area treated under DDP is 5.71 mha and investment is Rs. 1857.78 crores as on March 2005 (Table 1.9).

3. Integrated Wasteland Development Programme (IWDP): IWDP was started in 1988-89 by the Ministry of Environment and Forests with an objective of development of wastelands based on village/micro-watershed plans. However, the scheme was transferred to the Department of Wastelands Development (DWD) now called Department of Land Resources (DLR), during 1992-93. The projects under IWDP are being implemented in 216 districts of the country. Total area treated under IWDP is 6.32 mha with a capital investment of Rs. 2161.81 crores as on March 2005.

4. Externally Assisted Projects (EAPs): The DLR, MoRD is also implementing EAPs, assisted by the donor agencies like UK Department for International Development (DFID), European Economic Commission (EEC), Canadian International Development Agency (CIDA) and Swiss International Development Agency (SIDA), in the states of Orissa, Andhra Pradesh, Haryana, Kerala, etc. Total area treated is 0.36 mha and expenditure is Rs. 212.67 crores till March 2005.

5. Technology Development, Extension and Training: This scheme was launched during 1993-94 with a view to promoting the development of suitable technology for the reclamation of wastelands. Its main objective is to operationalise appropriate, cost-effective and proven technologies for development of wastelands. Till March 2005, total area treated is 0.99 mha and expenditure is Rs. 80.16 crores.

6. Investment Promotional Scheme: This scheme was launched in 1994-95 to promote participation of the corporate sector and financial institutions to enhance the flow

of funds for the development of non-forest wastelands. The scheme has been reconstructed in August 1998 with a major thrust for the development of degraded lands belonging to small and marginal farmers including Scheduled Castes (SCs)/ Scheduled Tribes (STs). Since inception 26 projects estimated to be covering an area of 893.08 ha have been sanctioned with an expenditure of Rs. 58.75 lakhs.

7. Support to NGOs: The objective of the scheme is to create awareness, encourage the application of appropriate technologies for the development of wastelands and provide training for increasing capability and capacity building. Extension and publicity are other components of the scheme. This scheme has now been transferred to the Council for Advancement of People's Action and Rural Technology (CAPART). Since inception of the scheme 238 projects have been sanctioned with expenditure of Rs. 20.37 crores.[6]

8. The Wastelands Development Task Force: The scheme was implemented using the services of ex-servicemen for development of 1200 ha of wastelands in ravines of Chambal in Morena district of Madhya Pradesh. The objective of the scheme was to develop wastelands through afforestation including soil and moisture conservation, plantation and protection. An area of 1200 ha ravine land is estimated to have been developed with an expenditure of Rs. 7.72 crores till March 2005.

1.3.3 Ministry of Environment and Forests

1. Integrated Afforestation and Eco-development Projects Scheme: The schemes implemented by the Ministry of Environment and Forests have relevance to sustainable eco-system development in rainfed/degraded areas in the country. This scheme is being implemented on watershed basis since 1989-90 to promote afforestation and development of degraded forests by adopting an integrated watershed approach to development of land and other related natural resources through the micro-planning process. Total area treated is 0.82 mha and expenditure is Rs. 813.73 crores till March 2005.

Table 1.9 summarises area treated and total investment under various programmes till March 2005. Till date, a total of 45.58 mha has been treated through various programmes with an investment of Rs. 17,037 crores. Average expenditure per annum during the Tenth Plan is around Rs. 2300 crores.

6 NGOs were also supported by NABARD under the Indo-German Watershed Development Programme (IGWDP).

TABLE 1.9: AREA TREATED (MHA) AND INVESTMENT UNDERTAKEN (RS. CRORES), WATERSHED PROGRAMMES IN INDIA

No.	Programme	Up to end of 8th Plan		During 9th Plan		During 10th Plan till March 2005		Total (Till March 2005)	
		Area	Investment	Area	Investment	Area	Investment	Area	Investment
I	**Ministry of Agriculture**								
(a)	National Watershed Development Project for Rainfed Areas (NWDPRA)	4.22	967.93	2.77	911.01	0.96	519.82	7.95	2398.76
(b)	River Valley Project (RVP) and Flood Prone Rivers (FPR)	3.89	819.95	1.60	696.26	0.60	377.91	6.09	1894.12
(c)	Watershed Development Project in Shifting Cultivation Areas (WSDSCA)	0.07	93.73	0.15	82.01	0.06	60.61	0.28	236.35
(d)	Alkali Soils	0.48	62.29			0.08	20.25	0.56	82.54
(e)	Externally Aided Project (EAP)	1.00	646.00	0.50	1425.01	0.86	2685.25	2.36	4756.26
	Sub-total	**9.66**	**2589.90**	**5.02**	**3114.29**	**2.56**	**3663.84**	**17.24**	**9368.03**
II	**Department of Land Resources (MoRD)**								
(a)	Drought Prone Areas Programme (DPAP)	6.86	1109.95	4.49	668.26	3.78	845.19	15.13	2623.40
(b)	Desert Development Programme (DDP)	0.85	722.79	2.48	519.80	2.38	615.19	5.71	1857.78
(c)	Integrated Watershed Development Programme (IWDP)	0.28	216.16	3.58	943.88	2.46	1001.77	6.32	2161.81
(d)	EAP			0.14	18.39	0.22	194.28	0.36	212.67
	Sub-total	**7.99**	**2048.90**	**10.69**	**2150.33**	**8.84**	**2656.43**	**27.52**	**6855.66**
III	**Ministry of Environment & Forests**								
	Integrated Afforestation & Eco-Development Projects Scheme (IAEPS)	0.30	203.12	0.12	141.54	0.40	469.07	0.82	813.73
	Grand Total	**17.95**	**4841.92**	**15.83**	**5406.16**	**11.80**	**6789.34**	**45.58**	**17037.42**

Source: Submission by MoRD to Parthasarathy Committee

1.4 Potential of the Watershed Programmes: A Summary of Available Evidence

A review of the performance of watershed projects during the last 20 years reveals their potential for drought-proofing, agricultural growth, environment protection and employment generation. Kerr and Chung (2001) provide an excellent summary of the operational indicators of impact of watershed programmes. It is true that there are not too many studies covering all these

aspects. There is clear lack of rigorous methodology in most studies. The quality of the data is also highly variable across projects (see the section on Research in the next chapter). However, there have been several studies and evaluations that do provide an indication of the potential of the watershed programme.

A study of 6 IWDP watersheds (Sharda, Samra and Dogra, 2005) showed that various mechanical and biological measures could reduce surface runoff by 58%. Soil losses from watersheds were reduced by 52%. The study reports that the water storage capacity created was on an average 47,400 cubic metres per watershed, which increased the recharge rate by 20 to 53%. The overall productivity of the watershed measured through a Crop Productivity Index rose by 12 to 45% in treated watersheds. A review of 120 selected households in four watershed projects in Gujarat (Amita Shah, 2000) found that after 4 years of implementation, irrigated area almost doubled in all the projects, reaching about 18% of the land held by the beneficiary households. Cropping intensity also showed a rise. The total net return from all crops increased by 63%. Around 87% of the households reported that their drinking water availability increased. About 71% of the landless reported better availability of employment opportunities in the post-project period. The value of the stream of benefits from the project over a 15-year period is estimated at Rs. 10.48 lakhs with an initial investment of Rs. 2.57 lakhs, with an overall benefit-cost ratio (BCR) of 4.07.

An evaluation by the State Water Conservation Mission in Andhra Pradesh showed that out of nearly 2000 watersheds, water levels showed a rise in as many as 90%, despite a fall in the rainfall by about 28%. About 0.17 mha of additional area has been brought under cultivation. The out-migration of labour from the project areas declined by 10 to 40%. There has been an improvement in the availability of drinking water as well. TARU's (The Action Research Unit) evaluation (TARU, 2001) of the Rajiv Gandhi Mission for Watershed Development in Madhya Pradesh showed that the cropped area increased in 46 out of 58 villages. There has been an improvement in groundwater levels in all project villages. The study also reports an increase in irrigated area in 38 out of 58 villages. While the landless households have benefited from direct wage employment, impact on long-term employment is less clear. The TARU study also showed that one of the major direct impacts of watershed work has been in terms of equal wages for men and women. The study felt that reservation for women could have far-reaching impact on gender equality (TARU 2001).

A study of impacts in five watersheds in Andhra Pradesh by Watershed Support Services and Activities Network (WASSAN) (Reddy and Ravindra, 2004) found that the overall BCR of

watershed investment in four watersheds varied between 1.10 and 3.78. On the basis of this estimate, they worked out that the investment payback period of a watershed project is 2 to 3 years. A cost-benefit analysis of eight watersheds located in different parts of Gujarat has been conducted by Development Support Centre (DSC) (Chaturvedi, 2005). The study comes out with rather high BCR figures in the range of 4.06 to 15.72. The study notes that benefits occur because of increase in cropped area, shifts in cropping pattern and improvements in crop productivity due to watershed treatment. Crispino Lobo (1996) presents a study of 3 watersheds under the IGWDP in Ahmednagar district of Maharashtra. An average rise of nearly 300% in the irrigated area and 50% in cropped area was recorded post-intervention.

An initial survey of 16 villages (8 watershed and 8 non-watershed) in drought-affected districts of Gujarat showed that the watershed villages were better placed compared to non-watershed villages in terms of water and biomass availability, employment opportunities and out-migration (Anil Shah, 2000). Only 1 out of the 8 watershed villages were dependent on water supply by tankers and 5 out of 8 watershed villages could take a rabi crop. Seven watershed villages had no shortage of fodder and there was no large-scale out-migration in 6 out of 8 villages. However, re-surveys of these villages in the second and third years of drought (Anil Shah, 2002, 2004) revealed that this advantage of watershed villages almost vanished over successive years of drought. In the third year, half the watershed villages had to depend on tankers for water supply and almost all watershed villages witnessed massive out-migration. Similar conclusions are arrived at in a study of Surendranagar, Gujarat by the Aga Khan Rural Support Programme (AKRSP) (AKRSP-I, 2004). The important policy implication of these studies is that more investment and intensification of effort is required to consolidate the gains from watershed development. We take this issue forward in Chapter 3.

MoRD conducted a comprehensive evaluation of watershed programmes in 16 states covering 221 districts in 2001. A compilation of the results of this study (TERI, 2004) reports overall improvement in land use, increase in net sown and gross cropped area, expansion in irrigated area, greater fuelwood and fodder availability, higher incomes and employment opportunities from the majority of states. Perhaps the most comprehensive summary of the benefits of watershed programmes in India is provided by ICRISAT's (International Crops Research Institute for the Semi-Arid Tropics) 'meta-analysis' of the impact of watershed programmes (Joshi *et al,* 2005). It is based on an exhaustive review of 311 case studies.

The study found that in treated watersheds:

- soil loss (51 studies) reduced by 0.82 tonnes/ha/year;
- rate of runoff (36 studies) reduced by 13%;
- irrigated area (97 studies) increased by 34%;
- cropping intensity (115 studies) went up by 64%; and
- additional employment (39 studies) of 182 persondays/ha/year has been created and in some cases, it went up to 900 persondays/ha/year.

The BCR figure arrived at by the ICRISAT study is around 2.14. Only 15% of the watersheds studied had BCR >3. The mean internal rate of return (IRR) was estimated at 22%. The maximum IRR was 94% and 35% of the watersheds had IRR >30%. This result clearly shows that the investment in the programme is justified in these fragile and uncertain environments.[7]

1.5 Investment Required in the Watershed Programme

In this section we provide an estimate of the annual level of investment required if the entire untreated area of the country is to be covered by watershed programmes by 2020. There are different estimates of degraded lands requiring watershed treatment in India (Table 1.10).

TABLE 1.10: ESTIMATES OF DEGRADED LAND IN INDIA NEEDING WATERSHED TREATMENT (MILLION HA)

1976	National Commission on Agriculture	175	Secondary Data
1985	Ministry of Agriculture, Government of India	174	Land Degradation Statistics of States
1994	NBSS-LUP, Nagpur	188	Mapping on 1:4.4 million scale
1994	Ministry of Agriculture, Government of India	107	Land Degradation Statistics of States
2000	NRSA	64	Mapping on 1:50000 scale

Source: Planning Commission (2004)

Our considered view (elaborated in the next chapter) is that the cost norm for watershed projects needs to be raised to a maximum of Rs.12,000 per ha. We would also suggest that the total area requiring watershed treatment needs to be re-examined. A comprehensive attempt towards delineating (AERs) in the country has been attempted by the National Bureau of Soil Survey

7 We treat the subsequent results of ICRISAT's linear regression analysis with greater caution. These would have to be carefully checked out to ensure that they do not suffer from standard statistical problems created by auto-correlation, multi-collinearity and heteroscadasticity of the error term.

and Land Use Planning (NBSS-LUP, 1992). This approach followed the FAO methodology (Higgins and Kassam, 1981) of a sequential layering of information on maps. Each contains areas of uniform physiography, climate, length of growing period (LGP) and soils, and have similar hydrological and ecological responses. The major physiographic regions of the country such as the Himalayas, Indo-Gangetic plains, peninsular Deccan Plateau and coastal plains are subdivided to get 19 landform units. Information on the distribution of 16 broad soil units is superimposed on this landform map to get a map with 49 soil-scape units, out of which 24 are found to be significant. The combination of climatic elements, such as rainfall, temperature, vegetation and potential evapo-transpiration (PET)[8] together provides the bioclimate units. Five such units, viz., arid, semi-arid, sub-humid, humid and per humid, are identified. The water balance parameters rainfall, PET and soil storage together determine the soil moisture and soil temperature regimes. These variables together determine the period in which the moisture of the soil is adequate for supporting plant growth, called LGP.[9] The growing period starts when rainfall exceeds 50% of PET and ends with the utilization of the stored soil moisture after rainfall falls below PET. Five different ranges of LGP, counted in days from <90 to >210, are used. These LGP ranges together with 5 bioclimate units give 18 moisture availability regions of which 9 are found widely distributed. Finally, the layering of 9 LGP-bioclimate units on the 24 soil-scape units gives rise to 20 generalized AERs.

We observed that treatment is required in areas from AERs 1-12 (extremely arid, arid, semi-arid and dry sub-humid areas) where gross irrigated area as a percentage of gross sown area is less than 33%. In addition, we need to consider those areas where rainfall may be relatively high but which are characterised by special ecological problems (AERs 13-14). The AERs from which the specific blocks to be covered under the programme need to be shortlisted are:

1. Western Himalayas, cold arid eco-region, with shallow skeletal soils and LGP <90 days.

2. Western Plain, Kutch and part of Kathiawar peninsula, hot arid eco-region, with desert and saline soils and LGP <90 days.

8 PET is defined as 'the amount of water transpired in unit time by short green crop of uniform height completely covering the soil and never short of water' (Penman, 1956). It indicates the maximum evaporative potential of the atmosphere in an area.

9 The picture gets much more complicated if one examines not just total rainfall but its pattern within the season. In many models, weekly rainfall and PET figures have been used to characterise the growing period accurately. What is important for assessing crop potential is the correspondence between this distribution and the patterns of water requirement of different crops.

3. Deccan Plateau, hot arid eco-region, with red and black soils and LGP <90 days.
4. Northern Plain and Central Highlands including Aravallis, hot semi-arid eco-region, with alluvium-derived soils and LGP 90-150 days.
5. Central (Malwa) Highlands, Gujarat Plains and Kathiawar Peninsula, hot semi-arid eco-region, with medium and deep black soils and LGP 90-150 days.
6. Deccan Plateau, hot semi-arid eco-region, with shallow and medium (with inclusion of deep) black soils and LGP 90-150 days.
7. Deccan (Telangana) Plateau and Eastern Ghats, hot semi-arid eco-region with red and black soils and LGP 90-150 days.
8. Eastern Ghats, Tamil Nadu Uplands and Deccan (Karnataka) Plateau, hot semi-arid eco-region with red loamy soils and LGP 90-150 days.
9. Northern Plain, hot semi-arid (dry) eco-region, with alluvium-derived soils and LGP 150-180 days.
10. Central Highlands (Malwa, Bundelkhand and Satpura), hot sub-humid eco-region, with black and red soils and LGP 150-210 days.
11. Eastern Plateau (Chhattisgarh), hot sub-humid eco-region, with red and yellow soils and LGP 150-180 days.
12. Eastern (Chhotanagpur) Plateau and Eastern Ghats, hot sub-humid eco-region, with red and lateritic soils and LGP 180-210 days.
13. Eastern Plain (North Bihar), hot, sub-humid eco-region with alluvium derived soils and LGP of 180-210 days.
14. Western Himalayas, warm sub-humid with brown forest and podzolic soils and LGP of 180-210 days.

Excluding the nearly 46 mha taken as already treated as per Table 1.9, the area remaining to be treated around is 125 mha.[10] At a project cost of Rs. 12,000 per ha (as proposed by us in Chapter 3), the total cost of treatment of 125 mha is Rs. 150,000 crores. At the current level of outlay, it would take around 75 years for treatment to be completed. For the work to be completed

10 The precise list of blocks and the exact area to be covered in these regions could not be worked out by the Committee since required data has not yet been provided by various state governments. Once this data becomes available, the exact area and list of blocks can be determined.

by the year 2020, the government needs to allocate around Rs. 10,000 crores per annum every year for the next 15 years. In our view, this amount could come from two main sources:

1. Doubling of current programme outlays that would yield about Rs. 5,000 crores.
2. An allocation of around Rs. 5,000 crores from the National Rural Employment Guarantee Scheme (NREGS) specially earmarked for watershed programmes. This makes perfect sense since the NREGS is already primarily focused on watershed-related activities. Para 1 of Schedule 1 of the National Rural Employment Guarantee Act states, "The focus of the Scheme shall be on the following works in their order of priority –

a. water conservation and water harvesting;

b. drought-proofing (including afforestation and tree plantation);

c. irrigation canals including micro and minor irrigation works;

d. providing irrigation facility to land owned by household belonging to the SCs and STs or to land of beneficiaries of land reforms or that of the beneficiaries under the Indira Awas Yojana of the Government of India;

e. renovation of traditional water bodies including desilting of tanks;

f. land development;

g. flood control and protection works including drainage in waterlogged areas; and

h. rural connectivity to provide all weather access."

Almost each one of these activities comes under the purview of the watershed programme. This investment amounts to less than 1% of India's gross domestic product. Even so, in any discussion on the stepping up public expenditure in the economy, fiscal deficit comes up as an area of major concern. Enhanced public expenditures could be seen as fuelling the fires of inflation. However, it must be remembered that investments in watersheds result in a sustainable rise in agricultural productivity, through labour intensive methods, using technologies, which are environmentally regenerating. They thus hold the key to a simultaneous solution to the problems of unemployment and inflation in India (Mihir Shah *et al*, 1998). As the eminent economist Rakshit (2004) has argued, even in theory, any absolute level of fiscal deficit could be sustainable, if the economy has excess capacity and unemployed resources and if the fiscal deficit is

productivity enhancing. The resulting higher incomes and tax revenues to the government would restore the revenue and fiscal balance in the short and medium term. In our view, a public investment programme for watershed development is not a mere short-run relief measure. It is instead an integral element of a strategy for rural transformation. It is the best way to embody the expenditures under NREGS and is also an imperative if the demands of food security are to be met by the year 2020.

1.6 Role of Rainfed Areas in Food Security

Raising the productivity of rainfed areas is an imperative if we are to meet the goal of national food security in the coming years. We have estimated that, even in the most optimistic scenario of further irrigation development in India, nearly 40% of national demand for food in 2020 will have to be met through increasing the productivity of rainfed dryland agriculture (Table 1.11).

TABLE 1.11: PROJECTED DEMAND AND SUPPLY OF FOODGRAINS IN INDIA IN THE YEAR 2020 (MILLION TONNES)

1	Projected Food Demand in 2020	307
2	Average Food Production in Triennium Ending 2002	205
3	Gap to be met	102
4	Maximum Possible Contribution of Irrigated Agriculture of which	64
	From Irrigated Area Expansion	38
	From Increases in Productivity of Irrigated Agriculture	26
5	Minimum Balance required from the Rainfed Agriculture	38
6	Share of Rainfed Agriculture	37%

Using the High Level Committee on Long Term Grain Policy's middle projections, we get a total foodgrain demand figure of 307 million tonnes. The foodgrain output during the triennium ending 2000 was 205 million tonnes. To maintain food security even at current nutritional levels, 102 million tonnes of foodgrains have to be produced additionally by 2020. We know that cropped area has plateaued in India since 1970. It has remained static at around the 140 mha mark for the last 3 decades. This is no longer a source of increased output in Indian agriculture. As for irrigated agriculture, its contribution can arise from two sources:

1. Expansion in the area under irrigation; and
2. Yield improvements in the areas already under irrigation.

The ultimate irrigation potential has been estimated at 139 mha, of which 75 mha is from surface water and 64 mha from groundwater (Planning Commission, 2002). As per Land Use Statistics, India's gross irrigated area (GIA) was 75 mha in 2001, which left a balance of 64 mha yet to be exploited. Many states in North-West India have already exhausted their irrigation potential. Nearly 65% of the national unutilised irrigation potential is in the eastern parts of the country, comprising the medium to high rainfall regions of West Bengal, Bihar, Jharkhand, Orissa, Chhattisgarh, eastern Uttar Pradesh and northern Andhra Pradesh. We have made state-level projections of possible rise in GIA, on the basis of past trends and incorporating a locational shift in the pattern of irrigation towards the hitherto unirrigated tracts.[11] Our calculations show that the GIA can be expected to reach a maximum of 100 mha by 2020. This is an increase of 1.25 mha per annum, comparable to what has been achieved historically between 1970 and 2000 (1.28 mha). If irrigated area grows at this rate between 2000 and 2020, we would have an additional 25 mha under irrigation by 2020. Even if the share of foodgrains in GIA does not fall (which it well might, with the growing crop diversification in Indian agriculture), only an additional 16 mha of foodgrain would thereby come under irrigation by 2020. Now since much of this addition to irrigated area would be in eastern India, and given current low yields under irrigated conditions, even under a most hopeful scenario, irrigated yields here are unlikely to cross 3 tonnes per ha by 2020. We can, therefore, expect expansion in irrigated area to contribute an additional 38 million tonnes to the total annual output of foodgrains by the year 2020.

Another part of the additional food output could come from yield improvements in the areas already under irrigation. Out of the 75 mha of GIA, 46 mha were under irrigated food crops in 2000. Yields of irrigated agriculture in India began to plateau in the 1990s and have even declined in some areas. Even if we optimistically assume that yield growth of 30 kg/ha is sustained over the next 20 years, the rise in yield by 2020 will be only 0.6 tonnes per ha. Thus, areas already under irrigation could contribute an additional 26 million tonnes of foodgrains to the shortfall in 2020. The total contribution of irrigated agriculture to foodgrain production from both area expansion and yield improvements put together is, therefore, likely to be around 64 million tonnes, still leaving a shortfall of 38 million tonnes of foodgrains in 2020. In other words, even in the best possible scenario of irrigation development, about 40% of the additional supply of foodgrains needed to match future rise in demand will have to come from the

11 In case the state is already near its full irrigation potential, we have projected a rate of growth that takes it to the full potential in 2020. In other cases, we have projected the historical rate of growth (3-yearly moving averages) for the period 1981-92. This is the period when irrigation rates picked up in the hitherto neglected regions such as Eastern India and Madhya Pradesh. Taking rates of an earlier period would have understated the potential of these emerging states.

unirrigated segment of Indian agriculture, most of which is located in the dryland areas. And this demands that the productivity of drylands be raised through intensive watershed work in these regions.

In this chapter, we have developed a strong case for an increased thrust to watershed programmes in India. However, it is instructive to recognise that the experience of these programmes has thrown up a very large number of lessons. These indicate that the programme is in urgent need of mid-term correction if it is to realise its true potential. In Chapters 2 and 3, we summarise these lessons and indicate the numerous ways in which the programme needs to be reformed. [12]

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CHAPTER 2 TWO

Lessons Learnt and Mid-term Corrections Required in the Watershed Programme in India

This Committee has attempted an exhaustive review of the experience of the watershed programme in India. We have travelled to a large number of watersheds. We have met almost all the state governments. We have also heard and seen the work of leading NGOs, support agencies, think-tanks and researchers on watershed development, met bilateral agencies such as Danish International Development Agency (DANIDA) and DFID and bodies such as Federation of Indian Chambers of Commerce and Industry (FICCI) and Confederation of Indian Industries (CII) (see Appendix I of the report for the details of our travel, Appendix II for the list of organisations we have met and Appendix III for a summary of the representations made to us by various state governments). Our review has revealed a large number of areas where major improvements are called for in India's watershed development programme. We have organised these into the following sections:

1. Issues regarding Conceptualisation of the Programme
2. Participation, Equity and Transparency
3. Appropriate End-uses of Harvested Water for Sustainable Livelihoods
4. Institutional Issues
5. Capacity Building
6. Monitoring
7. Research

8. Possibilities of Public-Private Partnership
9. Administrative Problems

2.1 Issues regarding Conceptualisation of the Programme

2.1.1 Shedding Watershed Fundamentalism

Water resource development in India appears condemned to swing between the fundamentalism of the irrigation engineers on the one hand, and the orthodoxy of soil and water conservation engineers, on the other. While the former refused for years to see the importance of treating the catchment areas of the dams they were building, the latter appear to suggest that once ridge area treatment is done, there is no need to treat the major drainage lines at all! It is even suggested by some that building any kind of dam, big or small will, or rather, should become redundant, if the catchment is treated with the necessary intensity and rigour.[13] This has given rise to an unnecessary opposition between those advocating watershed programmes and those in favour of irrigation. The important thing is to see the essential complementarity between the two programmes. No irrigation project can be sustainable in the long-run, if catchment area treatment is not done either prior or at least simultaneously with its implementation. Indeed, advocates of the Green Revolution irrigation strategies of big dams or tubewells must realise that it is only watershed development that can help revive fallen water tables and prevent dams from prematurely silting up. Likewise, watershed advocates must acknowledge that in many parts of the country (especially eastern and central India) there is a vast unutilised irrigation potential. Community-based micro-irrigation programmes can play a major role in drought-proofing these areas.

Within the watershed approach, problems are sometimes created by an excessively rigid insistence on what is termed the “ridge-to-valley principle”. Simply stated this means that watersheds are to be treated in a sequence beginning with the ridge area and moving gradually down the slope of the watershed. Interventions specifically vary according to slope and “order” of stream[14] in the watershed. This, indeed, represents the strength of the watershed approach, reflecting its emphasis on location-specificity. It ensures that dams built in the lower reaches of the watershed are protected from excessive siltation, something that will tend to happen, if the upper catchment is not treated first.

13 Very senior technical advisors to government, for example, would argue that since rivers are enlarged gullies formed due to soil erosion, the aim of watershed projects should be essentially to treat the catchments of rivers so that no drainage line treatment remains to be done, as there would be little runoff left to harvest! (Shah and Vijay Shankar, 2003).

14 Streams or drainage lines in a watershed are classified according to their catchment areas into lower and higher “order” streams. Interventions vary according to the order of the drainage line.

The problems begin when this principle, rather than being a guiding rule, starts to acquire the form of a rigid orthodoxy. For it often happens that village communities inhabit the lower reaches of the selected micro-watershed. Success or failure in watershed programmes depends on how closely the community is involved in it, right from the stage of action plan formulation. A rigid insistence on the ridge-to-valley sequence often alienates communities unwilling to understand the point of working so far from their fields and wells. From the very inception then, the implementing agency, in the consciousness of the villagers, is relegated to an interloper status, destroying all chances of success of the programme.[15]

A review of experience in the field suggests that it would be better to introduce a degree of flexibility in the way the ridge-to-valley principle is applied. We agree with the approach of demarcating the selected micro-watershed on a Survey of India toposheet and then plan various interventions within the watershed, in a ridge-to-valley sequence. However, the actual sequence of treatment may be kept a little flexible and responsive to local perceptions. It may at times be more useful to identify significant water harvesting sites within the selected watershed in a participatory fashion and then plan their construction, as also the treatment of their catchments, in a more or less co-terminus manner. This would simultaneously address the need to involve the village community, on the one hand, while ensuring that the catchments of the proposed structures are treated well in time, in anticipation of their storage. We would thereby achieve both – strong community participation and adherence to the ridge-to-valley principle as well.

There are also many cases where the ridge-to-valley principle may not apply for other reasons. Many such areas require a watershed approach but with a difference. These special areas, with fragile eco-systems, and the treatment required for them are described in Chapter 5.

2.1.2 Groundwater: The Gaping Hole[16]

India is a land of great social and natural diversity. One of the most important elements of the latter is the country's extremely variable hydrogeology. This varies not only across regions but also at times even within micro-watersheds. Groundwater is the single most important source of water in India, meeting 60% of our irrigation needs. But as explained in Chapter 1, the availability of groundwater varies enormously across the length and breadth of India.

Perhaps the most critical weakness of watershed programmes in India is that they operate almost as if groundwater does not exist. It enters only as something to be recharged and replenished.

15 In a rather naïve counter-reaction, even some fairly respected practitioners have started to speak of the need to adopt a "valley-to-ridge" approach. The real point is to apply the ridge-to-valley principle in a manner that gives primacy to social mobilisation, even while respecting the power of location-specificity and sequencing of works.

16 We gratefully acknowledge the inputs provided for this section by Himanshu Kulkarni and his team of hydrogeologists at the Advanced Centre for Water Resources Development and Management, Pune.

But it appears to play almost no role at all in watershed planning. Watershed planners forget that just as there is a surface water catchment, there also exists a groundwater catchment. The issue is extremely complex, as the boundaries of the two catchments do not necessarily coincide. But we always define a watershed with reference to the surface water catchment alone. Even if we continue to do this, there is a need to recognise and study the contours of the groundwater catchment and variations in hydrogeology, at the earliest stages of planning a watershed project. This is important for several reasons.

1. Location of Structures: Water harvesting structures can have broadly two purposes – either direct use of the water harvested or recharge of water sources downstream. Knowledge of the hydrogeology at the site and in the intervening strata between the harvesting site and the water source could make a crucial difference to decisions on matching location with purpose. What matters are the storage and transmission characteristics of the aquifer at that point. If water is to be stored for direct use the underlying strata should have low permeability and enough storage capacity to assimilate the artificially recharged water. On the other hand, if a water source downstream is to be recharged, the aquifer should have good transmission capability. For instance, if the water harvesting structure is underlaid by "karstic" or highly permeable limestone, with regional connectivity, the very attempt to harvest rainwater may fail as the water will not stay within the intended local area. Again, the direction of groundwater flow may not mirror that of surface water flow. Thus, we must remember that we customarily deploy "upstream" and "downstream" as surface water flow terms and are not mindful of the fact that these may not apply in precisely the same sense to groundwater.

2. Sustainability: Even while our entire focus is on harvesting surface water runoff and converting it into usable groundwater, watershed programmes do not adequately factor in the impact of unsustainable groundwater use. All the efforts in harvesting rainwater may be wasted if we do not regulate use of groundwater. Watersheds selected for treatment might vary greatly in the base-level of groundwater development. This is fundamental baseline data that must be collected at the start of a programme. We may be interested in recharging fallen water tables following over-exploitation of groundwater. Or else it may be a situation where groundwater use is under-developed. In this case we need to study the aquifer characteristics of different parts of the watershed and weave in a sustainable groundwater development and utilization plan into the overall watershed action plan. This is generally not done in most watershed projects implemented in India so far.

3. Danger of Groundwater Drought: Not doing so has meant that even when there is a normal rainfall year, the watershed could face a drought. This is because farmers overused groundwater

in the previous year. This is what is termed a "groundwater drought". The water balance calculation must include what the community is doing with its groundwater.

4. Equity[17]: The most important aspect of groundwater is that it is a common property resource, the means of access to which is privately owned. We generally access groundwater through private wells and tubewells. But extraction of water from our source can adversely affect the water in our neighbour's water source. Depending on the hydrogeology of the watershed, the question "Who is my neighbour?" gets answered. If the watershed is in an alluvial tract, for example, my deep draw of water can affect a farmer even hundreds of metres away. Thus, how farmers decide to collectively manage the groundwater resources of the village could have a deep bearing on how long groundwater is sustainable. It could actually determine the entire efficacy of the watershed programme. Indeed, one could go as far as to say that sustainable and equitable management of groundwater could be the key area of rural governance in the 21st century.[18]

The unique aspect of the situation is that water below my land is not "mine". Groundwater is a non-stationary, "fugitive" resource that merges into water under another's land in a fluid sort of way. By lowering the depth of his tubewell, my neighbour can draw all water out of my well. Without proper collective arrangements for groundwater use, there tends to be an infinite regress of competitive extraction, with farmers outbidding each other in depths of drilling. Competitive extraction of groundwater leads to disastrous outcomes, the worst of which are observable in coastal areas of Gujarat and Tamil Nadu, for example. Here, saline ingress of sea-water poses a virtually irreversible environmental hazard for farmers who have been engaged in competitive pumping of groundwater.

What is required, therefore, is that we take a three-dimensional view of groundwater and see each aquifer as a common property resource. Wells and tubewells are to be viewed as the means used by farmers to extract water from this aquifer. Extraction of water from this aquifer needs to be carefully, collectively regulated. To place this regulation on a solid scientific basis, each aquifer needs to be mapped and its storage and transmission characteristics carefully studied.

17 This section draws heavily on Mihir Shah and Vijay Shankar (2003). Also see Kulkarni *et al* (2004) for a more technical exposition.

18 In the present era of market fundamentalism, there are those who suggest that the best way to regulate groundwater and prevent its over-extraction is to develop groundwater markets. For them, the solution as always, lies in "getting prices right". They forget that we are dealing with a common property resource with significant externalities – a classic market failure scenario. They fail to understand that as water becomes scarce, prices will tend to rise, gradually putting it beyond the means of the poorest farmers. And those users, such as large corporates, who can afford to pay and bid the highest, will enjoy a virtual monopoly over water, and could indulge in its unbridled exploitation.

TABLE 2.1: MODEL FOR OPTIMAL USE OF GROUNDWATER IN WELLS ACROSS THE SEASON (To minimise interference and maximise productivity)

Well Characteristic		STORATIVITY (s)	
		Low	High
TRANSMISSIVITY (t)	Low	Drinking Water	Last Use (3)
	High	Early Use (1)	Interim Use (2)

Such studies are best done with the close involvement of the farmers of the watershed. They would help the community decide the intensity and sequencing of use of water from different wells in the aquifer. To give a rough indication of a possible scenario – wells tapping an aquifer or part of the aquifer with low storage and low transmission would be preserved for drinking water (Table 2.1). Wells with a low storage of water and high rates of transmission out of it, would be used in the first part of the season, as water will not last for long in these wells. Where storage is high but so are the expected losses due to transmission, water would be used in the middle part of the season. The best wells, which have high storage of water and lose it also slowly (low transmission), would be used only at the fag end of the season, with a part of the water from such wells apportioned for drinking water during summer.

5. Restriction on Tubewells: Considering the man-made crisis of water engendered in the country through deep drilling of tubewells (as described in Chapter 1), it may be useful to consider making it a condition of eligibility for a watershed project that

a) tubewells will be restricted only for drinking water;

b) if at all tubewells are to be drilled for irrigation, they should only be if groups of farmers have a prior agreement on water-sharing and water-use with great care being given to sustainability of water extraction and use.[19]

6. Sustainable Groundwater Development Plan using Dugwells: While we are for restricting extraction of groundwater by tubewells in all watershed projects, we support the idea of integrating a sustainable groundwater development plan based on shallow dugwells into watershed projects. This has not been generally attempted so far. But some agencies such as Samaj Pragati Sahayog (SPS) in Madhya Pradesh have developed such a plan and made it part of catchment and hydrogeological features of the watershed.

19 The celebrated Hivre Bazar watershed project in Maharashtra has banned borewells for non-domestic purposes. In the IGWDP, Maharashtra, a watershed project is undertaken only if the community agrees to ban the drilling of borewells for irrigation purposes and the cultivation of water intensive crops such as sugarcane, bananas, grapes, etc.

2.2 Participation, Equity and Transparency

2.2.1 The Meaning of Participation

After the Hanumantha Rao Committee report of 1994, the Guidelines formulated for watershed development greatly emphasised participatory processes. However, various studies show that participation, transparency and equity are some of the weakest aspects of the programme. Participatory Rural Appraisal (PRA) that was advocated as the tool for ensuring participation has perhaps turned into its own nemesis.[20] The spirit of PRA was demystification of the knowledge of experts and valorization of the knowledge of the people. The idea was that the programme would turn into a people's programme in which others (such as officials, NGOs and experts) will participate. Sadly, PRA has been turned into a "mechanical" tool wherein various prescribed exercises are ritually carried out without changing the overall tenor of the programme, as externally devised and implemented (Kolavalli and Kerr, 2002). Lip-service is routinely paid to the idea of participation without a genuine, organic practice of it. Moreover, it has also been recognised that PRA may be all right as a short-cut to getting quick, broad information. But in a programme as large as a watershed project, there is need for "hard" data for which a much more comprehensive baseline survey would be required[21] (AFARM, 1998; Samaj Pragati Sahayog, 2005a).

Perhaps a much more powerful tool is provided by PRM (Participatory Resource Mapping). The cadastral (*patwari)* map is used for data collection, resource literacy, planning and community mobilisation. This methodology was first developed by Centre for Earth Science Studies, Thiruvananthapuram in collaboration with the Kerala Shastra Sahitya Parishad (KSSP) (Sinha and Varma, 1994). More recently it was used very powerfully during the People's Planning Campaign in Kerala.

It is not difficult to understand why the resource-poor do not find a strong voice in decision-making in development programmes in an unequal society like rural India. It is not surprising, therefore, that this has generally not happened in watershed projects. So it may be unduly unfair to criticize watershed projects on this count. However, it is certainly possible and worthwhile to suggest specific steps that need to be taken and constitute a substantive attempt in this direction. Even after these steps, we may not achieve perfectly participatory processes or equitable outcomes, but the programme must still be judged by the extent and nature of effort it made in this direction.

Bina Aggarwal (2001) provides a very useful typology of modes of participation (Table 2.2).

20 See Mosse (2005) and Samaj Pragati Sahayog (1999) for a scathing critique of the practice of PRA in watershed projects.

21 In the section on research, we emphasise how poor quality of research on watershed programmes in India is, in part, a reflection of the fact that proper baseline data has generally not been collected, nor updated over the course of the project.

TABLE 2.2: TYPOLOGY OF MODES OF PARTICIPATION

Mode of Participation	Characteristics
Nominal	Membership of groups
Passive	Silent participation in meetings or getting information of decisions after meetings
Consultative	Being asked for opinions without necessarily being able to influence decisions
Activity-specific	Volunteering to undertake specific tasks
Active	Pro-actively expressing views, taking other initiatives
Interactive (empowering)	With voice and influence on decisions
Informed (empowered)	Being able to take into account information and opinions of external agents ("experts") and make considered decisions

Note: Adapted from Aggarwal (2001)

To her table we have added a row – informed participation, which we see as the ideal that must be moved towards. Here participation is seen as a two-way process of intense dialogue between the local people and the outside agency, be it government, NGO or professionals. We see the watershed action plan as emerging out of this "hermeneutic" exchange of ideas (Gadamer, 1990), neither a romanticisation of people's knowledge nor a debunking of the expert, rather a process of demystification of expertise in the process of valorising popular understanding, through a creative dialogue between the two. Such a dialogue has been rare. Most programmes have been either top-down impositions or a strangely hands-off acquiescence in whatever mistakes that may be taking place on the ground that "this is a people's programme, people know best, so what can we say" (Mihir Shah, 1998). The challenge is to give enough time and space for differing viewpoints to be expressed, understood and acted upon so that a process of truly informed participation can be set into motion. The people must guide the plans (not necessarily determine them, because there are cases where the so-called "people" are the elite or simply misguided and plain wrong about certain ideas).

Deciding the activities to be included in the action plan and their sites must involve participatory methods such as transect of the entire watershed by groups of villagers, utilizing their deep knowledge of local conditions. This includes their understanding of the topography at a micro level, as also water flows and soil types. As also the socio-economic profiles of the families likely

to benefit or be adversely affected by each proposed intervention. We get a picture of groups of villagers moving together, along with various professionals, across the watershed debating the merits and demerits of different proposals. Only when the plan is arrived at through such a deeply consultative process can it be called genuinely participatory and only then will it stand the test of time and village debate.

An innovative methodology called "Participatory Net Planning" (PNP), which facilitates this process, has been developed by the Watershed Organization Trust (WOTR), Maharashtra. PNP brings together farmer couples as well as villagers in dialogue with experts "on site itself" in order to determine treatments as well as their sequencing thus resulting in enhanced stakeholder ownership as well as generation of data and information useful for planning, implementation and monitoring.

2.2.2 Focus on Equity

One must not make the mistake of romanticising the notion of the village community. Indian rural society today (Adivasi pockets no exception) is deeply fractured across social and economic lines. Discrimination against women, Dalits, Adivasis and the poor in resource-use and access is widespread. Any development programme based on local initiative needs to be necessarily accompanied by effective social mobilisation in favour of these socially and economically disadvantaged groups. Detailed agreements on sharing of water and other benefits need to be worked out well before any construction activity is started. The interests of the landless have to be specially borne in mind. Otherwise all the water harvested will be cornered by the dominant elite. And this is what has happened in most watershed programmes in India. Many state governments have represented to us that social and economic equity have been largely ignored in the programme so far (see Appendix III).[22] It must be recognised that the benefits of public investment on public land must be seen as a public good, to be shared with equity amongst all sections. For example, the fishing rights to a public pond may be reserved for the landless or Dalits. The usufructs from protected/regenerated forests must extend to the Dalits/landless/ Adivasis. Even the benefits from investments on private land should be shared as far as possible. For instance, if investments on private land exceed a certain threshold, there must be provision that its benefits will be shared by groups of farmers. They can, for example, share water from a well or pond constructed under the project. The bottom-line has to be that benefits from any resource created through the project must be equitably shared. The principles of equity must extend to the following aspects, among others:

22 The Government of Gujarat has passed GRs restricting individual works only to the fields of below poverty line (BPL) families, Adivasis and marginal and small farmers (GoG, 2005).

Conflict Resolution: The entire range of activities to be included in the action plan must be discussed threadbare in a series of village meetings. There is bound to be some contention and conflict, but the attempt must be to allow this to be expressed and resolved in a democratic manner in the Gram Sabha. For example, detailed compensation packages need to be worked out for those who may lose a little of their land/assets due to dams to be constructed. Without a satisfactory resolution of all such conflicts, work cannot proceed.

Beneficiary Selection: This must be done in village meetings where detailed criteria are enlisted, reflecting considerations of equity. A hierarchy of preference must be created where the landless, poorest farmers, Dalits, Adivasis and women-headed households get highest ranking.

Benefit Sharing: This involves complex aspects of hours of pumping, sequence of irrigation, cropping patterns, share of cattle, ensuring share of landless, etc. Before any structure is built, detailed agreements have to be thrashed out on all of these aspects. The outstanding example of water sharing, of course, is the late Vilasrao Salunke's Pani Panchayat in Maharashtra. Water is made available to each family at half an acre of irrigation per person, with a maximum of 2.5 acres per family (Pangare, 1996).

Who will be Employed: Sometimes complex labour rationing has to be done to provide adequate representation to those in dire need, different communities, hamlets, villages, etc.

2.2.3 Special Provisions for Landless and Dalits

It is not surprising that a land-based programme like watershed has trended to neglect the interests of the landless. In many programmes a new mechanical *mantra* has developed – "User Groups for farmers, self-help groups (SHGs) for the landless". Apart from the fact, that SHGs must be focused on all poor families, not just the landless, we must also realise that by merely forming SHGs for the landless nothing much is going to be achieved. There is a need to explicitly factor in participation of the landless in decision-making from the word 'go', recognise their rights to the commons and include activities that would take care of their livelihood requirements. We also need to be careful that no provision in the watershed plan should militate against their interests. For example, there are instances from projects in Maharashtra where over-zealous bans on grazing in the commons have deeply hurt livelihoods of small ruminant dependent landless families (Kerr *et al*, 1998). On the other hand, rights to fodder and fuelwood from the commons could be a major source of security for the landless and could help make them active stakeholders supporting watershed programmes. This is the reported experience of the Indo-Swiss watershed project in Karnataka (Joy and Paranjape, 2004). The use of SHGs to manage

the commons in watershed projects in Karnataka is also most instructive in this regard (Mukherjee, 1998).

One of the most important arguments for this Committee suggesting a 2-year Phase III in the watershed programme (see Chapter 3) is to enable livelihood support initiatives that can take care of the interests of the landless. In many tribal-forest areas of Madhya Pradesh, the landless belong to various communities that have traditional artisanal skills of basket- and mat-weaving using bamboo and *harsinghar* (*Nyctanthes arbortristis*). Today, a large number of bamboo products has been developed for furniture and building construction, the world-over. *Harsinghar* is a major medicinal herb. It should certainly be possible for watershed programmes to imaginatively weave in many such interventions into the action plans that would develop this resource in Phase II and provide livelihoods for sections such as the landless and the resource-deprived through value-addition in Phase III (see Chapter 3).

The exclusion of the landless from watershed programmes finds a reflection in a similar exclusion of the Dalits and other backward communities. This is because Dalits are generally the ones who are resource-poor and often the landless. Little work has been done to study the specific concerns of Dalits but a recent initiative by WASSAN (2001) is worthy of mention. WASSAN reports cases in Andhra Pradesh where common lands developed by Dalits were handed over to non-Dalits. There are also instances from Maharashtra where Dalits have had to sell off their goats after their traditional access to commons was restricted following a watershed project (Joy and Paranjape, 2004). Every effort must be made to ensure effective representation of Dalit members in the Village Watershed Committee (VWC). This committee has made specific recommendations in this regard in Chapter 3.

2.2.4 The Question of Gender

Perhaps the most "universal" equity issue, cutting across classes and communities, is the discrimination suffered by women. The challenge of women's empowerment has to be a thrust area in national reconstruction. We need to develop local institutions led by a cadre of local women who would become the transmitters of new development perspectives in their respective areas. Only with the growth of such local leadership can various development programmes initiated by the government be truly mainstreamed in these areas. Or else the massive public investment being made over the years will continue to largely go down the drain.

Women suffer discrimination in all spheres of life. The prejudice against the girl child has resulted in an unfavourable sex ratio in India. To every 1000 men there are only 933 women in

India. The national literacy rate for women is only 48%, compared to 73% for men. There is a clear bias against sending girls to school. Among Dalits and Adivasis, the female literacy rate is as low as 8%. About 40% of girls aged 10-12 years never enroll in school (as against 19% boys). Between 100,000 to 125,000 Indian women die from pregnancy related causes every year. This is 25% of all maternal deaths every year in the world, most of which are preventable. In rural India, only 10% of deliveries take place in hospitals and 75% women suffer silently with reproductive tract infections.

It is women who will need to take the lead if these inequities that women suffer *qua* women are to be redressed. This does not mean a conflict with men. Rather, it needs a systematic effort to so empower women that they provide the lead to the entire process of social transformation being attempted. For it has been the experience of development programmes all over the world that it is the woman in the family who is best able to appreciate, understand and articulate the holistic view of development. Most men will more generally tend to narrowly focus on an objective such as gross income, which in so many rural settings ends up in male dominated decision-making families, being spent on things like liquor. Women, on the other hand, when they have to shoulder responsibility, worry about the health and education of their children. They pay careful attention to the uses to which the hard-earned income of the family is put. They are most active in credit SHGs. Women's empowerment has to be, therefore, the foundation of our strategy, both because it is women who are most disadvantaged, and because it is women who have shown that they can take the larger view of development that we are aiming at.

As Pangare and Farrington (1998) put it "activities currently undertaken for women in watershed development projects do not empower them to be equal partners with men." They provide three main reasons for this weakness – women's contribution to the rural economy is not recognized so they are treated as 'disadvantaged' rather than as 'farmers' like men; land titles do not belong to women which eliminates them from decision-making bodies where only landowners (men) are nominated; women's needs are overlooked, especially with regard to common property resources, from where women draw livelihood support.

Over the last two decades, several attempts have been made to introduce gender sensitivity and gender orientation into development programmes. Sadly, however, much of this has remained restricted to mere lip-service and tokenism. The real challenge is to make stipulations and devise strategies to give a real chance for women's empowerment to occur. Nearly two decades of watershed development in India have shown that by simply putting the onus for change on

a few women in committees and "users groups" here and there, has perhaps reinforced the ineffectiveness of women. The tight trap of patriarchy and consequently, women's reluctance to endanger their tenuous survival, call for guidelines that are firm, uncompromising and far reaching in commitment to gender equality.

The MoRD original guidelines (1994) restrict themselves to asking for the "willingness" of the community to share benefits with the weaker sections of society such as women. The CAPART guidelines speak of a "special emphasis" on disadvantaged sections such as women. The IGWDP's "guiding principles" on women take a step further to describe the effectiveness of "women-to-women" extension (IGWDP, 1996). The National Workshop on Watershed Approaches for Wastelands Development recommends "equal representation of women in gram sabhas and watershed committees" (Pangare and Farrington, 1998). Over the years the understanding has moved forward. For gender equality to happen an even handed approach will have to be dropped and women-specific interventions sharpened to overcome historical and social imbalances. This view is best expressed in a report prepared by the IFAD-UNIFEM Gender Mainstreaming Programme in Asia: "One common misunderstanding about gender mainstreaming is that it requires some sort of 'gender balance' in the project, a kind of 50:50 representation of women and men in various project components and not any women-specific projects or even women-specific components. Given that there is already a greater or lesser degree of gender imbalance in these groups, a pro-women or project imbalanced in favour of women, will only help to somewhat correct a historical imbalance. Thus, depending on the specific situation, attaining gender balance among the poor may require women-specific components or even women-specific projects" (Kelkar and Nathan, 2004). The report goes on to ask: "Who will mainly work to change existing gender relations? Will it be men, who get some minor benefits from these relations? Or, will it be women, who are oppressed and confined by these relations? It is not unusual to expect that those who are oppressed by existing relations, will be most interested in changing it; or that those who get some benefits (even if they are relatively minor benefits, like more leisure, better food or social status) will be less interested in instituting changes. There may well be exceptional men, who conscious of the need to enhance the position of women in order to accomplish desirable social change, will take the lead in bringing about changes in gender relations. But these are not easy changes, and social experience shows that there is substantial masculine resistance to these changes. At the same time, all efforts need to be made to gain the support of men for desirable changes in gender relations. The recognition of enlightened self-interest will only make implementation easier. But gaining such support of men cannot be made a condition for initiating changes. What is desirable cannot become a condition" (ibid.).

With the odds stacked so heavily against women the obvious lesson is that weak attempts to slide in gender concerns has led to 'policy evaporation' (Zuckerman, 2002) or a dilution of the effort to the extent that it has no effect. Partial representation in village-level institutions inhibits even vocal women, resulting in tokenism and reinforcing the pointlessness that women feel. Watershed development is an ideal opportunity to address gender intensively and in a multi-dimensional way. If ownership, control, decision-making, economic benefits, social security, knowledge and empowerment are to be the objectives then the guidelines should be a step-by-step visualization of how the process will make women's agency work. The aim should be to level the playing field and diffuse bias and to consciously use watershed development and the powerful potential it has to address some gender issues.

Some outstanding examples of this work already exist in India. They are best summarised in a recent work by ANANDI (Area Networking and Development Initiative) (2003), a leading women's organisation in India. This study highlights the work of Agragamee, AKRSP (I), Deccan Development Society, Jan-Vikas Ecology Cell and Kutch Mahila Vikas Sangathan. We have studied this entire body of impressive work to distill lessons for next generation watershed programmes in India:

1. A Separate Women's Watershed Council: This distinct women's body will enable women to articulate their perspective, perceptions and interests in a relatively uninhibited manner. This will facilitate the formation of a watershed action plan that genuinely reflects the needs and aspirations of women. The body will also act as an effective watch-dog to ensure that the implementation of the watershed programme necessarily takes women's interests into account. The Women's Watershed Council (WWC) will nominate their leaders who will represent women in the VWC. It will be mandatory for the Watershed Development Team (WDT) to mobilise WWCs in each village so that women are not only heard but play a decisive role in the formulation and execution of the watershed action plan. The WWC will provide the necessary back-up for the women members of the VWC so that their presence is not once again reduced to tokenism. The WWC would also play a big role in influencing the functioning of institutions such as the Gram Panchayat, ensuring greater and more effective participation of women in Gram Panchayats and ensuring that they work in an accountable and gender-sensitive manner.

2. Reservation for Women: Fifty percent reservation for women in membership of the VWC is necessary.

3. Social Empowerment of Women: For women to take on the massive planning and implementation exercises required for watershed development, the basic obstacles that prevent their participation will have to be addressed systematically. These are the overburden

of workload, health risks, child care, lack of information and socio-economic dependence. As entry point activities, drinking water, sanitation, alternative fuels, health facilities, crèches and improved shelter need to be provided for women to be free of drudgery and the struggle to survive.[23]

4. Technical and Legal Empowerment of Women: Special efforts on arming women with information and technology on watershed development, natural resource management (NRM) and procedures need to be introduced. This means making training accessible in relevant ways within the village. Again, most training efforts are designed and implemented in a way that eliminates even the possibility of women participating in them. Low literacy levels and the inability to leave their household responsibilities for several days at a stretch prohibit women from investing in themselves. Therefore capacity building for women means making it available at their doorstep, demystifying technology, learning-through-practice and interactive methods, etc. Skill enhancement for women in relevant areas like masonry, alternative building technology will increase their options in finding employment both in the construction of the entry point activities as well as at watershed sites. An important aspect is legal information to women so that they know their rights within the law.[24]

5. Changing the Schedule of Rates: Restructuring productivity norms in the Schedule of Rates (SoR) to enable women to benefit from the direct employment generated in watershed works is of critical importance. Preference in earthwork or masonry activities like mixing, carrying, brickwork and watering should be given to women.

6. Drudgery-reducing Appropriate Technology: To reduce drudgery, the nature of construction work in watershed development demands the provision of drudgery-reducing manually operated equipment like wheel barrows, small cranes, rollers and bullock cart mounted tankers for water. This is particularly relevant for reducing the arduous nature of manual labour for women given their biological differences and responsibilities.

7. Income Generation for Women: Building on the assets created in watershed development and the increased availability of water, skill enhancement opportunities for women must form part of the project. Improved agriculture, nursery management, livestock, fisheries, processing food and non-timber forest produce (NTFP) and other skills have to be imparted during the project implementation period to sustain the empowerment process afterwards.

23 This is a point strongly made to this committee by the Government of Gujarat.

24 The IGWDP, Maharashtra, has developed an approach called the Gender-Oriented Participatory Operational Pedagogy that not only addresses the needs and priorities of women but also systematically integrates them into the institutional and decision-making processes of the village and builds up their capacities to be actively involved in these (D'Souza, 1998).

8. Management of Common Property: The historical disinheritance of women from access to the primary means of production (land) make it an imperative that at least in common property (land, water, forests) management, women are given a primary role. The implementation of The Hindu Succession Act (Amendment) 2005, recognizing that women have equal rights over agricultural land, will have a powerful impact on gender equality. However, most married women in the village will be rightful owners of land in their maternal village. Common property must be therefore used by women to strengthen their position in the village.

9. Payment of Equal Wages for Men and Women: We have been amazed to find that adherence to even as elementary a provision as this is not as common as it should have been. Indeed, the whole issue of payment of statutory minimum wages to both men and women needs special and separate treatment. This is done in the next section[25]

2.2.5 Payment of Minimum Wages while Ensuring Productivity[26]

One of the major equity issues, especially affecting the landless, is whether labour receives statutory minimum wages. The review of experience across the country shows that this has not always been the case in watershed projects. Especially because we are advocating the use of NREGS funds for watershed programmes, this issue needs to be seriously addressed. The NREGS is simultaneously committed to creation of durable assets and payment of minimum wages. However, the way the SoR has been devised and deployed create many problems in attainment of these twin objectives. Based on the diverse experience of implementing watershed programmes that was presented before this committee, we suggest ways in which these issues could be resolved. The SoR brought out by various government departments prescribes state level average rates per volume of different types of work. It is used for:

- estimating the cost of the proposed activity;
- monitoring work progress; and
- valuation of the work completed.

The SoR sets up equivalence between the physical quantum of work done and the financial payments made for it. On the basis of the estimated quantum of work an *average* worker is expected to perform during a specified time period, it provides a rate, which should be equivalent to the statutory minimum daily wage. It follows that to earn the statutory minimum wage, the worker has to work at a pace equal to that of the *average* worker. The slower she/he works, the wider will be the gap between actual earnings and the statutory minimum wage. There are

25 We gratefully acknowledge the inputs of Nivedita Banerji (Director, Women's Empowerment, SPS) for this section.

26 This section draws heavily on Samaj Pragati Sahayog (2005b).

many factors that slow down the pace of work (for simplicity, we confine our discussion to earthwork only):

- *Hardness of the Strata:* As hardness increases, the pace of work slows down. Hardness is usually assessed on the basis of the implements used for excavation, such as shovel, pick axe and chisel.
- *Difficulty in Conditions of Work:* For instance, while digging in tank beds and water courses, excavation may get difficult due to intrusion of water.
- *Additional Jobs to be Done:* For instance, as worker digs deeper, the additional task of lifting and carrying the excavated material slows down the pace of work. While making corewalls in embankments, the clayey soil needs to be worked on more by watering and kneading, which takes up time.
- *Daily Temperature:* In areas characterised by hot summers with temperatures of 45 degrees C and above, work pace slows down considerably during the peak summer months. In such instances, there may be a case for reducing the working day definition to 6 hours.
- *Health Status of the Worker:* The underlying notion of the SoR is that of an *average* worker who is healthy and capable of hard work. The daily productivity of a poor, malnourished and physically challenged worker will be lower than this average. Hence, even when the SoR is honestly implemented, such persons will either get weeded out or be paid less than statutory minimum wage.
- *Gender and Age Disparities:* The same notion of the *average* worker does not allow for gender and age differences in productivity. Again, such persons will not get a just treatment even when the SoR is followed honestly.
- *Ethnic Disparities:* Studies have shown that particular communities such as the Primitive Tribe Groups (like the Sahariyas in Madhya Pradesh and Rajasthan) have for various historical factors inherited a weaker physical constitution.

The SoR accommodates some of these difficulties (such as the first three above) to an extent but does not address many others. This notion of average underlying in the SoR (average rate for whole state and that of an *average* worker) is thus endemically unjust. It may be noted that SoRs do state that the rates are averages that need to be revised upwards or downwards depending on market situation in different parts of the state.

1. To begin with, even the issues addressed by SoR such as variations in strata are incompletely addressed. The SoR usually recognises only six soil/rock strata: soft soil, hard soil, hard mooram (HM), disintegrated rock (DR), hard rock with blasting and hard rock where blasting is prohibited. The rates are different for each of these strata. The logic is that soft and hard soil can be excavated with shovels, HM and DR can be excavated with pick axe and other strata can be excavated either through chisels or would need to be blasted. The fact is that nature cannot be straitjacketed into six precise strata. To give an example from Madhya Pradesh, the rates across strata move as follows:

	Excavation and Earthwork	Rs/cum
301(a)	Soft Soil	17.90
301(b)	Hard Soil	23.20
301(c)	Hard Mooram (HM)	30.70
302(a)	Disintegrated Rock (DR)	77.10
302(b)	Hard Rock Requiring Blasting	98.40
302(c)	Hard Rock Requiring where Blasting is Prohibited	162.90

Source: Combined Schedule of Rates, Rural Engineering Service, GoMP, 2003

There is a massive jump from the rate for HM to that for DR. Usually, DR rates are not allowed in rural excavation works. As a result, only HM rates can be used that tend to underpay workers. The way out, therefore, is to devise at least two or three intermediate rates between HM and DR.

2. Yet another problem is created by the fact that rates are revised only once in 4 to 5 years. Inflation is, therefore, not taken into account. A standard indexing procedure needs to be followed by which rates must customarily be raised in line with the rise in statutory minimum wages. It may be noted that when the SoR of Rural Engineering Service of the Government of Madhya Pradesh was revised in 2003 over the previous one of 1995, the escalation in rates for specific activities was not as much as the increase in minimum wages. Of course, this presumes that the minimum wages themselves will be raised to reflect increased cost of living for workers. This has unfortunately not always been the case.

3. The only way to correct this injustice is to make the SoR as specific to each work location as possible. The district administration usually prepares Collector's Task Rates specific to each district. But the problem is that these rates do not cover many activities and the process of fixing these rates is far from transparent.

4. The method by which the SoR tackles difference is by adding percentages to each existing rate. The same can be followed to cover the items that are being left out at present. However, one should be aware that there cannot be too much flexibility in the hands of the implementers. One should, therefore, spell out the factors affecting productivity in their specific ranges. In no case should any rate be *below* what the SoR recommends. The SoR should be accepted as a *floor* for all other rates. Depending on local conditions, these rates can undergo changes.

5. For instance, in the case of temperature, if the daily mean temperature of an area is higher than the state average, then a percentage should be added to the existing rate.

6. Yet another issue is of certain composite activities such as "puddle filling of good clay". These include many sub-activities. There is a need to break this up into separate rates for each sub-activity. The least onerous sub-activity should be pegged at the minimum wage.

7. The way the present SoRs are designed also act as an incentive for mechanizing work. Since we are advocating that NREGS funds be used in watershed programmes, the SoR must build in an incentive to employ labour. This requires that the labour rates be higher.

While these changes would help, it is also true that in this people-centred programme, the principle the community must follow is that "the money belongs to us and we must see to it that it is used most productively while ensuring that there is equity as well".

2.2.6 Voluntary Contributions

One of the distinguishing features of the watershed programme in India is that almost every project emphasises voluntary contributions by those who benefit from the work done. The idea is that such contributions will promote feeling of "ownership" of the programme among stakeholders. This will contribute to sustainable outcomes in the long-term. The voluntary contributions are saved in the WDF that is to be used for repair, maintenance and use of assets created on common land. However, we also found many instances of so-called *shramdaan* (voluntary labour) working more as a "shram-tax", where landless labourers' wages were being deducted at a fixed rate to meet a set target of voluntary contribution resulting in effect in the poor subsidising the rich. This is a very serious shortcoming that needs to be addressed. The best way is to work out differential rates of contribution by beneficiaries – different rates applying to different classes of farmers as also to different activities. Whenever the activity is on private land and contributes directly to income generation, the contribution expected should be higher.

One of the best models of this system is reported from Gujarat in work done by the AKRSP (Sen, 2004). Of course, in many tribal areas, since a number of those who work on watershed projects themselves own low-productivity land, *shramdaan* can occur on a reciprocal basis, reflecting their own traditional practices. We also find that land offered by farmers for constructing water-harvesting structures, for example, is not generally being taken into account as a contribution. This needs to be taken into account as a voluntary contribution.

At the same time, we are very wary of claims of very high contributions made by some NGOs. We found that these are prevalent in villages inhabited by better-off farmers. It would be very wrong to impose such high rates of contribution everywhere, when the whole idea is to promote voluntarism especially in the most backward regions inhabited by socially disadvantaged sections such as Dalits and Adivasis. The Hariyali Guidelines are exactly right when they state: "The contributions to WDF shall be a minimum 10% of the cost of works executed on individual lands. However, in case of SC/ST and persons identified below the poverty line, the minimum contribution shall be 5% of the cost of works executed on their lands. Contribution to the Fund in respect of community property may come from all the beneficiaries, which shall be a minimum of 5% of the development cost incurred. It should be ensured that the contribution comes from the beneficiary farmers and is not deducted from the wages paid to the labourers who are engaged to treat the private lands." The Hariyali Guidelines state that this is the minimum and beneficiaries may be encouraged to contribute more for income-generating works on private land such as farm bunding, land levelling, well construction and repairs, etc. in accord with their capacity to do so.

Our travels around the country revealed that most of the money (running apparently into hundreds of crores) collected in the WDF is lying unutilised. We would strongly urge various state governments to pass enabling orders that would allow VWCs (the authorised personnel in each case) to use the fund. Rules for operation of the fund should be prepared by the VWC and ratified by the Gram Sabha. The fund should be operated by 3 persons, one of whom must be a woman, one a member of the Gram Panchayat and one from a Dalit/Adivasi/landless family. These people should be selected in a meeting of the Gram Sabha. At least 50% of the funds should be set aside for the operation and maintenance of community assets created during the project. No part of the fund should be used for maintenance of works on private land. The remaining money may be used as a revolving fund to advance loans to the villagers of the project area who have contributed to the fund.

2.2.7 Ensuring Transparency and Accountability[27]

The National Advisory Council observes: "At the watershed level, there is need to ensure the accountability of management to the stakeholders. Quite often, the records of funds spent are not properly maintained. Proper accountability would require, in the first place, greater involvement of Watershed Associations, Self-Help Groups and User Groups in planning, execution and financial management under the guidance of the PIA concerned. The Gram Panchayats should be concerned mainly with facilitating convergence, project review, monitoring and conflict resolution. These bodies should invariably be answerable for their work to the Gram Sabha at the Meetings held periodically for the purpose. Transparency ought to be ensured by publicizing the relevant information (through black boards and posters) for being accessible to the villagers and inhabitants of watersheds" (NAC, 2005a).

There are many dimensions to this:

- Once the action plan is ready it must be presented for approval at the Gram Sabha meeting.
- A summary of the approved plan must be put up for display in a public place and the complete plan must be available to anyone who seeks access.
- All labour payments must be made in public.
- Regular *jan sunwayis* (public hearings) must be held where detailed accounts are presented to the people, including all documents – sanction and release letter, pass books, cheque books, muster rolls, vouchers, etc.[28]
- Boards should be put up in public places and at each major site, which display details of work done, costs, volume of water harvested, employment generated, etc.
- Wherever possible information technology (IT) should be used to record, manage data and generate information on indicators to be monitored or measured.[29]

27 One of the most instructive studies on the issue of corruption in watershed works and systems required to prevent it is by Crispino Lobo of WOTR, Maharashtra (Lobo 2005).

28 Institutions such as the Mazdoor Kisan Shakti Sangathan led by the National Advisory Council member Aruna Roy need to be requested to carry out large-scale training programmes on the methodology and rigour required in conducting social audits.

29 A good example of this is the work of the WOTR that has developed and extensively applied various IT systems to facilitate efficient and transparent project implementation and programme management.

2.2.8 Clear Prioritisation of Objectives

This is also an equity issue. Drinking water security has to be the paramount goal of a watershed programme. Chronic shortage of drinking water is one of the first criteria for selection of villages for the programme. However, the record of watershed projects on this aspect is not definitive. In most cases we would expect to corroborate the positive conclusion of the study by Reddy *et al* (2001), which finds both that drinking water use has gone up in all watershed villages and the time spent on fetching drinking water has also declined. However, many studies also show that the increased water made available by these projects gets diverted to irrigation, often at the cost of drinking water needs (Joy and Paranjape, 2004). As Kakade *et al* (2001) argue, since irrigation and drinking water needs are often met from the same aquifer, situations arise where after two crops have been taken, there is shortage of drinking water in summer. It is important that drinking water is re-asserted as the first charge on the water resources of the watershed and that protective irrigation for drought-proofing is accorded the next priority. Only in this way can the interests of the resource-poor and small and marginal farmers be protected. Crops requiring intensive irrigation need to be strongly discouraged.

2.3 Appropriate End-uses of Harvested Water for Sustainable Livelihoods

2.3.1 Integrating Dryland Agriculture Packages with Water Harvesting

Unfortunately, watershed development in India has been one-sidedly preoccupied with supply augmentation. Little attention has been paid to the end-uses of harvested rainwater. In this respect it has failed to break with the dominant development paradigms of the 20th century, all of which are characterised by supply-side solutions. These solutions are caught in the infinite regress of forever trying to catch up with ever-expanding demand. They are a major reason for straining the delicate fabric of the eco-system, within which economic processes necessarily unfold.[30]

We need to recognise clearly that it is not merely enough to harvest rainwater. Although a large quantity of water may be conserved and collected, it will prove inadequate unless we take care to put it to sustainable uses. What is required is to find ways of not just increasing supply but much more critically reducing demand and regulating end-uses. So long as we do not question the emerging pattern of end-uses and pose the central question of efficiency of utilization of

30 We need the perspective of Ecological Economics – the economy as a sub-system of the larger eco-system, comprising human beings as also natural resources and non-human species. Unlike the closed, isolated, self-contained circle of conventional economics, the economy is here an open system, engaged in a unidirectional flow of entropy, drawing low entropy from the environment and dumping high entropy waste into it. The economy is seen in co-evolution with the larger eco-system. Evolution implies a dynamic and adapting disequilibrium, without necessarily suggesting either endless progress or impending doom (see Mihir Shah *et al*, 1998; Chapter 2 for an extended discussion).

our resources, it will be absolutely impossible to endlessly augment supply. The fundamental binding constraint is really provided by the demand side. An integral element of the conservationist approach has, therefore, to be a quantitative and qualitative regulation of end-uses and demand.

The National Advisory Council has correctly observed, "The existing guidelines for watershed development are designed basically to augment water resources through water harvesting with virtually no stipulation for conserving the harvested water. On the contrary, the existing cropping pattern and the system of pricing of electricity for pumping water encourage overdraw of water and its wasteful use. This is a major lacuna in the existing guidelines. This needs to be rectified by building necessary safeguards against wasteful use of water. Since water-use efficiency for irrigation is very low in the country, achievement of water security depends not only on the exploitation of the remaining potential but increasingly on the efficient and productive use of available irrigation water. There exists a vast gap now between the knowledge available for improving water-use-efficiency and its actual application in the country" (NAC, 2005a). The first step in this direction has to be the integration into programmes of water conservation of a *sustainable dryland agriculture* strategy. Only then can we hope to avoid the tragic spectacle of Maharashtra's drought-prone Ahmednagar district of the pioneering Ralegaon Siddhi experiment, growing vast acres of sugarcane, making a mockery of the watershed approach, by engendering man-made scarcity of water. Unfortunately, watershed programmes in India's dryland areas have failed to break with the Green Revolution type agricultural package. The major flaw of this strategy was to try and indiscriminately apply the same package to all areas, quite irrespective of the agro-ecological specificities of each region, in a country with such immense diversity as India. The drylands of India have a delicate ecosystem, extremely vulnerable to external stress, be it that induced by the weather or the market. The Green Revolution package made farmers more vulnerable on both counts, by making them critically dependent on high quanta and precise timeliness of irrigation, as also by increasing their reliance on expensive market-procured inputs, such as hybrid seeds, chemical fertilisers and pesticides. The poorest were naturally the worst hit by a production plan that was unsustainable, both in economic and ecological terms. The unprecedented increase in suicides by farmers in recent times is the most dramatic and tragic expression of this vulnerability. It is necessary, therefore, to arrive at a package of agricultural practices finely tuned to the resource endowments of each watershed, which is both accessible to the poor (*low-cost*) and sustainable (*low-risk*). We need an approach that:

- Focuses on crops that form the nucleus of the livelihood security of poor and marginal, dryland farmers
- Reduces dependence on the market

- Reduces intensive use of water
- Respects the specific matrix of resource-availability of the particular agro-climatic region
- Builds upon the germplasm local to drylands, rather than imposing exotic varieties
- Respects the ecological balance while planning increases in productivity, building in strategies of resource rehabilitation, along with resource use

Often the critique of Green Revolution strategies tends to take on an excessively romantic "back-to-nature" kind of tone. We are not advocating such an approach. We believe that there is no going back, as we are faced with a continuously evolving environment, to whose specific challenges newer and more creative responses have to be evolved. There is also the increased pressure of population that demands a level of productivity, beyond the capabilities of traditional seeds. At the same time, however, great care must be taken that the improvements we attempt are based on the germplasm of the drylands, which has attuned itself to their environment, as it evolved over the centuries.

Added to this must be the attempt to minimise dependence on external inputs.[31] This means that all efforts should be made to increase self-sufficiency in seed production. Also organic manuring should be both intensified on each field and spread to as many farmers as possible, so that dependence on chemical fertilisers is reduced. Adoption of organic pesticides such as neem oil, which can be locally produced, would also help in reducing external market vulnerability, while contributing to environmental sustainability at the same time. Water-saving technologies such as drip irrigation must be promoted and made part of the project cost. The costs of such technologies can be regarded as partially recoverable.

A great deal of promising work in this direction has already been done at ICRISAT and centres belonging to the network of Agriculture Universities spread all over the hinterlands of India; also by field research stations of the ICAR and Indian Agricultural Research Institute (IARI).[32] The problem is that these centres work in isolation from the farms for which their research is meant. As the National Advisory Council says: "At the moment there is little presence of

31 This is sometimes described as LEISA (low external input sustainable agriculture). See Reijntes *et al* (1992) for a detailed exposition of this approach. The Prayog Parivar in Maharashtra provides a good example of such work.

32 The ICAR initiated model watershed in Karnataka contains many examples of improved agronomic practices such as zingg terracing, broad-bed and furrow, contour sowing, etc. (Joy and Paranjape, 2004). The DFID-supported KAWAD (Karnataka Watershed Development Society) projects (KAWAD, 1999) and Swiss-supported PIDOW (Participative Integrated Development of Watershed) projects in Karnataka (Karanth and Abbi, 2001) provide good examples of improved varieties being tried in watershed programmes.

agriculture department in the DPAP watersheds by way of promoting locally relevant research and extending suitable technologies, inputs and other necessary support to farmers" (NAC, 2005a). In our view, the crucial bottleneck has been the absence of an agency[33] to effectively transmit the benefits of their research to farmers and also obtain detailed feedback from them. The packages developed by these scientists are in a crying need of field-testing. Without this they remain ideal-types lacking the cutting edge of real-world trials.

2.3.2 Pricing of Water

In this context, echoing the views of the Vaidyanathan Committee (1992), the National Advisory Council makes an important suggestion here: "A possible solution, therefore, is to evolve a system where the village communities develop a stake in the conservation of resources. Water Users' Associations and the Panchayati Raj Institutions (PRIs) can be fully empowered and induced to charge and collect water and electricity rates from the farmers on the basis of the volume of actual consumption where metering is possible, or, on the basis of the quantities of water received or electricity consumed as estimated by the farmers' associations where metering is uneconomical or otherwise infeasible. In certain situations, Panchayats can regulate the cropping pattern and the use of water for raising water-use-efficiency and productivity. For example, they could prohibit the boring of new wells or impose taxes on the existing wells according to the paying capacity of farmers, or could impose a progressive tax on the cultivation of water-intensive crops. Alternatively, a subsidy at the flat rate, say, on the estimated consumption of electricity of holdings up to one or two hectares, can be given to all the farmers or only to the small and marginal farmers, requiring them to pay for the extra consumption on a volumetric basis. This would have the merit of providing relief to a large number of deserving farmers in a manner that is politically feasible, even as there would be an incentive to conserve electricity and water. The revenues so collected should be allowed to be retained entirely by the Panchayats for the maintenance and development of irrigation and rural electricity services through Water Users' Associations. In addition, water conserving cropping systems, technologies and practices need to be propagated in watersheds with necessary incentives, for example, through a subsidy on sprinkler irrigation" (NAC, 2005a).

This view merits serious consideration by implementers of watershed programmes. Indeed, the relationship between property and prices needs careful understanding. From an ecological

33 A good example of such an agency is SPS in Madhya Pradesh. SPS work on dryland agriculture focuses on 34 varieties of 9 crops – jowar, maize, tuar, cotton, soybean, gram, groundnut, bajra and wheat – developed in the laboratories of agricultural scientists at Indore, Khandwa, Khargone and Chhindwara as also ICRISAT, Hyderabad. These are composite varieties based on indigenous seeds, which give good yields even with low external inputs. Multiplication of these seed varieties is carried out on farms of selected local farmers.

economics perspective, it is undeniable that resources like water must be priced. Without this there is no disincentive for over-use and abuse, violating the fine limits set by the eco-system. This is a key element in the story of groundwater over-exploitation in India. But it must also be understood that "getting prices right" does not mean simply handing over the resource to private corporate control. Rather, the way forward has to be for village communities to own and price natural resources. This is what many grass-roots organisations working on water are attempting to do. The price of water is arrived at through large-scale consultative processes involving the Gram Sabha. A minimum amount of water may be provided free to all households. Beyond that differential rates may be charged to users reflecting concerns of equity. In the celebrated case of Sukhomajri, money collected from water charges was equally distributed among all households (Kerr, 2002).

2.3.3 Appropriate Land-use Planning

Indeed, what we require are not just viable agriculture packages but meticulously worked out *location-specific land-use planning modules*, which make careful use of the harvested water and are fine-tuned to match the matrix of widely varying natural resource endowments of each field in the watershed. Except in the extreme cases of severely handicapped soils, all land can support some form of biomass production. Land-use planning proceeds from an assessment of the capability of land to support life without deterioration over a long period. Soils are grouped into eight categories, on the basis of the degree of limitation on their ability to produce biomass, such as the extent of erosion, wetness and soil hazards. Land belonging to land capability class (LCC) 8 is regarded absolutely barren and unfit for any form of biotic production. The remaining seven LCCs are broadly divided into two: LCC 1 to 4 are fit for cultivation, while LCC 5 to 7 are unsuited for cultivation but can support tree or grass cover. On the basis of this classification the best land-use system can be identified for each LCC type.

As an illustration of this approach, land-use systems appropriate for different situations in the Nimar valley in western Madhya Pradesh are shown in Table 2.3. In *horti-based agroforestry*, horticultural trees such as *Mangifera indica* and different *Citrus* species can be combined with arable crops. This system is suited to actively cultivating farmers with watering facilities. The *dryland agroforestry* systems are for those farmers who own land of medium quality and have no watering facilities. Species such as *Zizyphus mauritiana*, *Emblica officinalis* and *Psidium guajava* are good for such land-use systems. In ley farming, a period of pasture is rotated with field crops, in a three- to four-year cycle. *Stylosanthes hamata*, *Sehima sulcatum* (excellent fodder) and *Cenchrus ciliaris* are commonly rotated with sorghum in ley systems. Silvi-pastures and silviculture

land-use systems are appropriate for LCC 5 to 7. *Anogeissus latifolia and Prosopis cineraria* are good firewood species. Other species suitable for these systems are *Pterocarpus marsupium* (for fodder), *Terminalia bellirica*, *Acacia catechu* (for construction timber) and *Dendrocalamus strictus* (bamboo).

In this way, the water harvested in a watershed is put to optimal use, guaranteeing maximum returns, with long-term sustainability of the regime of water-use being adopted. In the absence of such a fine-tuned strategy, the benefits of watershed work remain sub-optimal and are quickly exhausted. This is a move decisively away from monoculture into a more diversified production system that is not only more in tune with local agro-ecological conditions, it also does less damage to the eco-system. Moreover, it provides a steadier stream of income to the farmer and protects against risk, both ecological and market-induced. Nutrition of the household is also better taken care of.

TABLE 2.3: MENU OF CHOICES FOR LAND-USE MODELS IN THE NIMAR VALLEY, WESTERN MADHYA PRADESH

	LAND TYPE		
WATER	GOOD (LCC 1-3)	MEDIUM (LCC 4)	POOR (LCC 5-7)
AVAILABLE	Agriculture	Horti-based Agroforestry	Horticulture
NOT AVAILABLE	Ley Farming	Dryland Agroforestry	Silviculture

Note: LCC refers to FAO's land capability classes 1 to 8.

Source: Shah *et al* (1998)

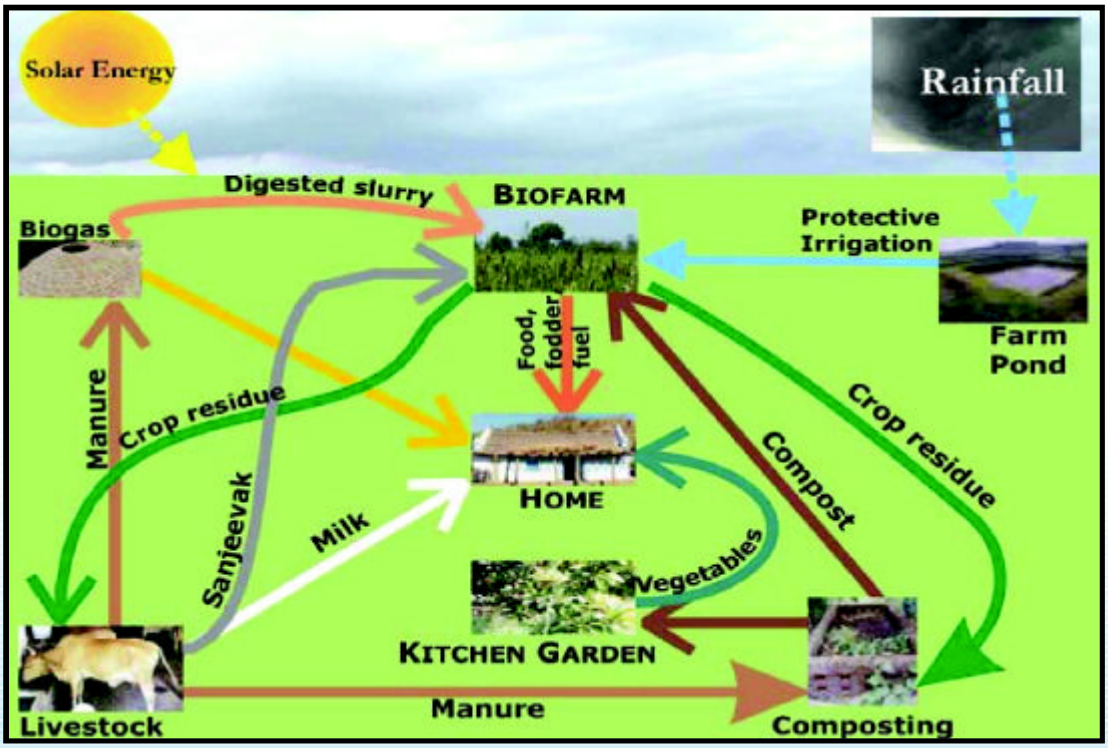
2.3.4 Move towards Biofarming

In this context, a very promising example we would like to cite is that of the All-India Co-ordinated Project on Biofarming being implemented at 12 locations throughout India under the aegis of the Department of Science and Technology, Government of India since 2004. The key insight here is that the internal stability of an agro-ecological system is its elasticity toward any sort of external perturbation. This stability is a function of the network of links that can be forged between various components of the system. Such links typically break down when monocultural production practices are adopted as in the Green Revolution or due to processes of environmental destruction such as deforestation and infringement on the domain of common property. These interventions weaken the internal linkages of the system, making it increasingly dependent on external energy subsidies (such as fossil fuels-based chemical fertilisers, pesticides, etc.). This has a dual consequence: one, it makes the system vulnerable to external shocks and

market fluctuations which causes a further decline in stability. The biofarm strategy emphasises a move away from monoculture, a multi-product system with crop-rotation and intercropping, fodder and firewood security as important goals, ensuring that each sub-system of the larger eco-system is closely inter-connected with other sub-systems, and a tight recycling of by-products of each sub-system, where nothing is a waste, and there is economy in use of water, minimal dependence on external fossil-fuel inputs and nutritional security for the family with fruits and vegetables. A synoptic view of the biofarm approach is provided in Figure 2.1. The attempt is to forge several new links within the elements of the natural resource base of the area (climate, rainfed agriculture, wastelands, forests, and crop residues, animal and human wastes). With soil and water conservation technologies, surface runoff is minimised which improves the level of soil moisture. Loss of essential soil nutrients is also reduced. And harvested runoff is recycled to agricultural land through water harvesting structures. The utilisation of soil moisture through vegetative systems strengthens the flows of fodder, firewood, timber and NTFP. Non-woody biomass from the regenerated forests and commons, as well as part of the crop residues, are returned to the soil through microbial decomposition. Revegetation of the commons also provides material for direct incorporation into soil as green manure. Animal wastes are directed to biogas plants, from which bio-energy is supplied to the households for cooking. The organic residue from the biogas plant (digested slurry) goes to enrich the soil as a nitrogen-rich fertiliser (Samaj Pragati Sahayog, 2004).

Figure 2.1

The BIOFARM Model



2.3.5 Livestock Development and Fisheries

Livestock is a key component of the household economy in rural India. It is a source of additional income to farming households, especially the poorest of them. About 70 million households (73% of total rural households) in India keep and own livestock of one kind or another and derive on average 20% of their income from this source (Walker and Ryan, 1990). Small and marginal farmers and landless labourers constitute almost two-thirds of these livestock-keeping households. Women provide nearly 90% of all labour for livestock management. Livestock also provide vital animal nutrition to the households, organic manure for the farms and essential draught power in agricultural operations. The distribution of livestock holdings, particularly milch animal holdings, is far more equitable, when compared to the distribution of land (IWMI, 2005). Marginal and small holders owned over 67% of all milking animals (including crossbreds) in 1992. About 87% of small ruminants and 90% of poultry and pigs were owned by small and marginal farmers. Ownership of livestock has a crucial drought-cushioning role for small and marginal farmers.

In spite of its importance for the poor, watershed programmes in India have not systematically integrated livestock management as one of the central interventions. Several studies have shown that while watershed programmes do not necessarily lead to an increase in the size of the livestock, the composition of the stock definitely undergoes a change (IWMI, 2005). Intensification of land-use resulting from implementation of watershed projects has often resulted in increased water availability in the agricultural production system (private land) and a decreased availability for other biomass production systems like forests and pastures (common land). While milch animals and draught bulls rely on irrigated fodder or crop residues, small ruminants and non-lactating and non-draught cattle remain heavily dependent on biomass from common lands. Experience of projects like Adagaon in Maharashtra shows that with the implementation of watershed programmes, the share of small ruminants kept by the poor decreased and that of milch animals and crossbreds increased (Joy and Paranjape, 2004). Lobo and Kochendorfer-Loucious (1995) show that in Western Maharashtra grazing regulations led to sale of small ruminants, especially goats on a large scale. There are also studies showing increase in bovine population by 80% but a decline in small ruminants by 63% in the Bundelkhand region (IWMI, 2005). With the demand for milch animals increasing, dairying emerges as a major ‘watershed plus’ activity, with incomes from dairying rising to as much as 54% in some cases. The existing marketing networks of milk and other dairy products need to be strengthened during watershed

implementation. Marketing is an activity that farmers' co-operatives and the SHG Federations can take up in Phase III of the watershed programme as outlined in the next chapter.

While watershed development opens up newer livelihoods, a reduction in grazing space affects the livelihoods of small and marginal farmers. It is not clear how watershed projects have addressed these changes affecting the landless and small farmers. Grazing regulations also imply greater amount of time spent in collecting fodder for stall-feeding of animals, particularly by women. Watershed investments should incorporate activities such as development of fodder banks in order to meet the increased demand for stall-feeding. This could also involve promotion of leasing arrangements of common lands to the landless for cultivation of fodder crops under irrigated conditions.

A study of five watersheds across the country (IWMI, 2005) brings out factors influencing the size of the livestock holdings by various classes of households. Size of landholdings and better marketing options of livestock products are the two key determinants of livestock holdings. The study also shows that high mortality of the animals is one important reason why the small and marginal farmers hold large herds often exceeding the limits set by their fodder sources. This raises an important issue of the health of existing stock and rationalisation of its size over time. It is necessary that watershed programmes address this important issue by formulating programmes for improvement of cattle health. Better livestock healthcare systems, breed improvement with hardy, indigenous species and provision of nutritive fodder through cultivation of improved varieties of grasses could be some of the key action points that watershed programmes could incorporate.

Along with livestock, improving the productivity of other land-based livelihoods should also be brought into the focus of watershed programmes. Fisheries in newly created water sources is one such land-based activity that could include the following components (WASSAN *et al*, 2005):

- Enhancing capacity of existing ponds and traditional water harvesting structures through periodic desilting of ponds;
- Entitling the groups of marginal farmers and the landless to leasing rights over newly created water harvesting structures;
- Introducing fish-cum-prawn culture with different varieties of fish suitable for different depths of pond water;

- Improving technological inputs such as provision of fish fingerlings prepared locally in places where pond filling gets delayed;
- Management of disease and predators through appropriate practices before pond filling;
- Training farmers on the feed pattern and nutritional adequacy for fish to enhance productivity per unit of land; and
- Arrangements for collective marketing of fish to distant places organised through cooperatives or SHGs.

2.4 Institutional Issues

2.4.1 Village-level Institutions

One of the main criticisms of the Hariyali Guidelines has been that they completely do away with the concept of the VWC which had till then been designated as the main implementing agency of the programme ("day-to-day activities of the project") under the control and supervision of the Watershed Association (WA) and with the guidance and support of the WDT. The Hariyali Guidelines hand over the VWC's role to the Gram Panchayat. And the WA's role is taken up by the Gram Sabha.

Let us first try and understand the spirit behind the change introduced by the Hariyali Guidelines. As stated in the Preface "the Ministry of Rural Development is committed to empower Panchayati Raj Institutions and has been impressing upon the State Governments to devolve necessary financial and administrative powers to the PRIs for self-governance particularly in planning, implementation and management of economic development activities in rural areas. Watershed Development has been included in the list of subjects to be devolved to the PRIs." It is also stated that Gram Panchayat and Gram Sabha are "equipped with statutory rights and mandate for natural resource planning, potentially equipped with the powers to impose local taxes or user charges and are committed to "reservations" for representation of women and weaker sections as per the Constitutional provision."

We believe that these constitute very powerful arguments in favour of involving Gram Panchayat/ Gram Sabha in the watershed programme. We also believe that one of the most important issues that arises in the case of watershed projects is that of conflict-resolution and equity. For this the implementing agency needs to be equipped with necessary legal and administrative

powers to enforce its decisions. The central role of PRIs ensures this. The only question that exercises us is: "What is the best way to involve PRIs in watershed development?" The experience we reviewed of the working of the watershed programme all over the country since the Hariyali Guidelines provides overwhelming evidence that the institutional arrangement as devised is not working well. The Gram Panchayat members are not able to discharge their responsibilities towards the watershed programme. The biggest weakness is that the Panchayat Secretaries are already overloaded with so many diverse responsibilities of revenue, development and administration that it is completely unreasonable to expect them to find the time required of a quality and process-intensive programme like watershed development. It is also not clear how the Gram Sabha can "form User Groups/Self-Help Groups" and the large number of functions devolved upon it by the Hariyali Guidelines (para 21).[34] As a result the watershed programme has suffered a very big setback. The high expectations raised by the programme are not being fulfilled. There is great disaffection at the village-level among the people at large.

We have applied our minds to finding a solution to this problem. We fully share and endorse the spirit and will expressed in the Hariyali Guidelines towards empowerment of PRIs. We believe this holds the key to the future of democratic governance in India and to realizing Gandhiji's dream of Gram Swaraj. But as the Mahatma would have advised in such a situation we must look for a practical solution. We must find a way of empowering PRIs while at the same time getting work done and meeting the goals of this critical and ambitious programme. Our submission is that we need to restore the key role of VWCs in each micro-watershed, but at the same time we also need to position them as one of the committees of the Gram Panchayat. In many states, Gram Panchayats have been strengthened and further democratized by designating committees elected in Gram Sabha meetings to carry out many of the functions devolved upon the panchayat. This is a way of making more effective the functioning of Gram Panchayats and also widens their democratic base. Thus, the VWC should be elected in the meeting of the Gram Sabha and function as a committee of the Gram Panchayat. We also strongly believe that the Panchayat Secretary must not be the Secretary of the VWC. The Panchayat Secretary is already a highly over-burdened functionary who has so many roles to perform. There is no way she/he can do justice to the huge responsibilities of the watershed programme.

At the same time, we believe that the designation by the Hariyali Guidelines of the Gram Sabha as effectively the WA is quite acceptable. Our review of the experience of the watershed programme clearly shows that most WAs were defunct and we also believe that there is really no

34 In para 22 of the Hariyali Guidelines, it is mentioned that the "Gram Panchayat shall constitute Self-Help Groups", which is again not a practical idea. We did not find any such instance throughout the country. These are specialized activities that require a dedicated body to implement.

need to designate a separate WA when in effect it is no different in concept from the Gram Sabha which is an existing constitutional body. Even if the milli-watershed spans more than one Gram Sabha, each VWC will answer to its own Gram Sabha, which is the constitutional body it is anyway answerable to.

The precise institutional setup we propose at the village level is described in detail in Chapter 3.

2.4.2 Sustaining Watershed Benefits: Savings, Livelihoods and Institutions

The watershed programme in India comprises a major investment by the state for the benefit of the people of rainfed areas and is also an attempt to realize the potential of these areas for national development. A crucial concern is of sustaining the benefits of this programme beyond the project period. Our review of the programme all over the country reveals two key requirements for this to become possible:

a. development of sustainable livelihoods on the basis of the augmentation of the natural resource-base through the programme
b. development of local people's institutions that would provide leadership to voicing the interests of the area and ensuring transparency, accountability and performance of state institutions

It is our considered view that for both these objectives to be realised a close interlinking of the watershed and SHG programmes is needed. Indeed, there is a deep and largely unexplored complementarity between the two that must be developed in order to make each programme realise sustained benefits. The benefits of any development programme can only be sustained if incomes generated by them are transformed into savings and investment that sets the platform for the long-term economic transformation of the area. This means that a complete saturation of the area with SHGs, especially among the poor is an imperative. At the same time cadre-based organisations of local people have to be developed that can take over leadership of development initiatives in the long run. In this respect, two rural institutions appear to be critical and to hold the maximum promise for very different reasons – one, the SHGs and SHG Federations and two, the PRIs. SHG institutions have the unique merit of representing a happy marriage of social and individual interests.[35] This gives them exceptional sustainability. Each member is a stakeholder, for her savings are what makes up the working capital of the institution. The interest of members is abiding. The SHG Federations are also financially powerful entities,

35 The work of MYRADA (Mysore Resettlement and Development Agency) is especially instructive in this regard (Fernandez, 2002).

growing in strength by the year. They, thus, possess the unique capacity of leveraging public funds from external institutions such as banks, NABARD, CAPART, SIDBI (Small Industries Development Bank of India), etc. They can grow into community-based organisations (CBOs), which can be registered under the Societies Registration Act and can marshal grants and loans from a variety of agencies, depending on the relative bankability of the activities concerned. Over time, they would move rural development up the loan-subsidy scale, in a way no NGO can even begin to imagine. For unlike Micro-Finance Institutions, which are condemned to remain external institutions like NGOs, these Federations are all grass-roots member-driven organisations.

A Federation of SHGs, with a membership of about 3000 women and savings of Rs. 60 to 70 lakhs, can become a powerful member-driven people's organisation, which takes up many activities including implementation of watershed projects. The SHGs can open up several non-agricultural livelihood options on the base of water security being created by watershed work. They can build up a strong grass-roots pressure to the development process a pro-poor orientation. Micro-finance programmes, thus, help sustain watershed programmes beyond their specified project period and allow withdrawal of the promotional agency over time. However, it is important to remember that in a backward area with low levels of income, the upscaling of SHGs will soon encounter a limit. This limit is imposed by the problem of low credit absorption on account of low repayment capacity of members. Credit absorption is hampered by the low level of income and lack of diversified livelihood options to utilise the loan. In the initial years of SHG formation, when the average size of loan is still small, it is possible to visualise SHGs operating at 90% and above repayment levels. As the loan size increases the members would find it increasingly difficult to take loans and repay them with interest within a specified period of time. After a point, the average loan size of members will stagnate and the programme will never reach the scale required. Accidents and unforeseen contingencies might force the members to borrow large amounts from the market and this would destroy the members' faith in the SHG. Mobilisation of public investment is required to raise the levels of income and to diversify the livelihood options (livestock, fish farming, NTFP processing, marketing of agricultural produce and non-farm wage employment). In a backward area, public investment programmes such as watershed are an imperative for upscaling of SHGs. Neither watershed nor micro-finance can, therefore, be viewed as stand-alone programmes. But they are the perfect complements for each other.

The PRIs, on the other hand, are constitutionally mandated institutions. These are the hope for a truly democratic India, where the voice of the weakest will be considered while taking decisions. It would be too romantic for us to visualize an anarchic, stateless society where people

manage their affairs on their own. In an era of globalisation and growing interconnectivity, isolated self-serving institutions are somewhat of an anachronism. Every attempt has, therefore, to be made to ensure accountability of the officials to the people to develop transparent systems of governance, where the officials truly serve the people. This is precisely the purpose of panchayat raj. So if we can create competent leaders running PRIs then the bureaucracy will perform.

2.4.3 Role of NGOs

As we have shown in earlier sections, watershed development is not merely a matter of harvesting rainwater. Its success crucially entails:

- working out collective protocols of equitable and sustainable use of surface and groundwater
- bringing together of scientists and farmers to evolve a dryland agriculture package and a host of other livelihood options
- detailed land-use planning at the micro-watershed level
- the mobilisation of rural communities in the direction of the disadvantaged

Many NGOs in India have set examples in one or more of these challenges. As the National Advisory Council states: "The NGOs are, in general, better equipped to undertake the task of creation of awareness, social mobilization and capacity building. However, the revised Guidelines for Hariyali (introduced in April 2003) have severely restricted the role of NGOs as PIAs in Watershed Development, notwithstanding the mounting evidence that the performance of watersheds, in the implementation of which NGOs have been involved, has been distinctly better than those which have been executed by the Government Agencies alone. . . . This process may be reversed at the earliest and mechanisms evolved at the national and regional levels, to involve bonafide and competent NGOs and empower Watershed Associations in the task of social mobilization and implementation at the watershed level" (NAC, 2005b).

We tend to agree with the National Advisory Council. But one has to be very careful here. Currently, the voluntary sector is seeing a proliferation of agencies, many of which are of a dubious nature. It is not clear that a commitment to serve the poorest has brought them to this field. It appears that the larger cloud of corruption enveloping society in India has made its entry into the voluntary sector as well. Many NGOs are simply fly-by-night operators who obtain government grants and disappear without a trace. There are others who play a contractor-type role, thriving on huge government grants and resultant commissions.

Grass-roots agencies have, therefore, to be very carefully identified, selecting only those with many special qualifications:

- solid field presence and deep commitment, so that the benefits can be sustained in the long-run
- requisite technical skills, with a capability of conducting meaningful interface with scientists, translating their inputs into specific field conditions, marrying the insights of scientists with those of the farmers and providing detailed feedback to scientists
- capacity to carry out empowerment programmes for representatives of Village-level Institutions
- capability of networking with other genuine grass-roots agencies, so that the benefits can be transmitted far and wide, with significant multiplier effects.

After all, we do not want to create oases of excellence – rather the attempt must be to develop "living laboratories of learning", from which more and more people benefit, far beyond the immediate location of the grass-roots agency. Most NGOs tend to be very localised in their operation. Many of them are excellent grass-roots mobilisers working as CBOs. They can have a very important role to play in building capacities of PRIs for effective governance of rural areas. And those who try to work on a large scale suffer the problems of neo-governmental bureaucratisation. The trade-off between scale and quality appears irreconcilable.

Thus, while the role of NGOs can be very important it is clear that two problems need to be addressed:

- how to find genuine NGOs with quality
- how to ensure that NGOs do not end up becoming mere oases of excellence

2.4.4 Challenge of Upscaling with Quality

A very interesting innovation in this regard has been attempted by CAPART. CAPART is a semi-autonomous body registered under the Societies Registration Act, working under the aegis of the MoRD, Government of India to provide financial and resource support exclusively to voluntary organisations for rural development. CAPART is a unique institution at the interstices of state and civil society in India. On the one hand, it represents a reaffirmation of

the responsibility of the state in facilitating the role of voluntary agencies in national development. On the other, it affords a space for civil society institutions in decision-making regarding critical policy issues concerning rural development in India. If one recognises that grass-roots civil society institutions have a vital role to play in enforcing accountability of state institutions and in galvanising rural development by setting exemplary standards of technical excellence and people's participation, then the role of CAPART becomes extremely important.

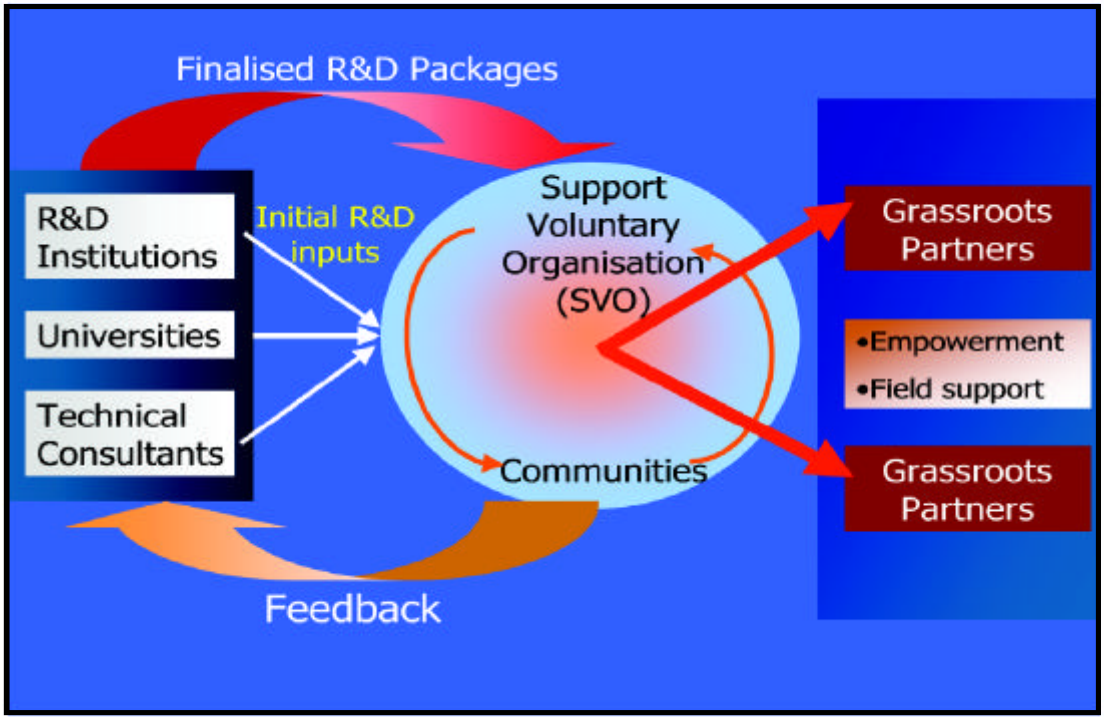
CAPART has sought to overcome the problem of quality of agency and operational scale through the concept of the Support Voluntary Organisation (SVO). CAPART has recognised seven SVOs for its watershed programme.[36] The role of SVOs is to search out and link up the thousands of disparate, small but sincere groups, working in far-flung corners of the country, and provide them the necessary wherewithal to both implement watershed programmes in their areas and mobilise rural communities for this purpose. These agencies could include not just grass-roots NGOs but also CBOs, Watershed Committees, Forest Protection Committees, SHG Clusters, Gram Panchayats or the committees of the Gram Sabha that look after natural resources. The SVOs would provide them all logistical support from resource mobilisation to action plan implementation. The responsibilities of SVOs are to search for and screen prospective partners with a good track record, promote the watershed programme among them, by pro-actively seeking them out, orienting them into the programme and assisting them in preparing watershed action plans; to impart training on watershed development to agencies engaged in the programme; to provide technical and other required support through field visits to the watershed area at regular intervals; to act as institutional monitors for the watershed programme, evaluating the performance of agencies engaged in the programme or those wishing to join it; to conduct research on various aspects of watershed development; to disseminate widespread awareness by acting as ambassadors of the watershed approach. Each of the SVOs can be visualised as a nucleus, giving rise to many nuclei of empowerment all over the country. Through the SVO concept we can project how the watershed programme could be upscaled over, say the next 20 years, with carefully selected partners being in the forefront of implementation. Each SVO can conceivably support 200 partners over such a period, each of which could in turn cover 10 watersheds of 2500 ha each. If we have 20 SVOs, this could add up to 100 mha of land being covered over the next twenty years. Also each SVO will not have to hand-hold each of its 200 NGO partners at the same time. There will be a typical phasing out period of 5-7 years, after which the NGO will be on its own, and will, in turn, empower other agencies in its area of

36 The CAPART SVOs are Hind Swaraj Trust (HST) and Association for Agricultural Renewal in Maharashtra (AFARM) (Pune), DSC (Ahmedabad), People's Science Institute (Dehradun), Agragamee (Orissa), Peermade Development Society (Kerala) and SPS (Madhya Pradesh). Organizations like WOTR, which have developed a systematic and graduated approach called "Participatory Operational Pedagogy" as well as the "Mother NGO" concept, and MYRADA also have an outstanding record in capacity building for watershed development and could play a vital role as national SVOs.

work.[37] This would be no mean achievement. Apart from its direct impact, such work once it reaches a critical mass, could have a major demonstration effect on government-run programmes as well.[38]

Figure 2.2

Support Voluntary Organisation



Source: Samaj Pragati Sahayog (2005a)

2.5 Capacity Building

Among the biggest weaknesses of the watershed programme has been the very scant attention that has been paid to capacity building. In this context, the reduction in allocation for training in the Hariyali Guidelines was an extremely unfortunate step. The sad thing, however, is that even when the allocation was 5% of the total project cost, very rarely was this money utilised in a meaningful manner for capacity building. The National Advisory Council observes: "Current experience suggests the need for (i) broadening the training programmes with a view to imparting training to the bureaucratic machinery at all levels as well as to political functionaries from the

37 To give an indication of what has already been achieved, it may be mentioned that over the last 7 years, one of the 7 national SVOs, SPS has identified and empowered 50 partners who have begun work on 200,000 ha in their watersheds.

38 This is how we must visualise the NGO effort – not as a substitute for government initiative but as a stimulus for improving its quality.

Panchayat level upwards; (ii) improving the content and quality of training programmes with due priority being accorded to the processes of peoples' empowerment through decentralization; and (iii) ensuring the autonomy of training institutions by entrusting this work to an independent nodal Agency and guaranteeing adequate funding by the concerned Ministries/Departments" (NAC, 2005b).

As explained in the next chapter, this committee is for restoring the expenditure on training to its rightful place. However, we are of the view that training is a professional activity that must only be entrusted to institutions with a proven track record and qualified faculty. The Eswaran Committee Report (1997) provided a very useful list of criteria for selection of institutions for training in watershed development:

"i) Practical experiences in the implementation of watershed development project as a PIA

ii) Availability and access to faculty from relevant disciplines, i.e., soil conservation water conservation and management, community organization, animal husbandry, forestry, agriculture, etc.

iii) Capacity to use a mix of appropriate teaching and training technology and aids such as case studies, field visits, audio-visual aids, etc.

iv) Reasonably good basic infrastructure including well equipped class rooms, furnished hostels, well-stocked library, etc.

v) Required to send faculty for updating the knowledge and skill at the National Level Institutions from time to time.

vi) Ability to provide post training follow up support to the trainees

vii) Linkages with other government organizations and NGOs engaged in similar work, academic and research institutions

viii) To develop ability to handle gender issues involved in watershed development and management."

Our own review of training institutions all over India shows that the training input has suffered from the following deficiencies:

- Training is conducted at locations completely cut off from the context where it is to be applied ("at-a-distance/remote-control training/orientation courses" kind of

approach). Training is provided in institutes based in locations far removed from the ground realities of the areas where its benefits are to be realised.

- These institutes are run by personnel who speak a language which is largely incomprehensible to the people and whose attitude is didactic rather than dialogic.
- A very serious lacuna has been the absence of any kind of follow-up to ensure that the benefits of training are materialised at the field-level for which it was meant.

Our review shows that the institutions most effective in carrying out training in watershed programmes have the following features:

- Location at the grass-roots, where local communities have actively participated in implementing development programmes. This ensures hands-on, field-based training of partners by trainers who include local people who have themselves learnt by doing. This is probably the most effective context and method of teaching and learning.
- A strenuous effort at demystification of expertise by a faculty which possesses the capability of communicating equally with scientists and the people, to harness and translate their respective insights into creative action in the field.
- Continuous research and learning by the faculty itself to refresh its knowledge and understanding of the issues involved.
- Development of a network of research institutions and scientific laboratories that continuously services the training institute.
- Beta-testing of these scientific inputs by the institute with communities in the field.
- Providing feedback based on this testing to the scientific institutions.
- Building a network of partners at the grass-roots in the most backward and needy parts of the country, who learn and receive support from the training institute. This support is based on the protocols developed by the training institute through its own work and its interaction with local communities and the scientific institutions.

The key elements here are:

- The ability to demystify, communicate and empower. The biggest weakness of the watershed programme so far has been aspects such as participation, equity and

transparency (as explained in earlier sections). None of these can be achieved without empowerment of a local cadre that can give leadership to the programme in the long-run. This has to be the basic mandate of training institutions.

- Location at the grass-roots, where hands-on work has been done with local communities in watershed implementation.
- Continuous follow-up support being provided to those trained. Training is not to be seen as a one-off activity. A lot of training inputs in India have largely gone down the drain because there is no effective link to what follows in the field after training. There has to be regular field-support provided by the training institute to partners during the implementation phase. This support can gradually taper off as the partner becomes capable of managing on its own.
- Capacity to leverage partners, both to reinforce intellectual capacities and to build fruitful partnerships in the field with potential programme implementers at the grass-roots.

In a note on *Strengthening Training for Watershed Scheme of Ministry of Rural Development*, Anil Shah (1999) states: "State Institutes of Rural Development are working for many years as state government's main instrument for imparting training to rural development functionaries. With some exceptions, most of them are weak in terms of infrastructure, leadership, faculty – number and quality as well as continuity, relation with field activities and implementation, lack of focus and development of methodology for training and training material etc." Among the existing training programmes we reviewed, the one that comes closest to this ideal is the SVO programme (mentioned above) initiated by CAPART and now being adopted by a number of national and international agencies (see Figure 2.2 for a synoptic view of the SVO concept).

The CAPART programme is, of course, a very small initiative. For it to be able cover the national watershed programme would need a major upscaling of the SVO concept. A major effort in this direction was initiated by the MoRD, Government of India in 1999 through the formation of a *National Committee on Watershed Training*. The Committee was engaged in working out the precise modalities of extending CAPART's innovative SVO concept to the national watershed programme. The idea was that each state would have one or more (depending on training needs) SVOs who could help develop one or more Master Trainer Organisations (MTOs) at the district-level. MTOs would in turn take up the responsibility of training project implementing agencies (PIAs) within the district. Each MTO could cater to the training and

support requirements of about 5-10 new PIAs each year. These MTOs must have a proven record in terms of social mobilisation and technical competence. The intermediary rung of MTOs would ensure that training is achieved at the requisite scale without compromising on the uniform standards of performance within each state. In selection of master trainers, it was felt that preference should be given to NGOs. The selection of these NGOs would be based on an assessment of their capacities and capabilities. In cases where NGOs are not available, government personnel should be developed as master trainers.

These ideas must be carried forward so that a national initiative for training all levels/kinds of functionaries at different stages of the programme in specific subjects (already worked out in detail by the Eswaran Committee) can be carried out on a war-footing, so that the watershed programme can attain requisite quality within a reasonable time-frame.

2.6 Monitoring

Our review of the watershed programme all over the country and a large number of representations we received, all point to the fact that lack of a proper monitoring system is one of the key weaknesses of the programme. We were shocked to find that in most states there was no system of regular physical and social monitoring of the work being carried out in the field. Some kind of financial audit was taking place and PIAs were being asked to send regular written reports. But it was not at all clear to us that there was any kind of system in place to check the veracity of these reports by actual verification of physical works in the field nor did we find any system of social audit. For a programme on which thousands of crores of public money are being spent every year, this is a very major weakness that cannot be condoned in any way. The situation needs to be urgently remedied.

The National Advisory Council expresses a similar concern: “The planning activities for soil and water conservation necessarily involve the setting up of measurable goals (which are also monitorable) such as quantitative targets for raising the Water Table, restoring the capacity of water bodies like tanks through desilting and raising crop output or productivity per unit of water. The evaluations and performance monitoring need to be focused on outcomes in relation to goals originally set at the District and Watershed levels. Mid-course corrections can improve the programme benefits substantially. As such, a relatively small part of Programme Outlay on Research and Evaluation would have a high pay-off in terms of achieving the programme objectives. It is important to put in place a decentralised institutional mechanism for evaluation in this field, including through the involvement of reputed institutions to upgrade the quality of evaluation” (NAC, 2005b).

We believe that a separate provision must be made for time and money to be allotted for social, physical and financial audit of the programme.[39] We elaborate the specific provisions for this in Chapter 3. Here we confine ourselves to specifying the dimensions that a monitoring protocol for watershed projects must cover.[40] Watershed projects must be monitored at least once every year. The main stages of monitoring are indicated below:

I. Phase I

I. A. Capacity Building of the WDT and the VWC

- Technical Capacities of the WDT: The capacity building process of the WDT should be carefully assessed, including the number of trainings undergone by WDT, place of training, duration of the training programme and the quality of training received.
- Social Orientation of the WDT: The sensitivity of the WDT towards the issues of participation and equity, especially with regard to women, landless and Dalits should be verified as reflected in the plan.
- Capacity Building of the VWC: The efforts made by the WDT to orient the VWC members on social and gender related issues and to technically empower the VWC should be assessed. Has special attention been given to empowerment of women members?
- On-the-spot Check of Action Plan: This needs to be done through site visits in which WDT and VWC members accompany the person evaluating and discussions are carried on around proposed structures. Typically, the team members could be asked (as an indicative set of questions) why they have chosen a particular intervention to be made on a particular site, what are the design parameters that they kept in mind, what dictated the choice of location, etc. They could also be asked to explain the process of costing and estimation of these structures.
- Transparency in the Process of Action Plan Preparation: The degree of awareness in the villages about the action plan, the structures proposed and the agreements arrived at should be checked. The preparedness of the villages to implement the watershed

39 The Government of Gujarat has developed a very interesting system of evaluation that could provide a model to be followed. They even involve college students as Assistant Evaluators.

40 Crispino Lobo and Abraham Samuel (2005) provide a useful compilation of tools that have been used by various programmes and agencies for purposes of monitoring and evaluation.

action plan and agreements arrived at for benefit sharing, repair of structures and voluntary contributions should be checked.

I. B. Appropriateness of the Action Plan and Cost Effectiveness

While assessing the appropriateness of an Action Plan the following aspects should be kept in mind:

- The Action Plan prepared must reflect the felt needs of the area and must bring out a prioritisation of interventions on the basis of the identified needs. Methods used for identifying problems should be participatory and involving the needs of all classes of households in the watershed. It should be verified whether the choices made while preparing the plan reflect the genuine needs of the area.
- The components of the Action Plan must be carefully studied to see the impact they would make on the priority areas in the watershed. For instance, in a watershed where fodder scarcity has been identified as a priority area of intervention, the extent to which proposed activities of the Action Plan would augment fodder sources should be examined. Similarly, it should be checked whether the proposed plan for afforestation reflects the priorities brought out by tree ranking exercises, etc.
- site selection (How well are proposed interventions suited to the sites selected?);
- degree of involvement of community in deciding works to be taken up and site selection;
- choice of technology (including materials selected to be used in construction, designs, how far traditional knowledge has been used/built upon, how far employment generation is a priority, rather than machines being used);
- technical assessment of design of works (FRL determination, settlement allowance, free board, design of weir, etc.);
- technical assessment of costing of works and technical drawings (how the SoR has been used);
- assessment of whether the Action Plan has given due weight to equity considerations while identifying beneficiaries (women, Dalits, Adivasis, landless and migrating households);

- does the plan incorporate a sustainable surface water and groundwater management strategy?
- what plans have been developed for sustainable and equitable use of the commons?
- equity in benefit sharing (what arrangements have been worked out);
- how holistic is the plan in terms of balance between ridge area treatment and drainage line treatment and in terms of its coverage of soil, water, forest, commons, private vs. public land, integration with dryland agriculture and allied activities such as livestock and pisciculture

II. Phase II

II. A. Conformity to the Action Plan

During the implementation phase, it should be checked whether the Action Plan is proceeding in conformity with the original plan. However, we must allow flexibility in this provided that sound reasons are spelt out for the changes made.

II. B. Qualitative Aspects

More important than conformity per se is the quality of work done in terms of each of the technical and equity aspects mentioned in section I. B. above:

- especially the most important structures have to be physically examined to ensure that the technical design and cost specifications have been met and the structure will provide expected benefits
- strength and functioning of village-level institutions such as User Groups, SHGs, VWCs, WWCs, etc. in terms of membership, regularity of meetings, quality of participation of women, Dalits, landless, etc.
- how far are equity and sustainability considerations being met? Have resource-use agreements been worked out? Are they being adhered to?
- have the interests of women, Dalits and landless been protected? In what specific ways?
- has a way of using the SoR been worked out that allows special consideration for temperature, soil strata, women, disabled, aged?

- have minimum wages been paid to the labourers working on construction sites? What are the norms followed in fixing wages to be paid? Have equal wages been paid to men and women?
- if there are voluntary community contributions, have their concept and practices been explained properly to village people?
- has a groundwater management plan been made? Has it been adhered to?

II. C. Record Keeping

- Have proper practices been followed in making payments, i.e., proper record of payments, etc.
- Measurement books, receipt books, muster rolls, vouchers, etc.

II. D. Impact Assessment Indicators

- water level fluctuations (well readings have to be taken for a selected number of wells 3 times a year: pre-monsoon – early June, post-monsoon – October, post-rabi – February). This data has to be studied over the years. The attempt is to finally arrive at some idea of the elasticity of the water table with regard to rainfall (%change in water table/%change in rainfall);
- drinking water security (including qualitative change in situation to be recorded through narrative case studies);
- changes in cropping pattern and intensity;
- changes in agricultural productivity;
- changes in fodder and fuelwood availability;
- changes in the size and character of livestock holdings;
- status of grazing lands and their carrying capacity;
- employment generated (both revolving – person-days of work and sedimented – how many people can the same piece of land support);
- change in incomes for each household category, total and source-wise;
- freedom from debt and reduction in the degree of dependence on money lenders (including qualitative change in situation to be recorded through narrative case studies);

- reduction in out-migration (including qualitative change in situation to be recorded through narrative case-studies);
- reduction in the drought-vulnerability of the watershed (including qualitative change in situation to be recorded through narrative case-studies);
- number of SHGs, their coverage, savings, bank linkages (quantitative and qualitative aspects) and purposes for which loans are taken;
- detailed case-studies of specific farmers impacted by the project;
- photographic documentation of work and its impact; and
- learnings and process documentation (what can the experience teach the team and others about how the programme could be implemented better, mistakes, improvements possible, changes made, etc.)

III. Phase III

All the indicators of Phase II will apply in this phase as well. In addition there will be many new indicators.

III. A. Livelihood Options

For each of the livelihood options, assess:

- Economic viability of the options proposed
- Forward and backward links developed
- How far do they build on the natural resource base of the area?
- Have considerations of equity and sustainability been kept in mind?
- Were the people involved in formulation of the plans?
- How far were SHGs or SHG Federations involved in the plans?

III. B. State of SHGs and SHG Federations

- What is the coverage of SHGs in terms of families in the watershed?
- How many SHGs have been linked to banks?

- What is the economic strength of the SHGs? (savings, loans, other products)
- Nature and strength of social and economic activities taken up by SHGs
- Have Federations been formed? How many? (details of membership, activities, etc.)

III. C. Maturity of Village-level Institutions and Preparedness of Exit Protocol

- How well are the various village-level institutions functioning? (regularity of meetings, participation of members, sense of ownership, degree of empowerment of members etc.)
- What are the steps taken by the Project Manager (PM) or WDT for exit protocol? Are they sufficient to enable exit?

2.7 Research

There have been several studies of watershed development projects. But as Vaidyanathan (2001) has argued in a masterly overview of these studies, most of them suffer from grave methodological errors. They have limited scope (in terms of parameters studied and area covered) as also unclear and unspecified protocols. It is no surprise, therefore, that they are unable to come to any definite and policy-relevant conclusions. Problems of sample size and biased sample selection also reduce the reliability of such studies. Crop areas and yields are highly variable across seasons and years. The same applies to water levels in wells. Hence, a simple comparison of changes in crop output or water levels between two points of time can give highly misleading results. If the pre-project year had below normal rainfall and the post-project year had higher than average rainfall, a part of the increase in output must be attributed to seasonal conditions. A proper comparison, therefore, calls for data on average output for at least 3 years before initiation and 3 years after completion of the project. Even this would be inadequate to assess its long period impact, as it would fail to take into account variations in the pattern of rainfall. As Vaidyanathan (2001) says: “Improvements in soil moisture, stream flow and groundwater regimes – all of which affect land productivity – may not fully manifest immediately after the project works are completed and may take a much longer time to unravel. . . . Because of these factors, it is difficult to provide credible and validated information on the magnitude of benefits which watershed development can bring to their communities” (Vaidyanathan, 2001). It follows that the impact evaluation studies of watershed projects must have a considerably broader scope and carried over much longer period of time for reliable results to emerge.

A major problem in assessing the real impact of a watershed programme is the unreliability of the information regarding the baseline situation. The required baseline data is often not maintained in most watershed projects. One way of getting out of this problem that has been attempted is through cross-section studies where "successful" watersheds are compared with contiguous watersheds where no intervention has taken place. However, here the selection of the "control" watersheds is not always done with requisite care, and highly incomparable situations are sought to be compared with each other.

There is hardly a single study of the programme in the country that provides rigorous conclusions at a reasonably large scale. Research studies would benefit from the wider scale, making them both cost-effective and enriched by the variation in range of conditions being studied.

For future projects, maintenance of baseline information on selected indicators and their constant monitoring throughout the project period should be made mandatory. The operational indicators to be monitored should be carefully chosen. An indicative list of eco-system and social indicators is provided in Kerr and Chung (2001). This could be modified depending on the location of the watershed and the primary problem it is attempting to tackle. A key variable is "water balance". Each term of the water balance identity should be quantified at the start of the project and monitored throughout the course of the project. Here, the need for maintaining adequate controls should be emphasised. Thus, the assessment of impact should proceed over time (from a given baseline situation to the present) and across areas at a point of time (changes in the indicators in the control and monitored plot/family/watershed). Given the variations in rainfall and other climatic parameters, results need to be normalised through monitoring over long periods. Maintaining such information systems, which involve instrumentation, measurement and quantification over long time periods, is not costly. As watershed projects at present do not budget for assessment of impact of the work done, this committee has recommended a separate financial provision for maintaining such a database (see Chapter 3).

Data regarding watershed programmes need to be consolidated Geographical Information System (GIS)-based data at different levels and put up in the public domain. Similarly the data and imagery collected by public-funded institutions [like National Remote Sensing Agency (NRSA)] should be made available to the different agencies involved in watershed development (the district agency, agencies involved in evaluation, monitoring and research, etc.) at affordable costs. Similarly it is also the responsibility of the state to provide (and in some cases even prepare) good scale and updated village cadastral maps. We have found that in many cases, especially in Adivasi areas, this is a bottleneck.

Considerable amount of secondary data on the nature, conditions and use of land and water resources at the micro-watershed level exists already. Fairly reliable and comparable data sets are available on:

- agro-climatic regions and sub-regions for the country as a whole;
- soil characteristics and degradation status of each region and sub-region;
- meteorological data at the division, sub-division and taluka levels;
- details on land-use, irrigation and cropped areas at the village level;
- groundwater potential and utilisation at block level; and
- maps based on satellite imagery, useful in delineating different orders of watersheds right down to the micro-watersheds in several states

Collection and compiling data from various sources and correlating them would provide a great deal of useful information for watershed planning at a micro-level (Vaidyanathan, 2001). However, this also involves time and effort and at times the information required (such as satellite imagery) may be expensive. This role could be usefully played by a specially designated cell within the national Authority we are proposing in the next chapter.

There are a number of areas where the ongoing watershed programme needs to generate new data to complement the gaps in existing database. Since their level of disaggregation limits existing data, information generated by watershed programmes can enhance the quality, richness and depth of our understanding. For instance, the scale on which soil surveys, Survey of India 'topo-sheets' and maps based on satellite imagery (mostly 1:50,000 and occasionally 1:20,000) are available, is too large for planning at the micro-watershed level. Generation of soil maps at the level of the micro-watershed and comparing it with the maps prepared at the district or region level could give interesting and useful results. Such micro-level information could give a much better idea about the extent and causes of soil degradation in an area (in ravine areas, for instance, it could give an idea about the extent and pace of the process of land degradation on a seasonal or annual basis). Similarly, there is much scope for expanding the coverage and improving quality of the existing climatic and hydrological data as well. Watershed programmes could generate information on rainfall, rainy days, daily temperatures, soil moisture levels, volume of flow and sediment load in streams and water levels in observation wells across seasons at a much more disaggregated level. Block level and village level data on land-use, cropping

pattern and irrigated area could be verified and validated by data generated by watershed programmes.

2.8 Possibilities of Public-Private Partnership

Public-private partnership in watershed programmes is a relatively unexplored phenomenon in India. This committee has received submissions from the CII and FICCI. Reflecting on the suggestions put forward in these representations, we suggest the following to the government for its consideration:

1. Corporates should be encouraged to contribute generously to the national/state NASDORA fund and to WDF at the micro-watershed level. These donations may be provided 100% tax exemption.

2. There is scope for corporate involvement in technical assistance, capacity building and training besides implementation of benchmark initiatives in collaboration with science and technology institutions.

3. The strength of corporate sector as we perceive it would lie in developing marketing systems, providing agricultural extension and other value-added services through IT-enabled activities, energy resource development and management, and some commercial initiatives in terms of developing agricultural plantations which would also return some benefits to the agricultural community in terms of buy back guarantees, information enriched services, etc. However, it needs to be emphasised that all corporate interventions must be faithful to the overall architecture of the watershed programme as enunciated in this report. They must adhere to the principles of people's participation, equity and sustainability emphasised by and mandatory for all practitioners.

2.9 Administrative Problems

Like many other large-scale government programmes being implemented under a very wide variety of conditions across the country, the watershed programme has had its own share of administrative glitches. Some of them arise from problems of inter-departmental coordination. Among the most serious of these reported to us were the problems that arise when the ridge areas of watersheds to be treated fall under the control of the Forest Department. In such circumstances, getting permission from the Forest Department has proved enormously difficult, not merely for NGO implementers but also when other government departments were the PIAs. This is because of the stringent provisions of the Forest Conservation Act. However, we

are of the considered view that most work under the watershed programme would certainly contribute to the cause of forest conservation and regeneration. It would, therefore, be in the interest of the Forest Department to grant permission to such programmes, as has been done in the case of the IGWDP in Maharashtra.[41] Appropriate institutional arrangements involving coordination with the local Forest Protection Committee can be worked out that would make this possible. Without such work in the ridges, most of the watershed work in the lower reaches would become meaningless.[42]

Other problems arise because of the fact that the officers in-charge of implementing the programmes have many other responsibilities on hand. They are also subject to frequent transfers. This disturbs continuity of approach. There are many cases where an officer who is doing very well has had to move for reasons beyond those to do with programme itself. It is also clear that in many instances officers have lacked the necessary motivation, orientation and professionalism to carry out the programme effectively. There are also widespread reports of delays in sanction of projects and release of funds.

It is our considered view that each of these administrative problems as also all the considerations outlined in earlier sections point to the urgent need for the setting up of a dedicated authority that would be devoted full-time to execution of the watershed programme at all levels. To an outline of this Authority we turn in the next chapter.

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CHAPTER 3 THREE

National Authority for Sustainable Development of Rainfed Areas

"The UPA government will introduce a special programme for dryland farming in the arid and the semi-arid regions of the country. Watershed and wasteland development programmes will be taken up on a massive scale . . . all existing schemes for drought-prone area development will be reviewed and a single major national programme launched" [National Common Minimum Programme of the United Progressive Alliance (UPA)].

3.1 The Mandate

One of the major problems with the watershed programme in India is that at each level it is administered by people who have many other responsibilities. This is true at all levels but especially at the district level where the Collector or the Chief Executive Officer (CEO), Zilla Panchayat (ZP) or the District Rural Development Agency (DRDA) are expected to look after the programme. Similarly, under the Hariyali Guidelines it is the Panchayat Secretary who is the CEO of the programme at the micro-watershed level. These are officials with a whole host of responsibilities who are unable to do full justice to the requirements of this quality- and process-intensive programme at times for no fault of their own. There are also policy and executing discontinuities because of the frequent transfers of these officials. Coordination between transient actors pursuing departmental agendas is another problem. The sharp focus needed to implement watershed programmes is often absent because they have many other competing priorities. With many competing priorities and insecure tenures, agency heads cannot follow

any endeavour that calls for focused, long-term engagement. Given the nature of challenges sketched in the last two chapters, developing the rainfed regions is clearly an unlikely agenda for the prevailing setup for centrally-sponsored schemes.

Again, as the Hon'ble Prime Minister Dr. Manmohan Singh has repeatedly emphasised, there has been a lack of focus on outcomes. Merely utilizing outlays has been the norm. As a result, government agencies at different levels have not felt challenged to develop a problem-solving culture and practices marked by flexibility, pro-action, goal orientation and open-ended engagement with rural communities and potential resource agencies within and outside the government. The National Advisory Council has correctly observed: "There are, at present, a multiplicity of programmes for rehabilitation of degraded lands through watershed development run by different Ministries. There has been a proposal in the government to bring all these programmes under a single Ministry – a necessary condition for implementing them on a Mission Mode. While the concerned departments are in agreement about the desirability of bringing together all the watershed programmes under one umbrella with a view to implementing them on a Mission Mode, serious differences persist among different Ministries regarding the ownership of the unified programme. It is of utmost importance to resolve this issue at the earliest so that the different programmes are merged and run on a mission mode by a single nodal ministry, as promised in the NCMP" (NAC, 2005a). Similar concerns have been voiced by many state governments (see Appendix III).

This Committee, therefore, is convinced that the present management structure of the programme needs to be replaced by an All-India Authority. Such an Authority must be functionally focused, operationally integrated and attuned to collaborate with a diverse set of stakeholders. It must be endowed with the autonomy and flexibility to respond innovatively to local needs and must have clear accountability for performance. It must be willing and able to invest in building human and institutional capacity at different levels to carry forward its agenda. The proposal is for setting up a totally new professional and output-oriented organisational structure geared to meet these requirements. The proposed design draws on successful international innovations in governance as well as experience with the enabling management structure that has been evolved in India vis-à-vis Central Government owned enterprises.

In his address to the nation on 15 August 2005, the Hon'ble Prime Minister Dr. Manmohan Singh announced the intention of the government to set up a Rainfed Areas Authority. We believe that a National Authority for Sustainable Development of Rainfed Areas (NASDORA) needs to be set up as a quasi-independent authority to manage the entire primarily Central

Government funded watershed programme. The overarching goals of this Authority would be to ensure access to safe drinking water to the local population, provide them sustainable livelihoods and secure freedom from drought for the vast rainfed regions of the country by 2020. The Authority would address the challenge of bringing prosperity to these regions through the sustainable development of their natural resource base. The Authority will be endowed with professionals, and the freedom and flexibility of operations necessary to perform its functions effectively.

3.2 Functions of NASDORA

It is envisaged that NASDORA will identify, finance and monitor action programmes in a systematic and time-bound manner. It will adopt an enabling strategy of fostering, nurturing and identifying decentralized implementing structures/organizations, financing action programmes through such decentralized constellations and monitoring such programmes. The specific functions of NASDORA would be as follows:

- Prepare a Perspective Plan, National Strategy and Road Map for sustainable development of rainfed areas by 2020
- Develop norms for identification and prioritisation of areas to be covered by NASDORA
- Develop financing strategies for the development of rainfed areas in different agro-ecological zones of the country
- Mobilise funds for NASDORA from national and international sources
- Mobilise required human resources for NASDORA at all levels
- Develop criteria for selection of Facilitating and Implementing Agencies at all levels
- In collaboration with such agencies, develop strategies and action programmes for the development of rainfed areas in different parts of the country
- Support such action programmes and monitor their implementation
- Develop a monitoring strategy for effective social, physical and financial audit at all levels
- Facilitate research on various dimensions of rainfed area development

- Suggest strategies for building capacities of village-level institutions and CBOs to function as self-governing institutions

3.3 Institutional Form

To ensure freedom and flexibility in its functioning, the Authority will be registered as a Society under the Societies Registration Act, 1860. Over time as it matures in functioning, a proposal for converting it into a statutory body could be seriously considered.[43]

3.4 Governance and Management

A two-tier governance and management structure is envisaged to ensure broad policy support as well as operating oversight.

NASDORA will be managed by an Apex Governing Board (Figure 3.1) consisting of a competitively selected professional as CEO, one representative each from Ministry of Rural Development, Ministry of Agriculture and Ministry of Environment and Forests, Government of India, three competitively selected whole time professionals representing the functions of operations, finance, and human and institutional development, two eminent experts in the field of watershed management, and two eminent members from civil society.

An Apex Rainfed Areas Stakeholders Council will provide overall policy support and guidance to the Apex Board and review the performance of NASDORA. It will be chaired by the Prime Minister, with the Minister of Rural Development, the Minister of Agriculture and the Minister of Environment and Forests as Vice-Chairpersons. The CEO of NASDORA will be the Member Secretary of the Council. The Council will include the Chief Minister of each state covered by NASDORA, Secretaries of the Ministries of Agriculture, Rural Development and Environment and Forests, Government of India, eminent national and international experts on watershed management, representatives of facilitating agencies of high standing, and representatives of the farming community.

NASDORA will have a lean operating setup, with personnel experienced in developing action programmes. The recommendations of search committees consisting of two eminent professionals connected with watershed management and a senior government official as chairperson will be the route for selecting the non-government members of the Apex Board. The CEO and the professionals will be appointed to the Apex Board by the Government of India following the recommendations of a search committee consisting of the Cabinet Secretary as the chairperson,

43 This was the institutional trajectory followed by the National Dairy Development Board (NDDB).

and two eminent professionals connected with watershed development programme of the stature of Dr. M.S. Swaminathan, Dr. Y.K. Alagh, Dr. A. Vaidyanathan and Dr. C.H. Hanumantha Rao.

The state governments will set up boards with a structure similar to the one at the apex level. Each State Board will have a CEO and professionals appointed on the basis of recommendations of appropriate search committees.

3.5 Support Agencies

Based on CAPART's SVO model described in Chapter 2, Support Agencies will be recognised at different levels. These will help build capacities at each level by providing technical and social mobilisational training and field-support to all project implementers. These agencies will be constituted as appropriate at the district, division or even state-level (2-3 agencies can look after smaller states). The Apex Board will lay down the criteria for selection of suitable Support Agencies. Many state governments have represented to this committee that support services need to be greatly strengthened for the watershed programme (see Appendix III). These agencies should also have the capability of providing requisite research inputs into the programme at all levels.

3.6 Monitoring Agencies

Since monitoring has been widely recognised as one of the most important weaknesses of the watershed programme, we are of the view that NASDORA must include within its purview a dedicated Monitoring Agency that will handle all aspects of monitoring projects across the country. The Agency will set up its branches in all states where the programme is being implemented. Its functions will include developing a Management Information System on the basic data of the projects, carrying out annual physical monitoring of projects as also financial and social audits. This Agency will maintain a roster of credible Facilitators-cum-Evaluators, who will be deployed by it to undertake field monitoring. It will also empanel auditors who will conduct financial audits and social activists who will help carry out social audits.[44]

3.7 District Level

There needs to be a separate dedicated body that will oversee the implementation of the watershed programme within each district. This body may be termed the District Watershed Development

44 We gratefully acknowledge the inputs of Deep Joshi (Executive Director, PRADAN), Paradip Khandwalla (former Director, IIM, Ahmedabad) and Anil Shah (Chairman, DSC) into sections 3.1 to 3.6.

Agency (DWDA). The DWDA will be a branch of NASDORA at the district level. The DWDA will be answerable to the ZP. The action plans formulated by the DWDA will need the approval of the ZP. The DWDA will be headed by a full-time CEO. The CEO will sign a 5-year Memorandum of Understanding (MoU) with the ZP that will spell out well-defined annual goals, against which the performance of the CEO will be monitored each year by the Collector and ZP. The CEO will be competitively selected from the open market in a fully transparent manner. A Search Committee including the state Principal Secretary, Rural Development, state Principal Secretary, Agriculture, CEO of the State Board and two non-official eminent experts from the watershed field, will be specially constituted for this purpose. The CEO, DWDA could be a serving government officer on deputation, a person from the NGO or corporate sector or an independent professional. Preference will be given to women in appointment of the CEO, DWDA. The CEO, in turn, will constitute a District Watershed Management Team (DWMT). This team will again comprise professionals competitively selected from the open market in a fully transparent manner. They would represent various disciplines involved in running a watershed programme, including *inter alia*, soil and water conservation, agricultural science, veterinary science/animal husbandry, social work, hydrogeology, life sciences, gender studies, management and accounts. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals. Preference will be given to women in appointment to the DWMT. The DWDA will sign a 5-year MoU with each member of the DWMT that will spell out well-defined annual goals, against which the performance of the member will be monitored each year by the DWDA. The DWMT would be responsible for overseeing the implementation of the watershed programme in the district. They will select PMs for each milli-watershed, provide technical assistance, conduct training, give field support, commission monitoring and evaluation of projects, as also impact assessment studies.

3.8 Milli-Watershed Level

The DWMT will identify the remaining untreated milli-watersheds in the district, ranging from a minimum of 4,000 to a maximum of 10,000 ha. We believe that anything less than 4,000 ha makes it impossible for institutional overheads and the monitoring and research expenses to be met for this programme. Also the larger the watershed the more it is able to take into account the issues related to groundwater flows. And the watershed plus activities that we are proposing for Phase III make sense only at a certain scale. But anything more than 10,000 ha makes it administratively unwieldy and not amenable to people-centred processes.

Since we believe the watershed programme is primarily a social programme, and also because VWCs within each Gram Panchayat are to be the ultimate implementing agency, the final selection of implementation area must be according to the Gram Panchayat boundaries, to which milli-watershed boundaries are to be approximated. These milli-watersheds will comprise a number of micro-watersheds that ideally should be but need not necessarily be absolutely contiguous to each other.[45] Broadly, we would suggest that the micro-watersheds may lie within a sub-basin of 25,000 ha.

3.8.1 Milli-Watershed Council

At the milli-watershed level there will be a Milli-Watershed Council (MWC) that will consist of nominated members (one man and one woman, at least one of whom should be SC/ST) from each VWC within the milli-watershed (see 3.8.3). The members from each VWC will have a fixed tenure of two years and will change by rotation. The MWC will also have the following as members – representative of the local MLA, one representative each from the WDT (see 3.8.2 below) and Janpad (block) Panchayat, representative of the CEO Janpad (block) Panchayat, representative of the Sub-Divisional Officer (SDO) (Forest), as also all the Gram Panchayat presidents/sarpanches/pradhans within the milli-watershed. The PM will be the Member-Secretary of the MWC. The MWC is the Stakeholders Council at the milli-watershed level. It is an advisory body that will give overall direction to the programme. It will also help resolve conflicts that may arise across micro-watersheds. It will monitor and review progress and carry out social audits of the programme. Each MWC will be registered with the DWDA.

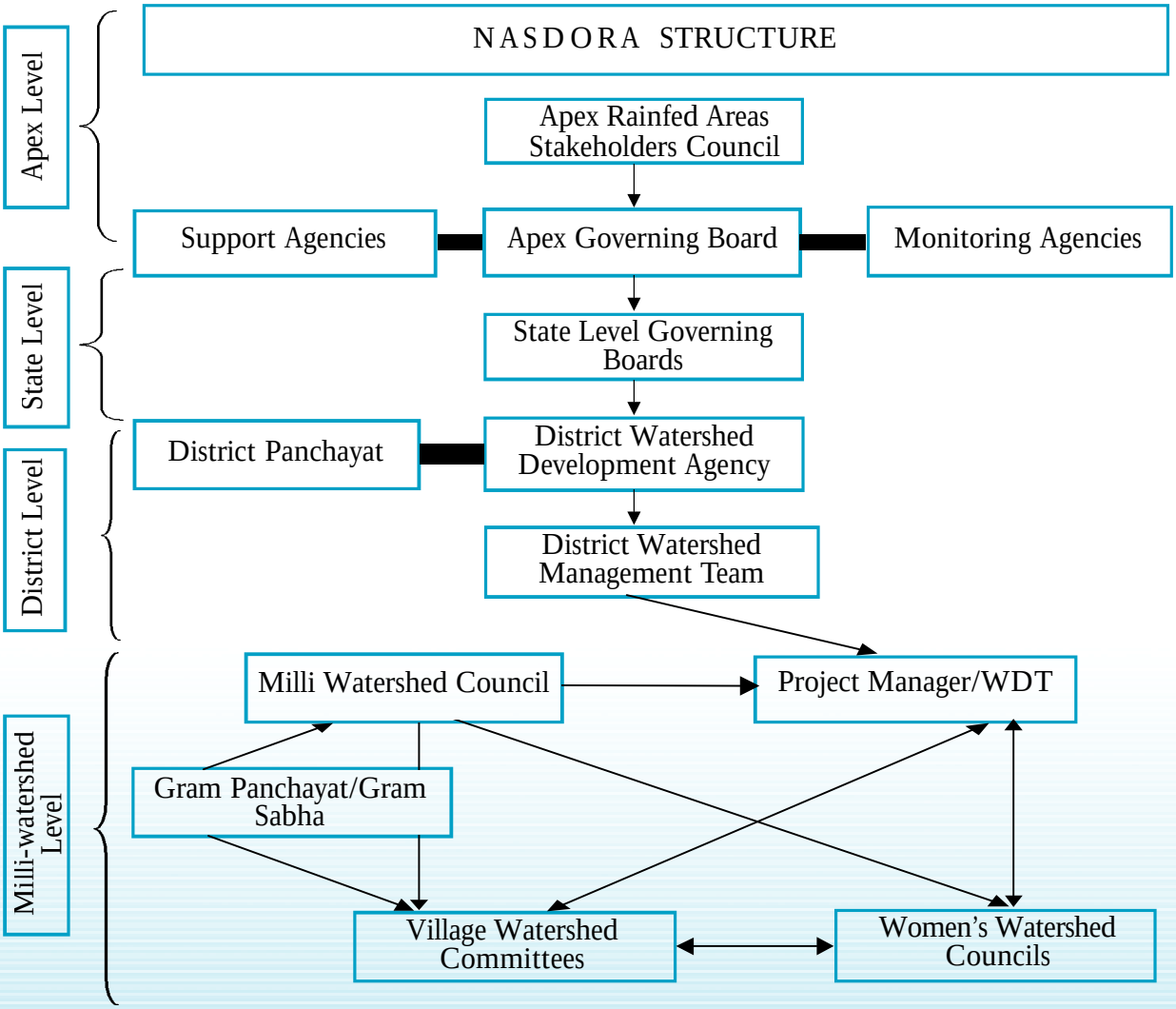
3.8.2 Project Manager and WDT

Once the milli-watersheds are demarcated, the DWMT will constitute a Search Committee that will select PMs for each of these milli-watersheds. The PMs will be competitively selected from the open market in a fully transparent manner. They will sign a 5-year MoU with the DWDA that will spell out well-defined annual goals, against which the performance of each PM will be monitored each year by the DWDA. PMs will be professionals with experience of implementing watershed projects. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals. Preference will be given to women in appointment of PMs. These PMs would be in-charge of overseeing

45 Since this is a programme with a history of 10-15 years in many areas, it may be difficult to find contiguous untreated watersheds of 10,000 ha.

implementation of each milli-watershed project. They will constitute the WDT at the milli-watershed level. Each WDT should have at least four members – from veterinary science/ animal husbandry, civil/agricultural engineering, agriculture/life sciences and social sciences. At least one member of the WDT should be a woman. PMs should be encouraged to constitute all-women WDTs or at least maximise the number of women in the WDT. For larger milli-watershed there could be more members in the WDT as per need. Preferable qualification for a WDT member should be a professional degree. However, the qualification can be relaxed in deserving cases keeping in view the practical field experience of the candidate. In case the PM belongs to an NGO, the latter will be at liberty to either earmark its own staff exclusively for this work, or engage fresh candidates through open market competitive selection. The WDT shall be located as close as possible to the milli-watershed.

Figure 3.1



3.8.3 Village Watershed Committee

Each milli-watershed will consist of a number of villages. For each village there will be a VWC that will implement the watershed project with the technical support of the WDT in their village. The VWC will be a committee of the Gram Panchayat that will be elected at a meeting of the Gram Sabha. Each VWC should have a maximum of 20 members. It must mandatorily have at least 50% members as women and at least 33% SC/ST community members. The VWC must also ensure that each hamlet gets a representation proportionate to its size. It should include 3-4 members each from User Groups and SHGs and one member each from the Gram Panchayat and the WDT. Representation must also be given to the landless, with a minimum of two members being accommodated in the committee.

The formation of the VWC must be a gradual process. The VWC must grow organically from its constituents, the User Groups and the SHGs over the first year of the project. Great care must be taken in its formation. It should ideally be constituted towards the end of the first year. Funds begin to flow to the VWC only from the second year onwards.

Each VWC will be registered with the DWDA.

The VWC will be answerable to and work under the control of the Gram Sabha. In States where there are Ward Sabhas (Palli Sabhas, etc.) and the area to be treated is within that Ward, the Ward Sabha may perform the duties of the Gram Sabha. In 6th Schedule areas, where traditional Village Councils are functioning instead of Gram Panchayats, these Councils may be assigned the responsibilities of the Gram Panchayats/Gram Sabhas. In cases, where there is neither a Gram Panchayat nor the traditional Village Council, social accountability of the VWCs will be affixed through regular social audits in the area, in front of village assemblies.

The Secretary of the VWC will be the paid CEO of the VWC. She/he will in no event be the Panchayat Secretary. She/he will be selected by the WDT on the basis of merit and experience. Preference will be given to women candidates. The appointment of the Secretary of the VWC will have to be approved in the meeting of the Gram Sabha. In view of the administrative costs, PMs may like to explore the possibility of one Secretary handling more than one VWC.

3.8.4 Women's Watershed Council

As elaborated in Chapter 2, to facilitate real participation of women, we propose the formation of a separate WWC within each village. The duty of the WDT will be to mobilise women to actively participate in meetings of the WWC. The aim of the exercise is to ascertain and give

requisite weight to women's perceptions and priorities in the formation of the watershed action plan. Every effort must be made to ensure that these perceptions are adequately reflected in the watershed action plan finally devised by the VWC. The aim is also to ensure that the WWC acts as an effective watch-dog protecting women's interests during the implementation of the action plan. Similar arrangements may be worked out to give requisite weightage to the interests of the Dalits, Adivasis and landless wherever they are in a minority or where there is acute danger of their interests being overlooked.

3.9 Duration and Phases of the Programme

We are proposing that the duration of the programme be increased from 5 years to 8 years. This is because most of the limits of the currently implemented programme strongly suggest the need for such an upward revision.[46] The most important weaknesses of the programme all stem from the fundamental shortcoming that durable village-level institutions have not been set up and the crucial participatory processes have not had sufficient time to be put into place. As a result, the qualitative dimensions of the programme have suffered. At the same time, it has not been possible to realise the livelihoods potential of the programme, which is widely seen as a major weakness. As the National Advisory Council has correctly said: "Instead of utilizing the first one and half years or so for social mobilization (as originally envisaged), hardly a few months and, in many cases, only some weeks are being devoted to this activity. Also, the outlays on training and capacity building have been reduced under the revised Guidelines" (NAC, 2005b). Similar concerns have been expressed by a large number of state governments (see Appendix III). We have tried to address these very pertinent concerns. In order to provide sufficient time to overcome these weaknesses, we propose an 8-year programme divided into 3 phases.

3.9.1 Phase I

Phase I may be termed the Preparatory Phase of the programme. In this 2-year period, the main activities will include:

1. Socio-economic and bio-physical participatory baseline ("beyond-PRA") surveys needed for preparation of action plan, selection of sites and beneficiaries and impact assessment. Every effort must be made to collect gender-disaggregated data to adequately reflect the situation and priorities of women.

46 In the final meeting of the Technical Committee, some members expressed the view that the duration be kept to 5 years. However, in the ultimate analysis it was decided to respect the strong aspirations expressed by countless watershed implementers in the field who repeatedly represented to the Committee that the duration of the programme has to be increased – if real quality is to be injected into the programme, if its institutional weaknesses are to be overcome and if the PM's directive that outcomes rather than outlays be emphasised is to be followed.

2. Hydrogeological survey of the watershed to map out zones of potential groundwater recharge and potential sustainable groundwater utilisation
3. Putting in place impact assessment protocols
4. Capacity building at all levels
5. Building up network of technical support agencies
6. Preparation of the detailed watershed action plan, including activities to be carried out, selection of beneficiaries and work-sites and design and costing of all works
7. Ensuring that the interests, perceptions and priorities of women, Dalits, Adivasis and the landless are adequately reflected in the action plan. Institutions like the WWC will be developed for this purpose in this phase.
8. Working out in a participatory manner detailed resource-use agreements (for surface water, groundwater and common/forest land usufructs) among User Group members, based on principles of equity and sustainability
9. Working out in a participatory manner protocols for voluntary contribution for different types of activities and across different sections of the community, based on the principles of equity
10. Entry point activities focused on the urgent needs of the local communities such as drinking water. Activities that reflect the interest of women such as bio-gas plants, toilets and baths must be taken up in this phase. These are important to develop the faith of the community in the programme and orient all stakeholders into the "work culture" to be followed. These must be integrally related to the overall objectives of the programme and not be completed "off-the-mark", as it has sometimes tended to be in the programme so far.
11. Initiating the development of village-level institutions that are to form the backbone of the programme. These include VWCs, WWCs, SHGs and User Groups.
12. Evaluation of the action plan and work done in Phase I by an external agency towards the end of Year 2.

3.9.2 Phase II

Phase II may be termed the Resource Augmentation and Institution Building Phase. This 4-year period is the heart of the programme. This is when the watershed action plan (if approved

by the external agency towards the end of Phase I) is implemented. This is also when the institutions that provide the bedrock of the programme mature. The work done in this phase is evaluated periodically and the next release is made only in the event of a positive appraisal. The end of Phase II also involves developing the action plan for Phase III on the basis of techno-economic feasibility studies, involving comparative assessment of both technologies and market potential of various income-generating options.

Unfortunately, in most watershed programmes, the investment on the upper reaches is comparatively lower than on private lands. Food security and livelihoods of the poor has diminished because of the degeneration of natural resources. There is, therefore, need to adopt a strategy that regenerates these natural resources in order to provide a degree of food security to the poor. Expenditure on ridge area treatment on public land must be at least 25% of the total budget for watershed works. Special emphasis must also be given to work on lands of the poor and on livelihood enhancement activities for the landless and marginalised.

3.9.3 Phase III

Phase III may be termed the Sustainable Livelihoods and Productivity Enhancement Phase. In this 2-year phase the resources augmented and economic plans developed in Phase II are made the foundation to create new livelihoods and raise productivity levels. This is the Watershed Plus phase. Here income-generating activities such as lift irrigation schemes, livestock improvement, agro-processing units, medicinal plants, local natural resource based energy generation units, jatropha oil-processing units, etc. can be taken up. Detailed land-use planning can be attempted on private lands with drip irrigation. Farmers may also be encouraged to develop organic farms and links developed with export firms to fetch a stable market and competitive price.

This is the phase when exogenous inputs, including water, begin to play a greater role. But we must be careful in the degree of exogeneity. These inputs should be introduced in a manner that does not disturb the resilience and sustainability of the eco-system. Water, for example, may be lifted from nearby streams in Phase III but we certainly must not entertain proposals for inter-basin transfer of water within this programme.

In these activities, the subsidy element will be lower than in Phase II and bankability of activities will be attempted, increasing the loan element. Fernandez (2002) has argued that in MYRADA's experience it is possible to move to a combination of loans (through SHGs) for treatment of

private lands and subsidies for treatment of commons. This is a formulation that needs serious examination, especially for income-generating activities on private land.

At the same time, it is Phase III when local-level institutions mature and exit protocols become operative for the WDT and PM. SHGs are coalesced into Federations and begin to operate as CBOs, learning how to leverage public funds and bank loans for development of their area. The VWCs begin to use the WDF for repair and maintenance of structures created in Phase II.

The most important element of Phase III is the benefit that can accrue to the resource-deprived sections, such as the landless whose livelihoods can be placed on a firm footing in this phase through many value-addition activities as described in the section on the landless in Chapter 2.

It is important to clarify, though, that the classification of activities in Phases II and III must not be understood in a rigid manner. Many of the Phase III activities may well start in many watersheds during Phase II itself. Phasing of activities needs to have an internal logic and integrity that must flow through the entire action plan. Similarly, within a milli-watershed, the pace of implementation can vary across villages. This will depend on a host of factors such as the prevailing initial conditions, needs and possibilities in each village, response of the community, etc. Such flexibility must be built into the action plan.

3.10 Expenditure Heads and Norms

When the MoRD initiated its watershed programme in 1995 the upper limit of expenditure was Rs. 4000 per ha of land treated. At that time this was a 4-year programme. The per-year per-ha norm worked out to Rs.1000. This norm was raised by the Ministry to Rs. 6000 per ha with effect from 1 April 2000. At that point the duration of the programme was also increased to 5 years. The per-year per-ha norm, thus, rose to Rs. 1200 (Table 3.1).

In the course of our tour of watershed programmes across the country, we received repeated representations from various state governments (see Appendix III) urging an upward revision of the cost norm. We are now proposing that the programme be of an 8-year period and the norm be raised to Rs. 12000 per ha. The per-year per-ha norm becomes Rs. 1500. This rise of 25% over the figure for the year 2000 is certainly warranted by the annual rate of inflation (4%) in this period. To put it another way, if we take into account the rate of inflation between 2000 and 2006, the figure of Rs. 6000 per ha comes to Rs. 7500 per ha. This is for 5 years. For 8 years this figure comes to over Rs. 12,000 per ha. Also we must note that since the norm will

be frozen for 8 years, we are already discounting for inflation in this 8-year period. Finally, we must also remember that Rs. 12,000 is a maximal figure. The projects will be funded as per the actual cost of the action plan. The tendency of PIAs to simply multiply the area of the watershed with the per-ha norm is to be very strongly discouraged. The norm only sets a ceiling and is no way indicative of the actual budget, which must be determined on the basis of ground realities – the needs and possibilities inherent in each watershed.

TABLE 3.1: COST NORMS FOR WATERSHED TREATMENT

Year	Maximum expenditure norm per ha (Rs)	Duration of programme	Norm per year per ha (Rs)
1995	4000	4 years	1000
2000	6000	5 years	1200
April 1, 2006 onwards (proposed)	12000	8 years	1500

We are also proposing a separate head of expenditure – Impact Assessment, Monitoring and Research. As explained in detail earlier these are deeply neglected and extremely important aspects of the programme for which 2% of total expenditure can by no stretch of imagination be regarded as excessive. The importance of this head lies in the fact that releases will take place only if the report of the assessment is positive. Especially after the first phase of two years, it is likely that many projects are shut down if they do not come up to the mark. Thus, monitoring is to be given due time and resources, within the programme.

As compared to the Hariyali Guidelines we have increased the expenditure on training and community organisation (now termed institution building) from 5% to 8%, since these two are also highly neglected dimensions of the programme. This demand was placed before this committee by a large number of state governments (see Appendix III) and NGOs.

3.11 Time-table of Release of Instalments

At the start of	Works	Training	Institution Building	Impact Assessment, Monitoring and Research	Admini-stration	Total	Total VWC	Total MWC for 4000 ha watershed	Maximum Rs (lakhs)
Year 1	0%	1%	1%	0%	1.00%	3%	0%	3%	14.40
Year 2	10%	1%	1%	0.50%	1.50%	14%	10%	4%	67.20
Year 3	20%	1%	1%	1%	3%	26%	20%	6%	124.80
Year 4	0%	0%	0%	0%	0%	0%	0%	0%	0%
Year 5	30%	1%	1%	0.50%	2.50%	35%	30%	5%	168.00
Year 6	0%	0%	0%	0%	0%	0%	0%	0%	0%
Year 7	20%	0%	0%	0%	2%	22%	20%	2%	105.60
Year 8	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	80%	4%	4%	2%	10%	100%	80%	20%	480.00

Release of funds for the MWC will take place at the beginning of years one, three, five and seven (see above table). Release of funds for the VWC will take place at the beginning of years two, three, five and seven. External monitoring will take place before year one, at the end of year one, two, four and six before release of each instalment. Each instalment will be used over a period of two years (except the one to the VWC for entry point activities at the beginning of year two, which will be used in year two).

3.12 Flow of Funds

Finances for the activities of NASDORA would be drawn from the Central and State Governments, various aid agencies, contributions from philanthropies and corporate houses, loans from financial institutions and people's own contributions. All funds meant for the watershed programme will be converged in the NASDORA. These funds will flow to the State Boards and from there to each DWDA. From the DWDA they will move to the VWC and the MWC. Funds for watershed works will move to the account of the VWC. The VWC Secretary and one member of the WDT will jointly operate the VWC Account. The money for "other expenses" of the watershed project will move to the account of the MWC. The PM who is the

Member-Secretary of the MWC and one member of the MWC will jointly operate the MWC Account.

Chapters 2 and 3 have summarised the lessons learnt and mid-term corrections required in the watershed programme in India. They have also provided an indication of the very many representations received by this committee in the course of its travels across the length and breadth of India as to the ways in which the Hariyali Guidelines need to be modified in the light of these lessons. These include representations from most of the state governments implementing the watershed programme (see Appendix III). In Chapter 4 we attempt the formulation of a new set of guidelines that attempt to do justice to the lessons learnt and the concerns expressed. It is our considered view that these new guidelines should henceforth steer the watershed programme in India.

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CHAPTER 4 FOUR

Neeranchal Guidelines for Watershed Development (2006)

4.1 NASDORA

The National Authority for Sustainable Development of Rainfed Areas (NASDORA) is a quasi-independent authority to manage the entire primarily Central Government funded watershed programme. The overarching goals of this Authority are to ensure access to safe drinking water to the local population, provide them sustainable livelihoods and secure freedom from drought for the vast rainfed regions of the country by 2020. The Authority is to address the challenge of bringing prosperity to these regions through the sustainable development of their natural resource base. NASDORA will identify, finance and monitor action programmes in a systematic and time-bound manner. It will adopt an enabling strategy of fostering, nurturing and identifying decentralized implementing structures/organizations, financing action programmes through such decentralized constellations and monitoring such programmes. To ensure freedom and flexibility in its functioning, NASDORA is registered as a Society under the Societies Registration Act, 1860.

An Apex Rainfed Areas Stakeholders Council provides overall policy support and guidance to the Apex Board and review the performance of NASDORA. It is chaired by the Prime Minister, with the Minister for Rural Development, the Minister of Agriculture and the Minister of Environment and Forests as Vice-Chairpersons. The CEO of NASDORA is the Member Secretary of the Council. The Council includes the Chief Minister of each state covered by NASDORA, Secretaries of the Ministries of Agriculture, Rural Development and Environment

and Forests, Government of India, eminent national and international experts on watershed management, representatives of facilitating agencies of high standing, and representatives of the farming community.

4.2 Applicability

These are the guidelines for the implementation at the district-level of the watershed development programme to be carried out under the aegis of NASDORA. New watershed projects shall be implemented in accordance with the Watershed Guidelines 2006 with effect from the date decided upon by the Government of India. Projects sanctioned prior to this date shall continue to be implemented as per the then existing Guidelines.

4.3 District Watershed Development Agency

A separate dedicated body will oversee the implementation of the watershed programme within each district. This body may be termed the District Watershed Development Agency (DWDA). The DWDA will be a branch of NASDORA at the district level. The DWDA will be answerable to the Zilla Panchayat (ZP). The action plans formulated by the DWDA will need the approval of the ZP. The DWDA will be headed by a full-time CEO. The CEO will sign a 5-year MoU with the ZP that will spell out well-defined annual goals, against which the performance of the CEO will be monitored each year by the Collector and ZP. The CEO will be competitively selected from the open market in a fully transparent manner. The CEO, DWDA could be a serving government officer on deputation, a person from the NGO or corporate sector or an independent professional. Preference will be given to women in appointment of the CEO, DWDA.

4.4 District Watershed Management Team

The CEO, DWDA in turn, will constitute a District Watershed Management Team (DWMT). This team will again comprise professionals competitively selected from the open market in a fully transparent manner. They would represent various disciplines involved in running a watershed programme, including *inter alia*, soil and water conservation, agricultural science, veterinary science/animal husbandry, social work, hydrogeology, life sciences, gender studies, management and accounts. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals. Preference will be given to women in appointment to the DWMT. The DWDA will sign a 5-year MoU with each member of the DWMT that will spell out well-defined annual goals, against which the performance of the

member will be monitored each year by the DWDA. The DWMT would be responsible for overseeing the implementation of the watershed programme in the district. They will select Project Managers (PMs) for each milli-watershed. They will also provide to each PM/Watershed Development Team (WDT) technical assistance, capacity building inputs, field support, commission monitoring and evaluation of projects, impact assessment studies, and ensure complementarity and convergence of work undertaken at different milli-watersheds within the district.

4.5 Objectives

The objectives of watershed projects will be:

1. Harvesting rainwater for drinking water security, protective irrigation, plantations, pasture development, fisheries, livestock development and other means of sustainable livelihoods.
2. Employment generation, poverty alleviation, redressal of socio-economic and gender-based inequalities, community empowerment, human development and sustainable economic development of the rural areas.
3. Mitigating the adverse effects of extreme climatic conditions such as drought and desertification on crops, human and livestock population for the overall improvement of rural areas.
4. Restoring ecological balance by harnessing, conserving and developing natural resources, i.e., land, water and biomass.
5. Encouraging village community, Gram Panchayat and Gram Sabha to develop local institutional mechanisms towards sustained community action for the operation and maintenance of assets created and sustainable development of the potential of the natural resources in the watershed.
6. Promoting use of simple, easy and affordable technological solutions and institutional arrangements that make use of, and build upon, local technical knowledge and available materials.

4.6 Milli-Watersheds

The DWMT will identify the remaining untreated milli-watersheds in the district, ranging from a minimum of 4,000 to a maximum of 10,000 ha. Since Village Watershed Committees (VWCs) within each Gram Panchayat are to be the ultimate implementing agency, the final

selection of implementation area must be according to the Gram Panchayat boundaries, to which milli-watershed boundaries are to be approximated. These milli-watersheds will comprise a number of micro-watersheds that ideally should be but need not necessarily be absolutely contiguous to each other. The micro-watersheds may lie within a sub-basin of 25,000 ha.

4.7 Criteria for Selection of Villages/Watersheds

The following criteria may broadly be used in selection of the villages/watersheds:

- Acute drinking water scarcity
- Gross irrigated area not higher than a certain percentage of gross sown area (this percentage may be fixed by each state government for each district, after taking into account the specific circumstances in each case – but a definite figure must be fixed in every district). The figure may be higher in case dependability of rainfall is low and if the main source of irrigation is rain-dependent groundwater.
- High incidence of poverty and backwardness in human development indicators
- Actual wages are significantly lower than the minimum wages
- Large population of SCs/STs
- Willingness of village community to make voluntary contributions, enforce equitable social regulations on use of common property resources, equitable distribution of benefits, gender equality, as also create arrangements for the operation and maintenance of the assets created.
- Positive history of women's agency and community action
- A preponderance of non-forest wastelands/degraded lands
- A preponderance of common lands
- Watershed which is contiguous to another watershed that has already been developed/ treated

4.8 Milli-Watershed Council

At the milli-watershed level there will be a Milli-Watershed Council (MWC) that will consist of nominated members (one man and one woman, at least one of whom should be SC/ST) from each VWC within the milli-watershed (see section 4.12). The members from each VWC will have a fixed tenure of two years and will change by rotation. The MWC will also have the

following as members – representative of the local MLA, one representative each from the WDT (see section 4.10) and Janpad (block) Panchayat, representative of the CEO Janpad (block) Panchayat, representative of the SDO (Forest), as also all the Gram Panchayat presidents/ sarpanches/pradhans within the milli-watershed. The PM will be the Member-Secretary of the MWC. The MWC is the Stakeholders Council at the milli-watershed level. It is an advisory body that will give overall direction to the programme. It will also help resolve conflicts that may arise across micro-watersheds. It will monitor and review progress and carry out social audits of the programme. Each MWC will be registered with the DWDA.

4.9 Project Managers

Once the milli-watersheds are demarcated, the DWMT will constitute a Search Committee that will select PMs for each of these milli-watersheds. The PMs will be competitively selected from the open market in a fully transparent manner. They will sign a 5-year MoU with the DWDA that will spell out well-defined annual goals, against which the performance of each PM will be monitored each year by the DWDA. PMs will be professionals with experience of implementing watershed projects. They could again be serving government officers on deputation, persons from the NGO sector or independent professionals. Preference will be given to women in appointment of PMs. These PMs would be in-charge of overseeing implementation of each milli-watershed project.

4.10 Watershed Development Team

Each PM will constitute a WDT at the milli-watershed level. Each WDT should have at least four members – from veterinary science/animal husbandry, civil/agricultural engineering, agriculture/life sciences and social sciences. At least one member of the WDT should be a woman. PMs should be encouraged to constitute all-women WDTs or at least maximise the number of women in the WDT. For larger milli-watershed there could be more members in the WDT as per need. Preferable qualification for a WDT member should be a professional degree. However, the qualification can be relaxed in deserving cases keeping in view the practical field experience of the candidate. In case the PM belongs to an NGO, the latter will be at liberty to either earmark its own staff exclusively for the WDT, or engage fresh candidates through open market competitive selection. Only those NGOs will be eligible who have done quality work and have requisite experience in implementing watershed development or related NRM programmes in rural areas. The quantum of funds handled by the NGO in the last 3 years will also be taken into account by the DWDA. The NGOs blacklisted by CAPART or other

Departments of State Government and Government of India should not be considered. The WDT shall be located as close as possible to the milli-watershed.

4.11 Roles and Responsibilities of the WDT

The WDT will guide the VWC in the formulation of the watershed action plan. The WDT members must undergo rigorous training at one of the designated Support Voluntary Organisations (SVOs)/Master Trainer Organisations (MTOs) (see section 4.20). These SVOs/MTOs will provide continuous field-support to the WDT throughout the duration of its work. The WDT will perform the following functions:

1. conduct the participatory baseline survey
2. collect all secondary data, including thematic maps, pertaining to the watershed
3. help the VWC identify sites and activities to be taken up under the plan
4. mobilise the Women's Watershed Council (WWC) (see section 4.15) to ensure that the perspectives and interests of women are adequately reflected in the watershed action plan. It must be ensured that decisions of the WWC are incorporated in the watershed plan.
5. help the VWC in identifying beneficiaries for the programme based on considerations of equity and social justice
6. form and manage User Groups and Self-Help Groups (SHGs)
7. undertake community organization and training for the village communities, with special emphasis on women members of the VWC
8. help the VWC develop protocols for voluntary contributions for different activities
9. help the VWC thrash out resource-use agreements, especially for common property resources, reflecting considerations of equity and sustainability
10. encourage adoption of low-cost technologies and build upon indigenous technical knowledge
11. develop a sustainable surface water and groundwater management plan for the watershed
12. put in place impact assessment protocols
13. undertake engineering surveys for structures to be built

14. prepare technical drawings and cost estimates for each structure
15. work out sustainable livelihood options based on the needs and possibilities within the watershed
16. presentation of the watershed action plan in the meeting of the Gram Sabha
17. marshal external technical support for the project
18. supervise watershed development activities
19. facilitate conflict-resolution by developing appropriate principles and institutional mechanisms for the same
20. inspect and authenticate project accounts
21. develop protocols to ensure that the Schedule of Rates (SoR) is used in a manner that leads to both requisite productivity of labour and payment of minimum wages
22. ensure that regular research inputs are built into the project
23. prepare six-monthly progress reports
24. arrange for physical, financial and social audit of the work undertaken
25. monitor and review the overall project implementation
26. set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

4.12 Village Watershed Committee

Each milli-watershed will consist of a number of villages. For each village there will be a VWC that will implement the watershed project with the technical support of the WDT in their village. The VWC will be a committee of the Gram Panchayat that will be elected at a meeting of the Gram Sabha. Each VWC should have a maximum of 20 members. It must mandatorily have at least 50% members as women and at least 33% SC/ST community members. The VWC must also ensure that each hamlet gets a representation proportionate to its size. It should include 3-4 members each from User Groups and SHGs and one member each from the Gram Panchayat and the WDT. Representation must also be given to the landless, with a minimum of two members being accommodated in the committee.

The formation of the VWC must be a gradual process. The VWC must grow organically from its constituents, the User Groups and the SHGs over the first year of the project. Great care must be taken in its formation. It should ideally be constituted towards the end of the first year. Funds begin to flow to the VWC only from the second year onwards.

Each VWC will be registered with the DWDA. The VWC will be answerable to and work under the control of the Gram Sabha. In States where there are Ward Sabhas (Palli Sabhas, etc.) and the area to be treated is within that Ward, the Ward Sabha may perform the duties of the Gram Sabha. In 6th Schedule areas, where traditional Village Councils are functioning instead of Gram Panchayats, these Councils may be assigned the responsibilities of the Gram Panchayats/ Gram Sabhas. In cases, where there is neither a Gram Panchayat nor the traditional Village Council, social accountability of the VWCs will be affixed through regular social audits in the area, in front of village assemblies.

4.13 Secretary of VWC

The Secretary of the VWC will be the paid CEO of the VWC. She/he will in no event be the Panchayat Secretary. She/he will be selected by the WDT on the basis of merit and experience. Preference will be given to women candidates. The appointment of the Secretary of the VWC will have to be approved in the meeting of the Gram Sabha.

4.14 Roles and Responsibilities of the VWC

The VWC shall carry out the day-to-day activities of the project and will be responsible for coordination and liaison with the WDT and the DWDA to ensure smooth implementation of the project. The VWC Secretary (along with a few paid “volunteers”) will ensure that the VWC effectively carries out the following functions:

1. guide and participate actively in the baseline survey
2. guide and participate actively in identification of sites and activities to be taken up under the plan
3. actively interface with the WWC (see section 4.15) to ensure that the perspectives, perception and interests of women are adequately reflected in the watershed action plan
4. guide and participate actively in identification of beneficiaries for the programme based on considerations of equity and social justice

5. guide and participate actively in formation of User Groups and SHGs
6. develop protocols for voluntary contributions for different activities
7. thrash out resource-use agreements, especially for common property resources, reflecting considerations of equity and sustainability
8. enforce regulations on tubewells that restrict use of new tubewells only for drinking water and permit their use for irrigation only by groups of farmers, not by individuals
9. facilitate conflict-resolution by developing appropriate principles and institutional mechanisms for the same
10. supervise watershed development activities
11. guide and actively participate in transparent payments to labour
12. inspect and authenticate project accounts
13. arrange for social audit of the work undertaken
14. help the WDT set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

4.15 Women's Watershed Council

To facilitate real participation of women, a separate WWC will be formed within each village. The duty of the WDT will be to mobilise women to actively participate in meetings of the WWC and give requisite weight to women's perceptions and priorities in the formation of the watershed action plan. Every effort must be made to ensure that the decisions of the WWC are incorporated in the watershed action plan finally devised by the VWC. It should be ensured that the WWC acts as an effective watch-dog protecting women's interests during the implementation of the action plan. Similar arrangements may be worked out to give requisite weightage to the interests of the Dalits, Adivasis and landless wherever they are in a minority or where there is acute danger of their interests being overlooked.

4.16 Role of the Gram Sabha

The Gram Sabha has a critical role to play. It will be expected to perform the following functions:

1. elect the VWC as per the norms
2. guide the identification of beneficiaries for the programme based on considerations of equity and social justice
3. guide the development of protocols for voluntary contributions for different activities
4. guide development of resource-use agreements, especially for common property resources, reflecting considerations of equity and sustainability
5. facilitate conflict-resolution by developing appropriate principles and institutional mechanisms for the same
6. give final approval to watershed action plan for the village
7. conduct annual social audit of the programme
8. lay down procedures for the operation and maintenance of assets created
9. approve the activities that can be taken up with money available in the Watershed Development Fund (WDF).

4.17 Self-Help Groups

The VWC shall constitute SHGs in the watershed area with the help of WDT from amongst poor, small and marginal farmer households, landless/assetless poor, agricultural labourers, women, shepherds and SC/ST persons. As far as possible, preference will be given to all-women SHGs. These shall be homogenous groups having common identity and interest who are dependent on the watershed area for their livelihood.

4.18 User Groups

The VWC shall also constitute User Groups in the watershed area with the help of WDT. These shall be homogenous groups of persons most affected by each work/activity and shall include those having land holdings within the watershed areas. Each User Group shall preferably consist of women of the households who are likely to derive direct benefits from a particular watershed work or activity. The VWC with the help of the WDT shall thrash out resource-use

agreements among the User Groups based on the principles of equity and sustainability. These agreements must be worked out before the concerned work is undertaken. It must be regarded as a pre-condition for that activity. The User Groups shall be responsible for the operation and maintenance of all the assets created under the project through which they derive direct or indirect individual benefits. They will also be responsible for collection of user charges.

4.19 Duration and Phases of the Programme

The duration of the Programme shall be eight years, divided into three phases.

4.19.1 Phase I

Phase I (2 years) may be termed the Preparatory Phase of the programme. In this, the main activities will include:

1. Socio-economic and engineering participatory baseline ("beyond-PRA") surveys needed for preparation of action plan, selection of sites and beneficiaries and impact assessment. Every effort must be made to collect gender-disaggregated data to adequately reflect the situation and priorities of women.
2. Hydrogeological survey of the watershed to map out zones of potential groundwater recharge and potential sustainable groundwater utilisation
3. Putting in place impact assessment protocols
4. Capacity building at all levels
5. Building up network of technical support agencies
6. Preparation of the detailed watershed action plan, including activities to be carried out, selection of beneficiaries and work-sites and design and costing of all works
7. Ensuring that the interests, perceptions and priorities of women, Dalits, Adivasis and the landless are adequately reflected in the action plan. Institutions like the WWC will be developed for this purpose in this phase.
8. Working out in a participatory manner detailed resource-use agreements (for surface water, groundwater and common/forest land usufructs) among User Group members, based on principles of equity and sustainability

9. Working out in a participatory manner protocols for voluntary contribution for different types of activities and across different sections of the community, based on the principles of equity

10. Entry point activities focused on the urgent needs of the local communities such as drinking water. Activities that reflect the interest of women such as bio-gas plants, toilets and baths must be taken up in this phase.

11. Initiating the development of village-level institutions that are to form the backbone of the programme. These include VWCs, WWCs, SHGs and User Groups.

12. Evaluation of the action plan and work done in Phase I by an external agency towards the end of Year 2.

4.19.2 Phase II

Phase II (4 years) may be termed the Resource Augmentation and Institution Building Phase. This phase is the heart of the programme, when the watershed action plan (if approved by the external agency towards the end of Phase I) is implemented. This is also when the institutions that provide the bedrock of the programme mature. The work done in this phase is evaluated at the end of every year. The next release is made only in the event of a positive appraisal. The end of Phase II also involves developing the action plan for Phase III on the basis of techno-economic feasibility studies, involving comparative assessment of both technologies and market potential of various income-generating options.

4.19.3 Phase III

Phase III (2 years) may be termed the Sustainable Livelihoods and Productivity Enhancement Phase or the Watershed Plus phase. In this phase the resources augmented and economic plans developed in Phase II are made the foundation to create new livelihoods and raise productivity levels. Here income-generating activities such as lift irrigation schemes, livestock improvement, agro-processing units, medicinal plants, local natural resource based energy generation units, jatropha oil-processing units, etc. can be taken up. Detailed land-use planning can be attempted on private lands with drip irrigation. Farmers may also be encouraged to develop organic farms and links developed with export firms to fetch a stable market and competitive price.

In these activities, the subsidy element will be lower than in Phase II and bankability of activities will be attempted, increasing the loan element. At the same time, it is Phase III when local-level

institutions mature and exit protocols become operative for the WDT and PM. The VWCs begin to use the WDF for repair and maintenance of structures created in Phase II. The most important element of Phase III is the benefit that can accrue to the resource-deprived sections, such as the landless whose livelihoods can be placed on a firm footing in this phase through many value-addition activities.

The classification of activities in Phases II and III must not be understood in a rigid manner. Many of the Phase III activities may well start in many watersheds during Phase II itself. Phasing of activities needs to have an internal logic and integrity that must flow through the entire action plan. Similarly, within a milli-watershed, the pace of implementation can vary across villages. This will depend on a host of factors such as the prevailing initial conditions, needs and possibilities in each village, response of the community, etc. Such flexibility must be built into the action plan and is to be seen as a distinguishing feature of these guidelines.

4.20 Watershed Development Works

The VWC will prepare a detailed Action Plan for integrated development of the watershed area under the guidance of the WDT. The WDT should utilize various thematic maps relating to land and water resources development in the preparation and finalization of the Action Plan. This Action Plan shall necessarily mention the clear demarcation of the watershed with specific details of survey numbers, ownership details and a map depicting the location of proposed work/activities. After approval by the WWCs and Gram Sabhas, the PM shall submit the Action Plan for Watershed Development for approval of the DWDA. The DWDA shall appoint monitors (from its empanelled list of monitors) for the Pre-funding Appraisal of the action plan. The approved plan shall be the basis for release of funds, monitoring, review, evaluation, etc. by the DWDA, State Government and Central Government. The items, *inter alia*, that can be included in the Watershed Action Plan are:

1. Entry point activities focused on the urgent needs of the local communities such as drinking water. Activities that reflect the interest of women such as bio-gas plants, toilets and baths must be taken up.

2. Repair, restoration and upgradation of existing common property assets and structures (such as village tanks) to obtain optimum and sustained benefits from previous public investments and traditional water harvesting structures.

3. Ridge Area Treatment: All activities meant to restore the health of the catchment area by reducing the volume and velocity of surface runoff, including regeneration of vegetative cover in forest and common land, afforestation, contour trenching, contour and graded bunding, bench terracing, etc.

4. Drainage line treatment with a combination of vegetative and engineering structures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures, underground dykes, etc.

5. Development of water harvesting structures such as low-cost farm ponds, nalla bunds, check-dams, percolation tanks and other ground water recharge measures.

6. Nursery raising for fodder, fuel, timber and horticultural species

7. Land development including in-situ soil and moisture conservation measures like contour and graded bunds fortified by plantation, bench terracing in hilly terrain, etc.

8. Crop demonstrations for popularizing new crops/varieties, water saving technologies such as drip irrigation or innovative management practices

9. Pasture development either by itself or in conjunction with plantations

10. Veterinary services for livestock and other livestock improvement measures

11. Fisheries development in village ponds/tanks, farm ponds, etc.

12. Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio-fuel plantations, etc.

Unfortunately, in most watershed programmes, the investment on the upper reaches is comparatively lower than on private lands. Food security and livelihoods of the poor has diminished because of the degeneration of natural resources. There is, therefore, need to adopt a strategy that regenerates these natural resources in order to provide a degree of food security to the poor. Expenditure on ridge area treatment on public land must be at least 25% of the total budget for watershed works. Special emphasis must also be given to work on lands of the poor and on livelihood enhancement activities for the landless and marginalised.

The Action Plan for Phase III will be formulated towards the end of Phase II. An indicative list of activities to be taken up in this phase is provided in section 4.19.3.

The WDT, while drawing up the Watershed Action Plan should ensure that project works involve only low-cost, locally available technologies and materials, are simple, easy to operate and maintain. Emphasis should be on vegetative measures. Use of labour-displacing machinery should be discouraged. Drudgery-reducing devices may, on the other hand, be encouraged. While preparing the watershed treatment plan, the Gram Panchayats should give emphasis to rainwater-harvesting activities and undertake massive plantation works on community as well as private lands. Where private lands are involved, these should belong predominantly to SC/ ST and small/marginal farmers. Focus should be on employment and income-generation activities that benefit the rural poor in the watershed project area. Impounded rainwater could also be used for income-generating activities like fisheries.

4.21 Components of the Watershed Action Plan

While preparing the detailed action plan, technical requirements and feasibility of appropriate biophysical measures are to be carefully worked out by the WDT for long-term sustainable interventions for the entire area of the watershed. The Action Plan should specify, among others, the following:

1. Basic information on watershed including location, rainfall, temperature, topography, hydrogeology, soils, forests, demographic features, ethnographic details of communities, land-use pattern, major crops, irrigation, livestock, etc.
2. Problems typology of the watershed including an account of the major problems requiring intervention
3. Description of proposed interventions (physical and financial, including time-table of interventions)
4. Mapping of plan on Survey of India toposheets and cadastral maps
5. Institutional mechanisms and agreements for implementing the plan, ensuring emphasis on participatory decision-making, equity and sustainability of benefits, and post-project sustainability
6. Expected benefits

4.22 Training

Each state will have one or more (depending on training needs) SVOs who will help develop one or more MTOs at the district-level. MTOs will take up the responsibility of training WDTs

within the district. Each MTO could cater to the training and support requirements of about 5-10 new WDTs each year. These MTOs must have a proven record in terms of social mobilisation and technical competence. In selection of master trainers preference should be given to NGOs. The selection of these NGOs would be based on an assessment of their capacities and capabilities. In cases where NGOs are not available, government personnel should be developed as master trainers.

The WDT must also ensure that the VWC secretary, volunteers and other active VWC members are provided requisite training. Capacity building of WWC, User Group and SHG members and exposure visits for the VWC, WWC, Gram Panchayat and Gram Sabha members is also a must.

4.23 Impact Assessment, Monitoring and Research

Special allocation has been made under this head in these guidelines. The WDT must ensure that impact assessment and research become an integral part of the watershed programme. Regular monitoring of the project will have to be carried out at each stage. The WDT/PM shall submit a six-monthly progress report to the DWDA for further submission to the NASDORA through the State Government. Monitoring will be done every year by the DWMT, involving physical, financial and social audit of the work done. Monitors are to be seen not so much as inspectors but as facilitators. However, they will be very strict in ensuring that these guidelines are being followed. External monitoring by monitors from the list empanelled by the Monitoring Agency under NASDORA will be done before the release of every new instalment. Fund release will depend on a favourable report from the monitors. This will be a 3-member team of monitors. The team will include subject specialists (at least one from civil/agricultural engineering, one from plant sciences/veterinary science/animal husbandry and one from social science/social work/gender specialist/management/accounts). The payment to monitors for their TA/DA will be made from the allocation under this head within the project. At the end of the project a physical and financial completion report will be submitted by the PM/WDT to the DWDA. A post-project evaluation and impact assessment study will be commissioned by DWDA through NASDORA.

The following monitoring indicators may at least be borne in mind at each stage.

I. Phase I

I. A. Capacity Building of the WDT and the VWC

i) Technical Capacities of the WDT: The capacity building process of the WDT should be carefully assessed, including the number of training programmes undergone by WDT, place of training, duration of the training programme and the quality of training received.

ii) Social Orientation of the WDT: The sensitivity of the WDT towards the issues of participation and equity, especially with regard to women, landless and Dalits should be verified as reflected in the plan.

iii) Capacity Building of the VWC: The efforts made by the WDT to orient the VWC members on social and gender related issues and to technically empower the VWC should be assessed. Has special attention been given to empowerment of women members?

iv) On-the-spot Check of Action Plan: This needs to be done through site visits in which WDT and VWC members accompany the person evaluating and discussions are carried on around proposed structures. Typically, the team members could be asked (as an indicative set of questions) why they have chosen a particular intervention to be made on a particular site, what are the design parameters that they kept in mind, what dictated the choice of location, etc. They could also be asked to explain the process of costing and estimation of these structures.

v) Transparency in the Process of Action Plan Preparation: The degree of awareness in the villages about the action plan, the structures proposed and the agreements arrived at should be checked. The preparedness of the villages to implement the watershed action plan and agreements arrived at for benefit sharing, repair of structures and voluntary contributions should be checked.

I. B. Appropriateness of the Action Plan and Cost Effectiveness:

While assessing the appropriateness of an Action Plan the following aspects should be kept in mind:

i) The Action Plan prepared must reflect the felt needs of the area and must bring out a prioritisation of interventions on the basis of the identified needs. Methods used for identifying problems should be participatory and involving the needs of all classes of households in the watershed. It should be verified whether the choices made while preparing the plan reflect the genuine needs of the area.

ii) The components of the Action Plan must be carefully studied to see the impact they would make on the priority areas in the watershed. For instance, in a watershed where fodder scarcity has been identified as a priority area of intervention, the extent to which proposed activities of the Action Plan would augment fodder sources. Similarly, it should be checked whether the proposed plan for afforestation reflects the priorities brought out by tree ranking exercises, etc.

iii) Site selection (How well are proposed interventions suited to the sites selected?);

iv) Degree of involvement of community in deciding works to be taken up and site selection;

v) Degree of involvement of women in deciding works to be taken up and site selection;

vi) Choice of technology (including materials selected to be used in construction, designs, how far traditional knowledge has been used/built upon, how far employment generation is a priority, rather than machines being used);

vii) Technical assessment of design of works (FRL determination, settlement allowance, free board, design of weir, etc.);

viii) Technical assessment of costing of works and technical drawings (how the SoR has been used);

ix) Assessment of whether the Action Plan has given due weight to equity considerations while identifying beneficiaries (women, Dalits, Adivasis, landless and migrating households);

x) Assessment of whether the Action Plan has given due weight to considerations of women while identifying activities;

xi) Does the plan incorporate a sustainable surface water and groundwater management strategy?

xii) What plans have been developed for sustainable and equitable use of the commons?

xiii) Equity in benefit sharing (what arrangements have been worked out);

xiv) How holistic is the plan in terms of balance between ridge area treatment and drainage line treatment and in terms of its coverage of soil, water, forest, commons, private vs. public land, integration with dryland agriculture and allied activities such as livestock and pisciculture?

II. Phase II

II. A. Conformity to the Action Plan

During the implementation phase, it should be checked whether the Action Plan is proceeding in conformity with the original plan. However, we must allow flexibility in this provided that sound reasons are spelt out for the changes made.

II. B. Qualitative Aspects

More important than conformity per se is the quality of work done in terms of each of the technical and equity aspects mentioned in section I. B. earlier:

i) The most important structures have to be physically examined to ensure that the technical design and cost specifications have been met and the structure will provide expected benefits.

ii) Strength and functioning of village-level institutions such as User Groups, SHGs, VWCs, WWCs, MWC, etc. in terms of membership, regularity of meetings, quality of participation of women, Dalits, landless, etc.

iii) How far are equity and sustainability considerations being met? Have resource-use agreements been worked out? Are they being adhered to?

iv) Have the interests of women, Dalits and landless been protected? In what specific ways?

v) Has a way of using the SoR been worked out that allows special consideration for temperature, soil strata, women, disabled, aged?

vi) Have minimum wages been paid to the labourers working on construction sites? What are the norms followed in fixing wages to be paid? Have equal wages been paid to men and women?

vii) If there are voluntary community contributions, have their concept and practices been explained properly to village people?

viii) Has a groundwater management plan been made? Has it been adhered to?

II. C. Record Keeping

i) Have proper practices been followed in making payments, i.e., proper record of payments, etc.?

ii) Measurement books, receipt books, muster rolls, vouchers, etc.

II. D. Impact Assessment Indicators

i) water level fluctuations (well readings have to be taken for a selected number of wells 3 times a year: pre-monsoon – early June, post-monsoon – October, post-rabi – February). This data has to be studied over the years. The attempt is to finally arrive at some idea of the elasticity of the water table with regard to rainfall (%change in water table/%change in rainfall);

ii) drinking water security (including qualitative change in situation to be recorded through narrative case studies);

iii) changes in cropping pattern and intensity;

iv) changes in agricultural productivity;

v) changes in fodder and fuelwood availability;

vi) changes in the size and character of livestock holdings;

vii) status of grazing lands and their carrying capacity;

viii) employment generated (both revolving – person-days of work and sedimented – how many people can the same piece of land support);

ix) change in incomes for each household category, total and source-wise;

x) freedom from debt and reduction in the degree of dependence on money lenders (including qualitative change in situation to be recorded through narrative case studies);

xi) reduction in out-migration (including qualitative change in situation to be recorded through narrative case studies);

xii) reduction in the drought-vulnerability of the watershed (including qualitative change in situation to be recorded through narrative case studies);

xiii) number of SHGs, their coverage, savings, bank linkages (quantitative and qualitative aspects) and purposes for which loans are taken;

xiv) detailed case studies of specific farmers impacted by the project;

xv) photographic documentation of work and its impact;

xvi) learnings and process documentation (what can the experience teach the team and others about how the programme could be implemented better, mistakes, improvements possible, changes made, etc.)

III. Phase III

All the indicators of Phase II will apply in this phase as well. In addition there will be many new indicators:

III. A. Livelihood Options

For each of the livelihood options, assess:

i) Economic viability of the options proposed

ii) Forward and backward links developed

iii) How far do they build on the natural resource base of the area?

iv) Have considerations of equity and sustainability been kept in mind?

v) Were the people involved in formulation of the plans?

vi) How far were SHGs or SHG Federations involved in the plans?

III. B. State of SHGs and SHG Federations

i) What is the coverage of SHGs in terms of families in the watershed?

ii) How many SHGs have been linked to banks?

iii) What is the economic strength of the SHGs? (savings, loans, other products)

iv) Nature and strength of social and economic activities taken up by SHGs

v) Have Federations been formed? How many? (details of membership, activities, etc.)

III. C. Maturity of Village-level Institutions and Preparedness of Exit Protocol

i) How well are the various village-level institutions functioning? (regularity of meetings, participation of members, sense of ownership, degree of empowerment of members, etc.)

ii) What are the steps taken by the PM/WDT for exit protocol? Are they sufficient to enable exit?

4.24 Transparency and Accountability

Transparency and accountability under the programme would be promoted by various instruments and agencies as follows:

i) Preparation of the Action Plan by the VWC in a participatory manner in consultation with SHGs/User Groups/WWCs with the assistance of WDT members.

ii) Approval of the Action Plan at the open meetings of the Gram Sabha.

iii) Display of approved Action Plan on a Notice Board at the Gram Panchayat Office, Village Community Hall and such other community buildings.

iv) Review of physical and financial progress of work during implementation phase through annual Social Audits by the Gram Sabha. During the social audit, members of local civil society (social workers, teachers, journalists) and officials will be present apart from the members of the Gram Sabha.

v) Payment to labourers directly and openly at work-sites with certification by VWC/ Gram Panchayat members and through cheques wherever possible.

4.25 Continuing, Diminishing Presence of WDT

While preparing the detailed Action Plan for Phase III, the VWC, under the technical guidance of WDT, shall evolve proper Exit Protocol for the watershed development project. The Exit Protocol needs to be understood as a strategy for continuing, diminishing presence for the PM/ WDT that may continue to assist the village community in certain areas, while withdrawing from others. The Exit Protocol shall specify a mechanism for maintenance of assets created, augmentation including levy and collection of user charges, utilization of the WDF, etc. Mechanism for equitable distribution and sustainability of benefits accrued under the watershed development project should also be clearly spelt out in the Exit Protocol.

4.26 Development of Forest Lands in Watershed Areas

Some watersheds may encompass, in addition to arable land under private ownership, forest lands under the ownership of State Forest Department. Since nature does not recognize artificial boundaries of forest and non-forest lands in any watershed, the entire watershed is to be treated in an integrated manner. The DWDA at the district level and the NASDORA at the state and

national level must evolve systems so that clearance under the Forest Conservation Act does not become a reason for long delays and associated bottlenecks. This is particularly true for tribal and hilly areas where large portions of the watershed may be forested. The state governments will pass clear and unambiguous orders to grant permission and create a facilitating environment for work in forest areas. Though the criterion for selection of watersheds primarily remains predominance of non-forest lands, forest lands forming part of such watersheds may also be treated simultaneously as detailed below:

i. The Divisional Forest Officer concerned should give technical sanction for the treatment plans.

ii. The treatment plans should as far as possible be implemented by the VWC in close coordination with the Village Forest Committees.

iii. The Micro-watershed Development Plan for the forest areas should be in conformity with the Forest Conservation Act and the approved working plan of the area.

iv. Where a large portion of the watershed is covered by forest lands, officials from the Forest Department may be encouraged to take up the work of PMs.

v. A forest official should invariably be included as a member of the WDT wherever forest land falls within the watershed.

vi. In hilly and mountainous watersheds such as found in the Himalayas eco-region, watersheds with up to 60 percent forest area should be considered for treatment. However, treatable area alone need be considered for financial allocations.

4.27 Funding Pattern

The cost norm is Rs. 12000 per ha. It may be noted that Rs. 12,000 is a maximal figure. The projects will be funded as per the actual cost of the action plan. The tendency to simply multiply the area of the watershed with the per-ha norm is to be very strongly discouraged. The norm only sets a ceiling and is no way indicative of the actual budget, which must be determined on the basis of ground realities – the needs and possibilities inherent in each watershed.

This amount shall be divided amongst the following project components subject to the percentage ceiling mentioned against each:

(i)	Watershed Development Works	80%
(ii)	Training	4%
(iii)	Institution Building	4%
(iv)	Impact Assessment, Monitoring and Research	2%
(v)	Administrative Overheads	10%
(vi)	Total	100%

Savings, if any, in the administrative costs can be utilized for undertaking activities under the other four heads, but not vice-versa. Purchase of vehicles, office equipment, furniture, etc., construction of buildings, and payment of salaries of government staff will not be permissible under administrative costs.

Cost estimates for each work item and project activity shall be worked out as per standard SoR approved by the State Governments in representative areas. Especially since a large proportion of funds being used for the programme come from the NREGS, every effort will be made to ensure that labourers are paid statutory minimum wages, even while ensuring that productivity norms are maintained.

4.28 Flow of Funds

The DWDA will move funds to the bank accounts of the VWC and the MWC. Funds for watershed works will move to the account of the VWC. The VWC Secretary and one member of the WDT will jointly operate the VWC Account. The money for “other expenses” of the watershed project will move to the account of the MWC. The PM who is the Member-Secretary of the MWC and one member of the MWC will jointly operate the MWC Account.

The DWDA will be entitled to recover funds from any MWC/VWC or any responsible individual office-bearer and take appropriate action under the law if the project is not properly implemented or funds are misutilised or not spent as per these Guidelines.

4.29 Time-table of Release of Instalments

At the start of	Works	Training	Institution Building	Impact Assessment, Monitoring and Research	Admini-stration	Total	Total VWC	Total MWC for 4000 ha watershed	Maximum Rs (lakhs)
Year 1	0%	2%	2%	0.50%	2.50%	7%	0%	7%	33.60
Year 2	10%	0%	0%	0%	0%	10%	10%	0%	48.00
Year 3	20%	1%	1%	1%	3%	26%	20%	6%	124.80
Year 4	0%	0%	0%	0%	0%	0%	0%	0%	0%
Year 5	30%	1%	1%	0.50%	2.50%	35%	30%	5%	168.00
Year 6	0%	0%	0%	0%	0%	0%	0%	0%	0%
Year 7	20%	0%	0%	0%	2%	22%	20%	2%	105.60
Year 8	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	80%	4%	4%	2%	10%	100%	80%	20%	480.00

Release of funds for the MWC will take place at the beginning of years one, three, five and seven (see above table). Release of funds for the VWC will take place at the beginning of years two, three, five and seven. External monitoring will take place before year one, at the end of year one, two, four and six before release of each instalment. Each instalment will be used over a period of two years (except the one to the VWC for entry point activities at the beginning of year two, which will be used in year two).

4.30 Procedure of Release of Instalments

External monitoring by monitors from the list empanelled by the Monitoring Agency under NASDORA will be done before the release of every new instalment. Fund release will depend on a favourable report from the monitors. While the first instalment shall be released along with the Project Sanction, further instalments shall be released when the unutilized balance is not more than 50% of the previous instalment released. The relevant release proposal should be submitted by the DWDA to NASDORA, through the State Government, along with Progress Report and Audited Statement of Accounts. In addition, proposal for release of next instalment shall be supported by details concerning village-wise area taken up for treatment, Project Profile,

Action Plan approved by DWDA and other documents called for as and when necessary. The DWDA shall release funds to the VWCs and MWCs within 15 days of receipt of funds from the Central and State governments.

4.31 Watershed Development Fund

One of the mandatory conditions for selection of villages in Watershed Development Programmes is people's contribution towards WDF. The contributions to WDF shall be a minimum 10% of the cost of works executed on individual lands. However, in case of SC/ST and persons identified BPL, the minimum contribution shall be 5% of the cost of works executed on their lands. Contribution to the Fund in respect of community property may come from all the beneficiaries, which shall be a minimum of 5% of the development cost incurred. It should be ensured that the contribution comes from the beneficiary farmers and is not deducted from the wages paid to the labourers who are engaged to treat the private lands. These contributions would be acceptable either in cash/voluntary labour or material. A sum equivalent to the monetary value of the voluntary labour and materials would be taken from the watershed project account and deposited in this Fund. User charges, sales proceeds and disposal amounts of intermediate usufructory rights shall also be deposited in the WDF.

The Secretary, VWC shall maintain a completely separate account of the income and expenditure of the WDF. Rules for operation of the fund should be prepared by the VWC and ratified by the Gram Sabha. The fund should be operated by 3 persons, one of whom must be a woman, one a member of the Gram Panchayat and one from a Dalit/Adivasi/landless family. These people should be selected in a meeting of the Gram Sabha. After completion of Phase II, at least 50% of the funds shall be utilized for maintenance of assets created on community land or for common use under the project. Works taken up for individual benefit shall not be eligible for repair/maintenance out of this Fund. The remaining money may be used as a revolving fund to advance loans to the villagers of the project area who have contributed to the fund. Individuals as well as charitable institutions should be encouraged to contribute generously to this Fund.

4.32 User Charges

The Gram Panchayat through the VWC shall impose user charges on the User Groups for use of common utilities like water for irrigation from village tanks/ponds, grazing from community pastures, etc. While one-half of the user charges so collected may be credited to the WDF for maintenance of assets of the projects, the remaining one-half may be utilized by the Panchayat for any other purpose as it may deem fit.

4.33 Convergence of Programmes

As the Watershed Development Programmes aim at holistic development of watershed areas, the convergence of all other non-land based programmes of Government of India, would enhance the ultimate output and lead to sustainable economic development of the village community. The DWDA, therefore, shall take all possible measures to ensure convergence of other programmes such as the Swarnjayanti Gram Swarozgar Yojana, the Indira Awas Yojana, the Total Sanitation Campaign and the Rural Drinking Water Supply Programme in the villages chosen for the implementation of the watershed development projects. It would also be worthwhile to converge programmes of similar nature of the other Ministries, e.g., Health and Family Welfare, Education, Social Justice and Empowerment, as also of the State Governments, in these villages.

4.34 Credit Facility

The DWDA shall explore and encourage availing of credit facilities provided by banks or other Financial Institutions by the SHGs, User Groups, Panchayats and individuals for further developmental activities in watershed areas.

4.35 Special Areas

The Parthasarathy Committee has identified a number of areas where the watershed approach as outlined in the present guidelines may not be exactly feasible for implementation. The Committee has suggested alternative mechanisms to suitably introduce special provisions in the Guidelines for Watershed Development. The Committee has suggested that special sub-committees may be set up by each concerned state government, which may be entrusted with the task of formulating precise guidelines that need to be adopted in each of these regions. More such regions may also be identified and approval sought for special treatment in the manner indicated by the Parthasarathy Committee. Eligibility of areas for this special status will be decided by NASDORA at the national level.

4.36 Queries

Queries may be addressed to the following:

1) At the District level: CEO, DWDA
2) At the State level: CEO, State Board, NASDORA
3) At the National level: CEO, NASDORA

CHAPTER FIVE

Possible Interventions in Areas where Current Watershed Approach may Require Modification

One of our terms of reference is "to identify the areas under DPAP, DDP and IWDP where existing watershed approach is not feasible for implementation and suggest alternative mechanism to suitably introduce special provisions in the Guidelines for Watershed Development". In this chapter we provide an indicative list of areas that fall under such a category. We summarise the unique features of these regions and also provide an indication of why special provisions are required here. To take what we have done in this chapter forward, special sub-committees may be set up by each concerned state government, which may be entrusted with the task of formulating precise guidelines that need to be adopted in each of these regions. More such regions may also be identified and approval sought for special treatment in the manner indicated in this chapter.

The NBSS-LUP has further divided the AERs referred to in Chapter 1 into AESRs (agro-ecological Sub-regions). We have identified 8 such AESRs and drawn upon the large body of work in India that could provide clues as to the specific approach that needs to be tried in these eco-fragile, special problem areas. These regions form 19% of India's land area. Table 5.1 provides a synoptic view of these regions. In addition to these areas, we have also included a special section on India's North-East region. Some reasons for modification in watershed guidelines are given in Table 5.2.

TABLE 5.1: AGRO-ECOLOGICAL SUB-REGIONS WHERE WATERSHED GUIDELINES NEED MODIFICATION

AESR	Code	Bio-Climate	Topography	Soils	Length	Location of Growing Period (GP) (Days)	Major	Focus of Intervention
1.1 and 1.2	A13Eh1 A13E2	Cold Arid	Plateaus and valleys	Shallow Skeletal Soils	60-90	Western Himalayas (Ladakh Plateau) and Spiti	Severe climatic Valley limitations, short GP and low AWC of soils	Improving the soils system and selecting tree component in the Valley areas
2.1	L12 Eh1	Extremely Arid	Mildly undulating	Desert and Saline Soils	<90	Western Rajasthan	Drinking Water (DW)	Rainwater Harvesting
4.4	I6 Dm4	Semi-arid	Ravinous	Mixed red and black	120-150	Chambal basin in UP, Rajasthan and MP	Severe land degradation	Ravine stabilization and reclamation
5.2	I5 Dm4	Semi-arid	Flat	Medium and Deep Black Soils	150-180	Central Highlands with Deccan Trap Formations	Over-extraction of Ground-water	Groundwater Recharge
5.3	L7 Dm4	Semi-arid	Coastal Saline	Coastal Alluvium derived Soils	90-120	Coastal Areas of Gujarat	Severe Salinity	Protection of DW sources and deep aquifers
9.2	N8 Cd5	Sub-humid	Undulating	Alluvium Derived soils	180-210	South Bihar Plains	High runoff and Floods	Ahar Pyne System
12.3	J2 Cd5	Sub-humid	Hilly	Red and Lateritic Soils	180-210	Eastern Plateau and Northern Hills of Chhattisgarh	High Potential but High Poverty	Livelihood Diversi-fication
13.1	O8 Cd6	Sub-humid	Flat	Alluvium	180-210	North Bihar derived soils	Water-logging	Development of Drainage Systems
14.1	A15 B9	Sub-humid	Mountainous	Brown Forest and Podzolic Soils	180-210+	Western Himalayas	Landslides and Excessive Drainage	

AESR	Area (mha)	% in India's Land Area	Rainfall (mm)	PET (mm)	Moisture Index (%)
1.1 & 1.2	15.2	6.3	100-800	700-800	(-)80 to (-)90
2.1	12.3	3.7	100-300	1700-2000	(-)80 to (-)90
4.4	5.9	1.7	800-1000	1400-1600	(-)30 to (-)40
5.2	14.0	4.3	800-1000	1500-1800	(-)35 to (-)49
5.3	0.9	0.3	500-800	1800-1900	(-)66 to (-)68
9.2	8.3	2.5	700-1000	1300-1500	(-)20 to (-)26
12.3	5.6	1.7	1200-1600	1400-1600	(-)03 to (-)22
13.1	9.9	3.0	1200-1500	1400-1600	(-)17 to (-)09
14.1	6.1	1.8	1400-1500	1400-1600	(-)20 to (-)23
Total	78.2	25.3			

Source: NBSS-LUP (1999)

TABLE 5.2: REASONS FOR MODIFICATION IN WATERSHED GUIDELINES

AESR	Region	Existence of Traditional Systems	Atypical Land Situation	Non-applicability of the conventional Ridge to Valley Principle	Need for Higher per Hectare Investment Norm	High Poverty & Low Human Develop-ment
1	Cold Arid Region	✓	✓	✓	✓	✓
2.1	Desert Rajasthan	✓	✓	✓	✓	✓
4.4	Chambal basin in UP, MP & Rajasthan		✓	✓	✓	
5.2	Central Highlands		✓	✓		✓
5.3	Gujarat Coastal		✓	✓	✓	✓
9.2	South Bihar Plains	✓			✓	✓
12.3	Eastern Plateau and Northern Hills	✓	✓		✓	✓
13.1	North Bihar Plains	✓	✓	✓	✓	
14.1	Western Himalayas		✓		✓	✓
15.2-15.4, 16.3, 17.1-17.2	North-East	✓	✓	In some parts	✓	✓

5.1 Ladakh Plateau and Spiti Valley[47]

AESR	1.1 and 1.2
Bioclimate	Cold Hyper Arid
Soils	Shallow Skeletal Soils
LGP	60-90 Days

5.1.1 The Region

The area includes Ladakh in Jammu and Kashmir and Spiti Valley of Lahaul and Spiti districts besides Pooh sub-division of Kinnaur district in Himachal Pradesh. They constitute 12.64 mha. While considering the cold deserts, besides improving and maintaining the crop production and the existing water harvesting systems, care should be taken while selecting tree component in the valley areas. This is AER 1 of NBSS&LUP.

5.1.2 Traditional Water Harvesting Systems

Much of the systems are traditional. The most important are *Kuhl / Gool* and Artificial Glaciers. Some details are as under.

- ★ *Kuhl / Gool:* The most important source of irrigation in NW Himalayan region is *Kuhl / Gool* (Natural gravity stream). Outflow from natural water springs is also diverted in some areas to grow vegetables. But natural springs are drying up due to human intervention. The *Kuhl / Gool* is lined with rocks to keep it free of clogging (Terrain is muddy). The length of the *Kuhl* varies from 1.0 to 15.0 km. It is trapezoidal in cross-section (0.1 to 0.2 m^2) with 15-100 litres/minute discharge. Each *Kuhl* leads to a circular tank in a village and provides irrigation to about 30 ha. Each family in the village would have a share in the irrigated area. There would be no subsequent division of land. Only the eldest son of the family inherits the irrigated area.

- ★ Artificial Glacier *(Kangris)*: This is an adaptation of using glacier water in Ladakh. Artificial glaciers are constructed by diverting water from stream towards terraces built at low mountain terrain. Small pipes of 12.7 mm diameter are laid on the bed of the channels, cross-wise at every 3.0 m interval to let the water seep. To tap more water dry bunds parallel to the water channel at 6-30 m distance are constructed

47 We gratefully acknowledge the inputs provided by J. Venkateswarlu (former Director, CAZRI) for this section.

depending on the slope. The entire catchment would freeze during winter. These artificial glaciers melt in early spring as they are located at much lower altitudes than natural glaciers. The melted water is diverted towards agricultural fields, thus enabling the farmers to take up earlier agricultural operations. They are cost-effective.

5.1.3 Changing Systems in Water Management

The changes in water management are shown in the following table (Table 5.3).

TABLE 5.3: SYSTEMS OF WATER MANAGEMENT

Area	Source of water	Traditional water managers	Remarks	Present status
Uttaranchal	*Kuhls* (unlined diversion channels from mountain streams or springs to farmlands)	Chowkidars or Kollahus or Tekedar	They are appointed by the gram sabha, generally for the kharif season.	Virtually the water managers vanished
			They ensure that all the farmers get their turn to grow a kharif crop.	Govt. took over the *Kuhls*, their chowkidar maintains
			Then the farmers themselves take care of the *Kuhls* during winter.	Govt. levy tax from the people
				Kuhls are reducing (e.g., Almora from 2,539 in 1998-99 reduced to 1,136 by 2003)
Ladakh	*Kangris* (water from glaciers) comple-mented with water from springs and marshals. This water is diverted through intricate earth channels.	Churpun	Appointed in rotation every year from among the younger generation; hand-on-experience is mandatory	Growing of potatoes replaced food crops
				Now Churpun is paid in cash and not in kind
			Rules for water distribution exists only in oral form	Prestige accorded to Churpun decreased
			Churpun diverts water if needed (e.g., to a dried-up field). He acts on an agreement (Kamgya) between him and the community	
			Mediating in conflicts, taking help of village head, if needed and being impartial	

There is a need to retrieve the old management systems.

5.1.4 Traditional Vegetation

Precious indigenous plants in the cold arid ecosystems include *Juniperus macropoda, Hippophae rhamnoides, Ephedra gerardiana, Hyoscyamus niger, Capparis spinosa, Rose webbiana, Rheum moorcrogtianum* and *Ribes orientale*. These have both medicinal and economic value.

5.1.5 Components of Watershed Plan

The present components in Watershed Development Programme are:

- Afforestation with fast-growing multipurpose trees (poplar and willow)
- Soil conservation against wind erosion
- Development of irrigation potential (repair of irrigation channels)
- Development of local livestock (small ruminants)
- Improving horticulture, agriculture and fisheries

5.1.6 The Need for a Change

- The present poplar and willow planting must be replaced with local plant species of medicinal and economic value (*vide supra).*
- The management of the irrigation systems must be handed over back to the people.
- Arable farming with protective irrigation is practiced and that too is possible only in the valley areas and during the thawing period. Besides improving productivity of crops, efforts should be made to produce vegetable seed under the supervision of the R&D agencies to fetch more income to the farm families.
- The pastures are very poor with low carrying capacity. Creating water bodies for use by livestock and social fencing may be useful in improving the carrying capacity of these pastures.
- The soil conservation may be limited to local knowledge systems.
- Plastic greenhouse for vegetable farming (as identified by Defence Laboratory) need to be encouraged.

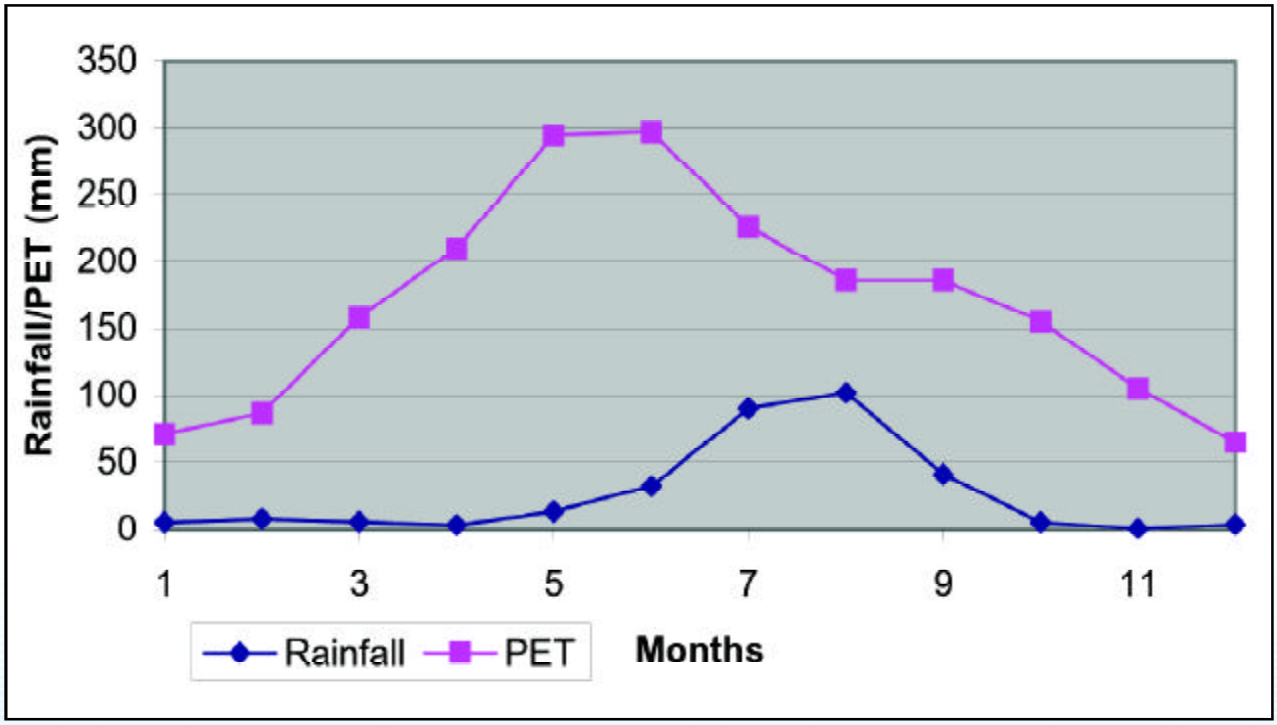
5.2 Western Rajasthan Desert

AESR	2.1
Bioclimate	Hot Arid
Soils	Desert and Saline Soils
LGP	<90 Days

This is the hottest region of AER 2. This region has a total area of 12.3 mha (3.7% of the country). This desert area of Western Rajasthan receives the lowest rainfall in the entire country (100 to 300 mm). This covers only 15% of the annual PET demand of 1800-2000 mm, leaving a huge deficit of over 1700 mm. August is the highest rainfall month but even in that month, PET is higher than rainfall (Figure 5.1). Moisture index varies from (-) 80 to (-) 90, suggesting that most of the area falls under hyper-arid conditions. Soils are dry during most of the year and the growing period of the region is less than 90 days.

Figure 5.1

Monthly Rainfall and Evapo-Transpiration in Western Rajasthan



Source: NBSS-LUP (1999)

Bajra is the main crop, covering about 70% of the area. Soils of the sandy plains are predominantly deep, calcareous and sandy with severe erosion. These soils occur on very gently to gently sloping dunes or inter-dunal plains (NBSS-LUP, 2000). The soils of inter-dunal plains also have inclusions of moderately deep, loamy soils with severe erosion and moderate salinity. This region has no perennial streams, Luni and Khaggar being highly seasonal. Scanty rainfall and sandy texture of soil produces very little or no runoff. Groundwater in shallow aquifers is highly brackish to saline and hence unfit for drinking. At places, bores with depth up to 60 to 80 metres yield good quality drinking water.

Analysis of long period rainfall in Western Rajasthan (Table 5.4) brings out its highly erratic nature. The coefficient of variation of annual rainfall is around 40%. Moreover, 32% of the years in this period have been low rainfall years. This shows that drought vulnerability in Western Rajasthan is as high as once in three years. In a drought year, drinking water becomes the most severe problem.

TABLE 5.4: ANALYSIS OF LONG PERIOD RAINFALL RECORDS FOR WESTERN RAJASTHAN, 1871-2000

Decade	Average Rainfall (mm)	Coefficient of Variation	No. of Low Rainfall Years (<80% of Average)
1871-1880	264.6	27%	10%
1881-1890	242.3	29%	30%
1891-1900	262.2	44%	30%
1901-1910	270.0	52%	40%
1911-1920	224.7	69%	50%
1921-1930	238.6	27%	30%
1931-1940	239.0	30%	30%
1941-1950	278.5	38%	30%
1951-1960	271.6	27%	20%
1961-1970	230.6	41%	40%
1971-1980	297.5	38%	40%
1981-1990	248.9	44%	30%
1991-2000	308.2	35%	30%
Average	259.7	39%	32%

Source: Indian Institute of Tropical Meteorology, www.tropmet.res.in

In the absence of substantial surface runoff to harvest through a conventional watershed approach, the focus of interventions in the deserts of Western Rajasthan has to be creation of artificial catchments around the traditional systems of water harvesting for drinking water security. We also need to adopt sustainable arid-zone agricultural packages and appropriate land-use systems for livelihoods.

5.2.1 Revival of Traditional Systems of Water Harvesting

Tankas

The major focus has to be on ensuring drinking water security to poor households to reduce their vulnerability during years of drought. The *tanka*, (or underground cistern located in the middle of a large circular area which is its "catchment") is a traditional method of rainwater harvesting in the Rajasthan desert. The "catchment" of the *tanka* is usually treated to augment runoff by providing a smooth, impervious floor to facilitate water flowing into the *tanka*. The treatments involve increasing land slope (a smooth gradient of 3 to 4 percent) and "plastering" the immediate catchment by compacting the soil, spreading and ramming a layer (5-7 cm) of materials such as silt from water harvesting structures, mooram, wood coal ash, gravel, etc. After the first shower this layer is compacted and made semi-impervious. *Tankas* have fallen into disuse with the arrival of groundwater-based, piped water supply system. Still, they are perhaps the only reliable source of drinking water in remote villages. Since almost all villages in the desert have traditional *tankas* on private and community land, work on revival of *tankas* can be replicated on a large scale. At a per capita norm of 20 litres per day, the *tanka* of a capacity ranging from 20,000 to 40,000 litres, can take care of the drinking water needs of 5 to 10 persons for 200 days in a year. *Tankas* are perhaps the cheapest and most effective method of providing drinking water to scattered desert settlements (*dhanis*). Construction of *tankas* has significant economic, social and gender-related implications. First, creation of decentralized drinking water structures has reduced the cost incurred by very poor families for purchasing water. With erratic supply of pipeline water, women of poor families had to go as far as 2-3 km to get water or depend on camel-carts or tankers. Such poor families typically used to pay Rs. 200 to Rs. 300 per month to camel-carts and tankers. This was indeed a huge financial burden for them. With the construction and repair of *tankas*, the money spent on the purchase of water has significantly reduced in many areas.[48] Second, construction of *tankas* for Dalit households reduced their caste-based discrimination. Third, from a gender perspective, the

48 An example is the OXFAM-supported project in Barmer.

biggest advantage of the drinking water intervention accrues to women. Collection of drinking water is normally the duty of the women. Easier availability of water reduces the drudgery of women's work.

However, for them to be effective, *tankas* have to be carefully designed, so that they fill to capacity even in a drought year. Given the high level of rainfall variability, the basic parameter for designing a *tanka* is the 60% ***dependable*** rainfall. Since much of the rainfall events in the desert are often of very low intensity, virtually no runoff is produced from such showers. The runoff coefficient for desertic soils is hardly 0.2 to 0.3. With these values for the dependable rainfall and runoff coefficient, the catchment area required to fill these structures needs to be worked out. The sizes of catchment recommended by the Central Arid Zone Research Institute (CAZRI) for *tankas* of capacities ranging from 20,000 to 40,000 litres in Barmer are given in Table 5.5.

TABLE 5.5: ARTIFICIAL CATCHMENT AREA TO BE CREATED FOR FULL CAPACITY UTILISATION OF *TANKAS*

Annual Rainfall (mm)	Dependability Factor	Dependable Rainfall (mm)	Runoff Coefficient	Capacity (Litres)	Catchment Area Required (sq.m.)	Diameter of Circular Catchment (m)
259	0.6	155.4	0.3	20000	429	23.38
259	0.6	155.4	0.3	30000	644	28.63
259	0.6	155.4	0.3	40000	858	33.06

Source: Vangani *et al* (1988)

Construction of such *tankas* would cost Rs. 12,000 to 15,000 at 2004 prices. Given the acute nature of the problem and the potential of the *tankas* to drought-proof households, such expenditure can easily be justified. At appropriate places, it is also possible to locate larger community *tankas*, catering to the needs of an entire *dhani*.

Nadi-Dighi-Khadin

The water stored in individual and even community *tankas* will, however, not be sufficient to meet other household needs or the drinking water needs of animals. When the drinking water requirement for animals is worked out at accepted norms (camels @ 50-60 litres per capita per day (lpcd), cattle @25-30 lpcd and goats and sheep @ 7-8 lpcd), the need will be far greater than availability through a *tanka*. It is necessary, therefore, to go for larger water storage structures such as community ponds (*nadi)* and lined farm ponds (*dighi)*. *Nadi* is constructed in

inter-dunal areas (where there is some surface water runoff because of underlying geological conditions), to harvest runoff and store it for drinking water needs of the community. These structures can be constructed and repaired under watershed programmes and used as community assets. *Dighi* is another traditional structure of the desert region, which dates back to the time of Emperor Shahjahan (1627-58 AD). A *dighi* is a square or semi-circular, step-reservoir. Washing or bathing is not allowed inside a *dighi* but people can take water for personal use, including drinking purposes. *Dighis* are usually of two capacities: 750 cum and 350 cum. The location of *dighis* should be such as to maximise the possibility of natural harvest of rainwater, in addition to creating the artificial catchment (a la *tankas*). In dune areas, locational factors include stability of dunes and wind direction. Appropriate technologies need to be adopted for dune stabilization (Narain *et al*, 2000). The sizes of artificial catchment recommended by CAZRI for *dighies* in Barmer are given in Table 5.6.

TABLE 5.6: ARTIFICIAL CATCHMENT AREA TO BE CREATED FOR FULL CAPACITY UTILISATION OF A *DIGHI*

Annual Rainfall (mm)	Dependability Factor	Dependable Rainfall (mm)	Runoff Coefficient	Capacity (Litres)	Catchment Area Required (sq.m.)	(ha)
249	0.6	149.4	0.3	350000	7809	0.78
249	0.6	149.4	0.3	750000	16734	1.67

Source: Vangani *et al* (1988)

Khadin (embankment built across slopes in agricultural fields) is another traditional structure of Western Rajasthan. It harvests water from small catchments and makes cultivation in the upstream side possible after water dries up. *Khadins* were devised in the 15th century by the Paliwal Brahmins, who developed a whole network of *khadins* in Jaisalmer. Around 500 *khadins* covering more than 12,000 ha are still to be found in Jaisalmer, Jodhpur, Barmer and Bikaner. *Khadins* make agriculture possible by conserving soil moisture. Another function they perform is the recharge of wells downstream. In fact, traditionally, wells would be located downstream of *khadins*, somewhat like an intake well. *Khadins* are a very location-specific intervention. They are best built at points where there exists an upstream drainage with a high surface water runoff potential and a flood-plain where soils can support crop production (Aggarwal and Narain, 1997).

5.2.2 Adoption of a Sustainable Agricultural Package and Land-use Systems

The climate of the arid zone is characterized by dry spells, extremes of temperature and scanty, uncertain and erratic rainfall. Net sown area constitutes 51% of total geographical area and fallows constitute nearly 30%. The average size of holdings here is as high as 8.73 ha. However, land productivity is very low (about 41% of the national average) on account of poor soil quality and low irrigation percentage (13%). Crop cultivation between trees and shrubs was a traditional practice of desert dwellers as cultivation of crops alone is a big gamble under erratic rainfall conditions. The area has very low groundwater availability and wherever it is available, the resource is heavily overused. Given the extremely arid nature of the eco-system and existence of large tracts of low productivity agricultural land, agro-forestry land-use systems are an absolutely priority intervention. Appropriate agri-horticultural model needs to be formulated to maximise the biomass yield per unit of land through tree and crop combinations and provide supplementary income to farmers. Species like *ber* (*Zizyphus mauritiana*) and *anwla* (*Emblica officinalis*) are being advocated by CAZRI. *Ber* intercropped with dals like mung bean and moth bean is one system, which has produced good result in similar conditions in CAZRI's experience. The optimum plant population of 200 plants at a spacing of 5 x 10 metres is proposed per ha. Time of plantation should be such that it is able to make use of whatever rainfall is available. Water-saving technologies like drip irrigation can be tried out in both plantations as well as in kitchen gardens. The model must have some provision for field bunding and fencing. It is possible to use the bund area also for tree plantation, which can also act as wind breaks.

Besides the water harvesting structures, the other important need is the control of the moving sand dunes (*barchans*). To address this serious ecological problem, CAZRI suggested vegetation (e.g., check-board) as a means to arrest the movement of sands. Over 50% of dunal area is with farmers. They need to adopt a massive shelter belt plantation, as most of the dunes are fixed or recently disturbed ones. The mobile dunes largely are that of the community or government and for their control, the origin of the moving sands must be identified (satellite imageries) and these must be treated with vegetation (silvi-pasture systems). Aerial seeding of palletized suitable grasses and tree species also can find a place. In Iran, spray of bitumen and establishing selected tree species (e.g., *Tamarix*) in such areas is in vogue.

There are quite a few traditional systems of addressing the problem of moving sands. One is use of micro-wind breaks through the use of locally available shrubs and brushwood species. The local species are collected and thrust into the loose sand, crownside down, in 2-5 m wide rows.

This checks the wind velocity over the treated part. This is in vogue in Barmer, Bikaner and Jaisalmer districts. Similarly strip cropping of crops like pearl millet and cluster bean with *sewan* grass in the low rainfall (<200 mm) is suggested. In the Shekhawati region, large size bunds are set up protected by multipurpose grasses like *Saccharam munja*. All such systems need to be a part of the Watershed Development Programme in these regions.

Thus, the principles of NRM in hot and cold arid systems include the following:

- Focus on revival/strengthening of traditional water harvesting systems for (a) drinking water; and (b) irrigation with increased water-use efficiency.
- Address the soil conservation related issues with the local knowledge systems as a start point. Identify critical areas and initiate action in their correction.
- Choice of vegetation to be guided by the primary stakeholders. The tree choice must be of multipurpose local species.
- Similarly, vegetable farming, with the help of even plastic green house, must be an integral part of the watershed programme in cold arid areas.
- Livestock (small ruminants and cows) along with improved silvi-pasture systems supported with water bodies must be encouraged.

5.3 Chambal Basin (Ravines)[49]

AESR	4.4
Bioclimate	Semi-arid Hot
Soils	Mixed Red and Black Soils
LGP	150 to 180 Days

Ravines are a result of gully formation within unconsolidated, relatively loosely bound material such as soft sediments. Network of gullies along riverbanks particularly Yamuna, Chambal, Mahi, form extensive ravines, which is one of the worst forms of land degradation. National Commission on Agriculture (1976) estimated that India has 3.67 mha of ravine lands constituting 1.12% of total geographical area. Ravines are an inherently unstable dynamic system, formed by the simultaneous erosion and deposition actions of runoff water. Every year during floods, the backwaters spread in the drainage system for a few days. Rainwater loosens the soil and erodes the ravine slopes. This silt is in turn deposited in the ravine bed causing further shifts in

49 We gratefully acknowledge the inputs provided by K.G. Vyas, Senior Adviser, National Centre for Human Settlement and Environment, Bhopal for this section.

the drainage lines and even more erosion of land area. Further, once formed the ravine has a tendency for *headward expansion* at the source-end of the gully, which ingresses further into existing agricultural land. The village people often say that they keep shifting their houses and agricultural land, but ravines chase them wherever they go. This headward movement of ravines poses a permanent threat to agricultural land and existing infrastructure such as canals, roads, railway lines and communication systems.

5.3.1 Water Management in Ravine Areas

Identification of drainage lines is extremely difficult in a ravine area and hence defining a watershed is a big problem. Moreover, structural treatment measures like gully plugs often lead to shifting of drainage lines causing more erosion. Ravines are a landform that develops due to the operation of natural agents (soil and water) on a highly erodable land surface. However, their development is further facilitated by deforestation particularly near riverbanks, excessive grazing pressure and unsustainable agricultural practices. Ravines are usually shallow at their point of origin, gradually becoming wider and deeper as they move down the slope. Studies have shown a positive correlation between the size of the ravine and (a) the overall hydraulic gradient; and (b) the concentration of overland flow. Thus, it is necessary to regulate the hydraulic gradient by land levelling and reduce the concentration of overland flow. The valley portions in ravinous areas have lower bed slopes, huge silt deposits and waterlogging due to poor drainage. From the treatment point of view, ravines can be classified into three categories (Table 5.7):

TABLE 5.7: CLASSIFICATION OF RAVINES

	Shallow	Medium	Deep
Depth (m)	1-3	3-9	>9
Bed Width (m)	0-9	9-18	> 18
Side slope (%)	Varies	6-12	>12

- Shallow ravines, with depth 1 to 3 metres and a bed width of 0-9 metres, usually in the ridge areas. These can be treated and recovered for cultivation;
- Medium ravines with depth 3 to 9 metres and bed width of 9 to 18 metres. The focus of intervention here should be to prevent their spread by controlling headward erosion;

- Ravines with width more than 9 metres and bed width more than 18 metres, usually found near the rivers. As they are too big to be either recovered or controlled, the focus of intervention must be to stabilise the inward slopes of the ravines so that further erosion and deposition downstream does not take place.

5.3.2 Treatment Measures in Ravine Areas

1. Extensive catchment area treatment with soil conservation measures and afforestation of the ridge area. By dissipating the concentration of the overland flow, it will protect the area from rapid soil erosion. This will help controlling formation of new ravines and reclamation of existing shallow ravines back into cultivation.

2. Collar bunds at the beginning of the ravine, to control their headward expansion. These can be usually earthen bunds but depending on the size and location of the ravine, masonry structures may have to be used. Cost of such structures will go up on account of both the higher expenditure on stabilisation of the natural embankments and lack of easy availability of construction materials such as stones or bricks.

3. Runoff dissipation and regulation of velocity of flow from the catchment by construction of water harvesting structures at appropriate locations. These structures are made primarily to harvest excess runoff from the catchment and reduce the erosive power of running water.

4. Tree and grass plantations for stabilising the existing gullies. There are highly effective vegetative methods of erosion control used by the local people, which include use of *Ipomoea* spp., and local grasses known as *sarpatha* and *dau (Anogeissus pendula),* which have good soil binding properties.

5. Agricultural package for utilisation of ravines for cultivation. It is necessary to work out separate packages for ravine and adjoining non-ravine areas. Local wisdom says that soils in the bed of ravines are extremely fertile. Cultivation of ravine bed will gradually lead to land levelling and disappearance of ravines over time. Cultivation of areas outside the ravines will have to be supported by irrigation facilities, as the soils have very low water-holding capacity. Such support systems can be provided by small diameter dugwells constructed at the ravine bed in the valley portion, where water table is found to be relatively high in the post-monsoon period.

5.4 Central Highlands Plateau

AESR	5.2
Bioclimate	Semi-arid Hot
Soils	Medium and Deep Black Soils
LGP	150 to 180 Days

Central highlands are a plateau region with a predominantly hard rock lithology. The major rock type here is basalt[50] and the formation is called the Deccan Traps. The area occupied today by the Deccan Traps is about 320,000 sq. km, including Kutch, Saurashtra, Madhya Pradesh and Maharashtra. They are found up to Belgaum in the south, Rajahmundry in the southeast and Amarkantak and Surguja in the east. Rocks of the Deccan Traps are igneous in origin, having formed by volcanic eruptions spanning several million years. Volcanic eruptions are made up of two component actions, the uprush of gases under high pressure and the outflow of liquid rock. Molten rock below the surface is highly charged with gases, which stay in solution so long as the mass is held under great pressure. As the molten rock works its way upward, it not only carries the gases with it in solution, it also turns to steam any water in the overlying rocks. Fractures in these 'roof rocks' allow some of the steam to escape into the air while the gas crowding into the pockets in the fractured rocks builds up bursting pressure and the explosive activity begins, initially blowing out rock fragments and then masses of molten material or *lava flows*.[51]

Low rainfall, hard rock geology and flat topography renders the conventional watershed interventions extremely difficult in the Central Highlands region. The unsustainable levels of groundwater in the Central Highlands compound the problem. Malwa Plateau in Western Madhya Pradesh is a case in point. Located in a comparatively low rainfall regime, with hardly any large perennial streams, the Malwa region of Western Madhya Pradesh has moved far ahead in the utilisation of water resources. About 95% of the irrigation in this region is accounted for by groundwater. As explained in Chapter 1, natural rate of replenishment in hard rock regions is low. What does give rise to some, at times surprisingly high, primary porosity are the few small cavities or vesicles caused by the presence of bubbles of gas, trapped as the lava cools quickly on the surface. Moreover, as the lava shrinks cracks develop, creating joints. Most of the porosity of igneous rocks is, in fact, *secondary*, created by the processes of *weathering and fracturing*.

50 Basalt, which is a crystalline extrusive rock (as against intrusive, i.e., which does not extrude out of the earth's surface, being forced into other rocks) formed from magma of a low gas content, has a porosity of 1 to 20%.

51 The term lava flow is applied both to the flowing sheet of liquid and to the resulting layer of solid rock.

This means that while there can often be fairly large reservoirs of stored water in hard rock aquifers (accumulated over several thousand years), the renewability of this resource in flow terms is likely to be limited. Great caution needs to be exercised in the extraction of groundwater in hard rock areas. Increasing the depth of groundwater extraction creates a very real danger of groundwater mining. Moreover, the extent of weathering and structural deformations is never uniform, which allows for very little connectivity and transmissivity between the aquifers. This points to the second important characteristic of hard rock geology, namely, the high variability of groundwater availability within a drainage basin. We must be very modest in the rate and depth of extraction of groundwater. Uncontrolled extraction has given rise to a severe, man-made crisis of groundwater in Malwa (Table 5.8).

TABLE 5.8: LEVEL OF GROUNDWATER DEVELOPMENT IN THE DISTRICTS OF MALWA REGION, 1998

District	Net Groundwater Availability (ham)	70% of Net Groundwater Availability (ham)	Current Groundwater Draft (ham)	Level of Groundwater Development	Blocks with GWD >80% in Total Blocks
	(1)	(2)	(3)	(3)/(2)	
Dewas	91305	63913	55495	87	2/6
Dhar	90014	63010	89820	143	5/13
Indore	76289	53402	43685	82	3/4
Mandsour	61888	43322	73474	170	4/5
Neemuch	59830	41881	43146	103	1/3
Rajgarh	49216	34451	53180	154	2/6
Ratlam	48312	33818	62993	186	4/6
Shajapur	34578	24205	55162	228	8/8
Ujjain	23015	16111	80128	497	4/6
Total	534447	374113	557083	149	33/57

Source: Ministry of Water Resources, GoMP at http://www.mp.nic.in/wrd/HIS/Index_GW.html

All districts in the region are in the dark (extraction >80% of recharge) or overexploited (>100%) categories. Nearly 60% of the blocks also belong to these categories. Falling water levels are being reported from a majority of the observation wells in the region. Implementation of a watershed programme in a plateau region with flat topography, hard rock geology and highly

depleted aquifers will have to simultaneously engage with both supply augmentation as well as demand management. The priority areas are mentioned below:

a) Revival of Traditional Tanks: Even plateau regions in low rainfall regions have a history of tank construction. Such tanks typically have large catchments with very mild slope (1% or less), with the size of the catchment compensating for the lesser volume of runoff generated on account of lower land slope. These tanks have fallen into disuse with the construction of tubewells. Over time, tanks either have silted up or their beds encroached upon for cultivation. A revival of this system of tank irrigation will help recharge of groundwater.

b) Excavated Farm Ponds: The major constraint on surface water harvesting in a plateau region is the topography. Excavated farm ponds are relatively free of strict topographical limitations, which larger water harvesting structures have. Farm ponds of capacities ranging from 1000 to 1500 cubic metres and harvesting runoff from small local catchments of 5 to 10 ha can be constructed in the plateau region for protective irrigation and enhanced groundwater recharge. The presence of clayey layers in the soil reduces seepage losses from ponds. Ponds constructed on the upstream side of wells and tubewells will contribute to the recharge of these water sources.

c) Subsurface Dams: Another technology which has good recharge potential is the subsurface dam (underground *bandharas* or dykes). It is commonly observed that even after surface flows dry up, water courses in low rainfall areas have a large volume of *subsurface runoff*. A subsurface dam diverts such flows into wells located nearby, adding to the recharge of the wells. This dam works best in areas underlain by hard rock strata, with an overhang of relatively permeable soil of about 3 to 5 metres. Hard rock strata at the base ensure that water does not seep down and the impervious dam wall diverts the underground flow.

d) Artificial Recharge: Enhanced recharge of deeper aquifers is also possible through roofwater harvesting systems and artificial recharge. The quantities recharged by these systems are very small compared to the rate of extraction by a tubewell. However, in extremely water-scarce areas such as urban settlements, artificial recharge can be very important from the point of view of ensuring drinking water security.

e) Low-cost Micro-irrigation Systems: No amount of supply augmentation will prove adequate without measures for regulation of the end-uses of water. Drip irrigation systems raise the productivity per unit of applied water. In black soils where flood irrigation results in

waterlogging, use of drip systems irrigating fields with spaced crops or small, intensive cultivation vegetable plots could enhance productivity while economising water use.

f) Crop Diversification: The main reason for groundwater overextraction has been a shift in the cropping pattern in favour of water-intensive crops. Hence, diversification of the cropping pattern towards drought-resistant varieties and unirrigated pulse crops such as pigeonpea and chickpea can be a major plank of intervention. A key constraint in the promotion of these varieties is the problem of marketing. If adequately supported by public investment, marketing of agricultural produce (and livestock products such as milk) is an activity that Federations of SHGs can take up. Public investment in warehousing facilities and price incentives through the support price mechanism could strengthen the production system of crops such as pigeonpea and chickpea. For irrigated crops like wheat, more varieties requiring lesser number of irrigation need to be popularised. There are a large number of wheat varieties released by the National Agricultural Research System (NARS), popularisation of which should be an integral part of any watershed programme in this region.

5.5 Coastal Gujarat (Saline)[52]

AESR	5.3
Bioclimate	Semi-arid
Soils	Alluvium Derived Soils
LGP	90 to 120 Days

5.5.1 Background

The classical watershed programme is designed for rainfed areas wherein the micro-watershed is clearly defined with a specific ridgeline and an outlet. However in India there are many drought-prone areas, which do not have these typical characteristics. With a very large coastline, India needs to develop guidelines for addressing the specific development challenges of coastal saline and non-coastal flat areas. The magnitude of these special areas is also substantial – 10 states and 7516 km. Gujarat alone has 1600 km of coastline and about 1400 villages that are affected by coastal and inherent salinity.

The communities in coastal areas are largely dependent on agriculture and fishing. Watershed, being a land-based programme, focuses on people whose primary livelihood is agriculture.

52 We gratefully acknowledge the inputs put together by Development Support Centre, Ahmedabad for this section.

Many of these areas, despite being on the coast, have inadequate rainfall and hence have problems of recurrent droughts very similar to typical watershed areas, with a few major differences:

- The terrain is flat and ridge-line is not sharply defined.
- Water and soil quality is also a critical issue.
- Typical land-treatment measures, which are the core of the watershed programme, may not be relevant.
- Fresh water storage would be a critical treatment.
- Unit of treatment would need to be a cluster of villages rather than scattered individual 500 ha units.

Taking this fact into consideration, watershed guidelines should have separate provisions to address the problems of these two areas.

5.5.2 Coastal Saline Areas

These are regions, which have salinity ingress due to increased groundwater withdrawal or low-lying areas that have seawater coming inland during tides. Therefore, groundwater and land become saline in respective cases. Overall coastline in India is 6400 km. In Gujarat this is 10,500 km covering 1200 villages.

Characteristics

- Flat terrain, no defined ridge-line
- Low slope (0.5-3%)
- Water quality key issue, drinking water over-riding concern
- Large-scale groundwater extraction for irrigation is the main cause of ingress, though mining of minerals along coast is also a contributory factor.

Treatments

Area-based interventions and structures are required that may not be covered under a typical watershed programme:

1. Tidal regulators: Major structures like tidal regulators need to be constructed near the sea to prevent sea water intrusion; hence a sea to inland approach (the reverse of ridge to valley) may need to be adopted.
2. "Spreading canal" along the coastline to prevent saline water intrusion and storage of fresh water
3. Check-dams and subsurface check-dams to check ingress of saline water
4. Bunding of fields for water harvesting
5. Sealing of saline wells to divide saline and sweet water aquifer
6. Large-scale recharge is the main solution for formation of sweet water barrier, e.g., link canals between large stored water bodies or fresh water trench.
7. Recharge pits in rivers/small streams
8. Reviving of step wells
9. Dug-out ponds and deep trenches
10. Subsurface recharging through filtered wells/bore wells
11. Roof water harvesting for drinking water
12. Plantation of species to act as saline-wind breaks
13. Mangrove protection and plantation of other appropriate grass species
14. Cultivation of salt-tolerant species
15. Small *bandharas* to stop tides (salinity control structures which prevent tidal water for mixing inland)
16. Horticulture/agriculture practices which have less water consumption including promotion of water-use efficiency devices

5.6 South Bihar Plains

AESR	9.2
Bioclimate	Sub-humid
Soils	Red and Yellow Soils
LGP	150-180 Days

South Bihar is characterised by (a) medium rainfall; and (b) stiff clayey or highly sandy soils, both of which are highly retentive of runoff water (Pant, 2004). As this region has very low slopes, conventional ridge-to-valley planning may encounter certain difficulties here. The other unique feature of this region is the highly fragmented and scattered nature of holdings. Many farmers own small pieces of land spread across the village, at times even across villages.

5.6.1 Revival of the Ahar-Pyne System

Ahar-pyne system is an indigenous irrigation technology, which continues to irrigate substantial areas even today. This system has evolved from an understanding of the particular agro-climatic conditions of the South Bihar plains (including the districts of Gaya, Jehanabad, Aurangabad, Nawada, Bhojpur, Nalanda, Jamui, Lakhisarai, Munger, Bhagalpur). Ahars are rectangular embankment-type water harvesting structures, impounding rainwater or water from drainage lines. An ahar comprises a main embankment wall built in mud. From the two extremities of the main wall, two side embankment walls are built, perpendicular to the main wall. One side is left open for water inflow. They differ from the regular tanks in that the bed of an ahar is not dug and usual tanks do not have the raised embankment of an ahar. While ahars irrigating more than 400 ha are not rare, the average area irrigated by an ahar during early 20th century was said to be 57 ha (Pant, 2004). Pynes are dug-out canals which take water from one place to another. Pynes may transport water from an ahar into agricultural fields or from ahar to ahar, or from large streams to other pynes or ahars. Some of the biggest pynes in Bihar were 20-30 km long, feeding a number of distributaries and serving over 100 villages. It is this system that made paddy cultivation possible in South Bihar, which is otherwise unsuited for this crop. In particular, it helped farmers meet the crucial water requirement for paddy during *haathia* (grain-filling stage).

The Ahar-pyne system had well worked-out institutional mechanisms for sharing of water between farmers. Synchronisation of the agricultural operations over the year was achieved by earmarking each 14-day period on the lunar cycle for each agricultural operation (Table 5.9). For allocation of water, *warabandi* system or irrigation by rotation was imposed in the command area of each pyne, at times covering different villages. Each village was given a fixed number of days and hours to irrigate their fields after which they would not get water from the source. This necessitated large-scale coordination within the community and participation of all landholders in taking crucial decisions. Thus, the survival of the ahar-pyne system was dependent on community action.

TABLE 5.9: TIMING OF AGRICULTURAL OPERATIONS IN AHAR-PYNE SYSTEM

	Period	Operation
1	June 20 to July 5	Seed bed sowing
2	July 18 to August 15	Transplantation
3	September 12 to September 25	Field water drained out
4	September 26 to October 7	Fields filled again
5	October 8 to October 20	Standing water in fields
6	October 21 to November 3	Field water drained out
7	November 4 to November 15	Harvesting

Source: Aggarwal and Narain (1997)

The ahar-pyne system of irrigation was instrumental in saving all of Gaya district from the ravages of famine and drought. It is worth highlighting that through the 1866 famine of Orissa, the Bihar famine of 1873-74 and during the famine of 1886-87, Gaya district required practically no relief. But the Ahar-pyne system has had an important role in flood control as well. The South Bihar plains are sandwiched between the Chhotanagpur plateau in the south and the Gangetic basin in the north. The soils of this belt have very poor water retention capacity and the overall south to north slope implies that rainwater tends to flow rapidly towards the north, causing floods. The Flood Advisory Committee of Gaya district in its report in 1947 greatly commended the value of this flood-control role of the ahar-pyne system.

South Bihar has very small and highly fragmented landholdings. As a result, every landholder in the command of a pyne had some land at the head, some in the middle and some at the tail of the irrigation channel. This meant that it was in everyone's interest that the maintenance and repair of the system was done regularly so that water reached all parts of the command. In this way, ahar-pynes seem to overcome the problem of headreach/tailender conflicts that are a common feature of irrigated commands of major and medium projects. Ahar-pynes ensured equitable distribution of irrigation water in the command.

However, with the passage of time, the collective institutions of management of the ahar-pyne system have declined. Area irrigated by ahar-pynes is on the decline, accounting for only about 12% of the total irrigated area in Bihar (Table 5.10).[53]

53 One of the reasons cited for the decline of ahar-pynes is the abolition of the zamindari system. Zamindars regularly organised maintenance and desilting of ahar-pynes before independence.

TABLE 5.10: AREA IRRIGATED BY AHAR-PYNE SYSTEM

Year	Area Irrigated (mha)	Region Covered
1930	0.94	South Bihar
1971	0.64	South Bihar
1976	0.55	South Bihar
1997	0.53	Whole of Bihar

Source: Pant (2004)

The major reason for this has been the development of new irrigation sources, notably canals and tubewells. Easy availability of water through such systems made people lose interest in ahar-pynes, which needed community effort for upkeep and maintenance. It also appears that irrigation departments did not have adequate understanding of the value of this system. Hence, often the new irrigation schemes were at variance with the existing ahar-pyne system and no attempt was made to integrate the two.

Revival of this traditional irrigation system could be one of the major activities for livelihood security in South Bihar. Ahar-pyne system is based on a minute understanding of the topography so that even at such mild slopes, pynes carrying water over several hundreds of metres could be constructed. Pynes also diverted water from the streams over long distances, irrigating large areas. Hence, revival of this system and ensuring their proper maintenance through community action should be a major plank of watershed projects in South Bihar.

5.7 Chhotanagpur Plateau and Eastern Ghats[54]

AESR	12.3
Bioclimate	Sub-humid
Soils	Red and Lateritic Soils
LGP	180-210 Days

This AESR encompasses the plains and the undulating and hilly (UH) regions of eastern India. The UH regions in this AESR comprise the southwestern districts of West Bengal and Jharkhand. About 75 to 90% of the population in these parts is rural. The STs comprise 20 to 35% of the rural population in most districts, and in many blocks they are in a majority. Most people own land and landlessness is significant only among the SCs. Agriculture is a key source of livelihoods, supplemented by gathering from forests and wage earnings from seasonal migration.

54 We gratefully acknowledge the inputs provided by Deep Joshi (Executive Director, PRADAN) for this section.

This region receives 1100 to 1600 mm rain on an average every year, about 80% of it during June to September. The combination of UH terrain and high rainfall produces high micro-ecological variability in the region. One encounters diverse conditions with regard to soils, slope, water availability, soil depths, etc. within the boundaries of even the smallest village. Though there are variations across upper, middle and lower watersheds, the overall pattern repeats itself in micro-watershed after micro-watershed:

- dry uplands *(taand)* with shallow soils;
- dry upper midlands *(baid)* with deeper soils;
- seasonally wet lower midlands *(kanali)* with deep soils; and
- wet lowlands or valleys *(bohal)* with deep soils.

To be most profitable, dependable and sustainable, systems of NRM must be designed incorporating such variations. There is no reason for anyone to go hungry in the UH regions given the endowment and distribution of natural resources. Indeed, high rainfall and a complex ecology make these regions potential engines of future growth as a wide variety of trees and crops can be grown and complex farming systems are feasible. Yet, these regions are almost uniformly poor and among the most food-insecure in the country. Two-thirds of the population in some of the districts is officially classified as being BPL and almost no district has less than 40% BPL population.

Agriculture continues to be almost the sole private land-use in the UH regions of this region. In agriculture, paddy accounts for almost two-thirds of crop coverage (about three-fourths of kharif) even though less than one-tenth of the net sown area is irrigated (some of it defunct, and none used during kharif) and no more than one-fifth to one-third of the net sown area is in the valleys where water control may be feasible during kharif once the monsoon settles down. Productivity of all the crops is in the range of one-third to one-fifth the national average. Crop and resource husbandry practices continue to be poor due to low returns and high risk. It is not unusual for farmers owning a few acres of land in these regions to migrate to the plains as agricultural labourers during the peak kharif season even as their own fields languish. The downward spiral of low productivity leading to poor husbandry, which further reduces productivity results in widespread resource degradation and impoverishment of the people.

PRADAN (Professional Action for Development and Networking) has had extensive experience of working on the theme of enhancing rural livelihoods in this region – from Purulia in West

Bengal, through Jharkhand, non-coastal Orissa, Chhattisgarh to eastern MP – for over 15 years. Following a watershed approach, PRADAN has demonstrated ways to promote integrated development of natural resources that would lead to equitable and sustainable economic growth, ensure household food security and eliminate mass poverty in the region. Such an approach requires participatory planning at the level of hamlets and villages, to develop production and management systems suitable to the resource endowment to meet people's needs and preferences. The movement of rainwater across time and space is a key consideration in resource management in such a terrain. A basket of strategies to improve returns from land and water resources successfully promoted by PRADAN on a small scale are schematically presented here.

1. Intensive cultivation of homesteads *(baari)* to create year-round income earning opportunities is one of the strategies. Every family here has 200 to 400 sq. m. of homestead land. Homesteads are very fertile due to presence of organic material and are also easiest to protect. Yet, these lands are very poorly managed. By developing dug wells shared by several families, homesteads could be irrigated and used for intensive cultivation of vegetables, fruits and flowers. This would especially benefit women and offer them an alternative to leaving home in search of wage labour.

2. Developing fallow uplands (*taand*/*goda/dhipa*) is the second strand of the strategy. Situated at the uppermost reaches of the terrain in each micro-watershed, these have the highest slope, very thin topsoil, *moorum*/rocky substrate (often exposed) and very low water-holding capacity. Uplands are generally not terraced or bunded. Wherever there is a bit of topsoil, farmers are prone to use this land to cultivate paddy through direct seeding even though water control, essential for paddy, is not possible without irrigation here. Land treatment to harvest rainwater to improve soil moisture locally is the first step to enhance the productivity or carrying capacity of these lands. The "30x40 model" developed by PRADAN is suitable for the uplands and it would be essential to treat a large, contiguous patch of land. Agro-forestry, with a combination of trees and grasses is more suited to such lands rather than paddy or other field crops. Tree varieties could be chosen for light timber, fuel wood, rearing tasar silk and horticulture.

3. The third element of the strategy is to improve the management of medium uplands (*baid*). These are generally bunded and terraced and have moderate slopes. With increasing population pressure, these have been brought under transplanted short-duration paddy cultivation. Soils are sandy to sandy-loam and shallow, with low organic matter and low moisture-holding capacity. Due to low productivity presently, these lands are not husbanded

well. The field bunds are shallow and poorly maintained; rat holes are not plugged and little or no manure is applied. Paddy crop in these lands is highly vulnerable to rain failure, even short breaks in the monsoon and early withdrawal of monsoon. To enhance and stabilise productivity, these lands need to be treated for water harvesting and recycling of biomass to ensure good organic content in the soil. Promotion of on-farm water resource development (5% model) and green manuring (through field bund plantation or cultivation of sunn hemp) would be the required interventions in these types of lands. Besides these, alternatives to paddy, such as maize, pigeonpea and maize mixed with pigeonpea can be cultivated profitably.

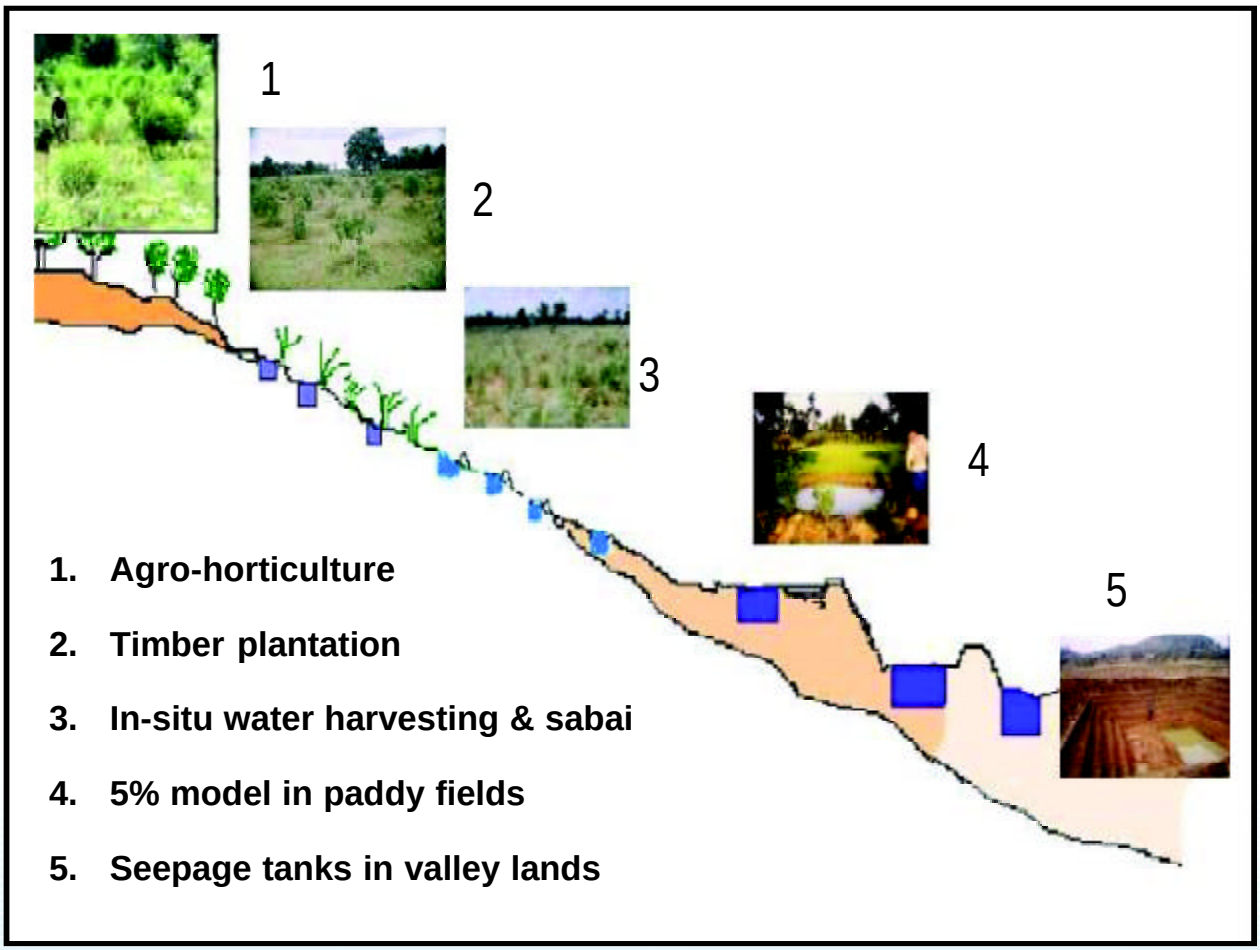
4. Improving the management of medium lowlands (*kanali*) and lowlands (*bohal*) is the fourth element of the strategy. These are the most productive lands, the core of the farming system. Soil is rich, hence most suitable for intensive cultivation throughout the year. Besides direct rainfall, these lands also get the benefit of surface runoff and seepage from upper catchments. Once monsoon sets in, these lands do not face any water shortage during the rest of the crop-growing season and surplus water has to be often drained out to ease farming operations in the lower valleys. These provide huge opportunities to harvest both surface runoff and subsurface seepage and recycling of water for localised irrigation to support intensive agriculture. Unfortunately most of these lands are used well below the potential, with a single paddy crop grown during the monsoons. The most suitable infrastructure here is a chain of *haapa*s or seepage tanks (over 6 to 8% land area with 2 to 3 m depth) constructed in the valleys along the drainage line. As seepage tanks retain water for long duration (up to 10 months) these provide excellent opportunity to promote composite fish farming besides providing irrigation. Once this is done, the lowlands would not only produce three crops a year but would also provide life saving irrigation to adjoining *baid* lands with low cost water lifting devices during late-monsoon failure, which is very common in this region.

With these interventions and certain simple changes in cultivation practices, such as selection of healthy seeds, better nurseries, timely transplanting and application of potash, production and use of vermicompost, crop yields can be dramatically increased. In regions with complete control over water, such as medium lowlands and valleys, the alternative technique of rice farming, namely, System for Rice Intensification (SRI) can bring about truly remarkable increases in productivity, sustainably (A schematic presentation of these interventions is given in Figure 5.2).

Once agriculture is stabilised and intensified, intensive livestock rearing would become feasible as a subsidiary livelihood. The infrastructure on private land for rainwater harvesting would provide scope for rearing fish and farm residues would support cattle rearing. PRADAN has successfully introduced composite fish rearing, including rearing of fresh water prawns and promoted intensive dairy. Enhanced productivity of land and lower risk in farming would reduce the need for distress migration, bringing greater stability to the household. This would lead to better husbandry of resources and crops, higher private investments in land development and open up opportunities for subsidiary home-based economic activities.

Figure 5.2

Schematic Presentation of Interventions in Each Land Situation



5.8 North Bihar Plains (Waterlogged)[55]

AESR	13.1
Bioclimate	Sub-humid
Soils	Alluvium Derived Soils
LGP	180-210 Days

A watershed approach can be very useful even in waterlogged regions of the country. This has not been recognised in the present guidelines. Waterlogging refers to the condition where the underground water table rises close to the surface and water collects in topographical depressions due to insufficient drainage. Waterlogging can occur due to a) poor drainage on account of either natural factors or due to disturbances in surface hydrology causing obstructions to flow of water; b) inundation by river water due to high flood; and c) over-irrigation leading to rise in water table in the canal commands. Each of these problems differs in nature needing very specific interventions for remedial action. Ministry of Water Resources in 1991 has adopted the following norms for defining an area as waterlogged (Table 5.11):

TABLE 5.11: DEFINITION OF WATERLOGGED AREA ADOPTED BY THE MINISTRY OF WATER RESOURCES

Description	Water Table Depth, bgl (m)
Waterlogged Area	<2
Potentially Waterlogged Area	2-3
Safe Area	>3

Estimates of waterlogged area in India are given in Table 5.12. The earliest estimate by the Irrigation Commission in 1972 (4.84 mha) has been revised upwards by the subsequent estimates. Recent estimates by the Ministry of Agriculture (1990) put the figure at 8.5 mha while that of NBSS-LUP comes up with a figure as high as 11.6 mha (8.3% of the net sown area) (NBSS-LUP, 1994). These figures could mean that the area affected by waterlogging has risen between 1972 and 1990. West Bengal (2.18 mha), Uttar Pradesh (1.98 mha), Punjab (1.10 mha) and Bihar (0.71 mha) have huge stretches of permanently waterlogged land.

55 This section draws heavily on Vijay Shankar (2004).

TABLE 5.12: ESTIMATED AREA UNDER WATERLOGGING IN INDIA

Source	Year	Estimated Area (mha)
Irrigation Commission	1972	4.84
National Commission on Agriculture	1976	5.98
Central Water Commission (CWC)	1990	6.00
Ministry of Agriculture	1990	8.52
NBSS-LUP	1994	11.61

5.8.1 Monthly Rainfall, Evapo-transpiration and Water Balance

Monthly rainfall, evapotranspiration and water balance of this AESR shows an annual moisture deficit of 138.6 mm. However, in peak monsoon months, the rainfall is far in excess of evapo-transpiration and absorptive capacity of the soils. This produces very high rates of overland flow. Analysis of weekly rainfall in the eastern region shows that ponding of rainwater on land surface reaches the maximum level in the 32nd week (mid-August) and remains till the 49th week (early December). During the period December to June, water recedes in most areas due to extraction and underground flow. The maximum height of ponded water during this period is about 165 cm.

Being part of the alluvial plains, the region is characterised by flat slopes (typically 30 to 40 cm over a km, 0.03% to 0.04%), high water table (shallow water table is around 2 to 3 metres), deep alluvial soils and small and fragmented land holdings. Relatively flat land slopes combined with the high intensity rainfall causes severe problem of drainage congestion in the region. This gives rise to heavy waterlogging in low land and deepwater land ("*chaurs*").

5.8.2 Land Situation in Waterlogged Areas

The land situation of this region could thus be classified into three: a) waterlogged lowland ("*chaur*" in local language); b) midland (*dhanwar*) which is temporarily flooded but remains dry from December onwards; and c) uplands (*bhit)* which are not flooded at all. "*Chaurs*" are the saucer-shaped, topographically low-lying areas where rainwater collects and accumulates due to inadequate drainage. The surface area of a *chaur* can be very large, covering portions of several villages. *Chaur* is a land situation typical of the flood plains of North Bihar.[56] This

56 Though as a water body a *chaur* is continuous, it is usually known by the name of the nearest village.

problem of waterlogging is entirely unrelated to the general problem of flooding due to overflow from rivers. In the region as a whole, 10% of the total geographical area is in *chaurs* (deep water land) and 23% is lowland.

The majority of the soils of the region are calcareous, containing up to 40% calcium carbonate. These soils are white to olive grey in colour but dark grey in *chaurs* and are hard due to compacting action of standing water. These soils are hard also because they are not tilled and support only long-duration (9 months) paddy. Each of the three land situations practice distinct cropping sequences. In the low-lying *chaur* area, normally tall and long duration varieties of paddy (local varieties known as *jagger* and *darmi*) are grown along with fish and, occasionally, water plants like *singada*. Paddy is the main crop in the midland portion, followed by wheat. Paddy constitutes 85% of the kharif cropped area and 57% of the total cropped area in the region. Midland soils are a mix of yellow and black in colour and are well drained. Uplands are very fertile with soils of loamy texture and yellow colour, which support three crops during the year. Maize, potatoes and vegetables are the main crops. Their texture is on account of the application of organic matter. Groundwater is mainly tapped through shallow tubewells, which get water at a depth of 40 ft. But for drinking water, handpumps with depth varying from 50 to 80 ft are the primary source.

The region is characterised by extremely skewed distribution of landholdings. For instance, in Muzaffarpur district, 65% of the holdings occupying about 16% of the area are below 1 ha. The average size of holding is less than 1 ha. Landholdings are also greatly fragmented so that each household in the village has at least part of its land in all three land situations. Therefore, reclamation of waterlogged areas would be beneficial to most of the households in a village since this part of the land could be brought back into cultivation.

5.8.3 Traditional System of Management of Waterlogged Areas

Traditional management of *chaurs* included cropping systems to suit this complex eco-system. Prominent among them was the sugarcane-paddy sequential system where *burrokh*, a local variety of sugarcane, was followed by local varieties of tall paddy called *jager* and *darmi* in alternate years. *Burrokh* variety of sugarcane would grow taller with rising water level and was not susceptible to lodging with receding water. *Jager* and *darmi* varieties of paddy are known to have tolerance to deepwater conditions. However, since its sucrose content was considered low, local sugar factories discouraged the cultivation of *burrokh.* These sugar factories began to propagate new varieties of sugarcane that did not have tolerance for waterlogged conditions. As a result, the paddy-sugarcane crop rotation in *chaurs* was discontinued and *darmi/jager* paddy

became the sole crop. The level of productivity of these varieties is extremely low (1.3 tonnes per ha) compared to 2 to 2.5 tonnes per ha of rainfed, lowland paddy. Moreover, farming with these varieties is extremely risk-prone. Sowing operation normally takes place before the monsoon and the entire dose of fertiliser is given as the basal dose. The crop would suffer if water level rises rapidly (suffocating the growing paddy seedling) or if water does not recede within the expected time. Also, these varieties are susceptible to lodging if water withdraws when the crop stand is not dense (Aggarwal and Narain, 1997).

5.8.4 An Action Plan for Waterlogged Areas of North Bihar

From the drainage point of view, this area can be classified into four regions:

- Areas unsuitable for any crops throughout the year and which cannot be economically reclaimed;
- Areas unsuitable for cultivation of any crop but can be improved economically through better drainage systems;
- Areas unsuitable for cultivation during kharif but can be cultivated during rabi. These areas can become unsuitable to rabi season as well if rainfall is prolonged and above normal and would need special measures to make rabi crop possible; and
- Areas suitable for both kharif and rabi but where the crop suffers due to poor drainage, which can be improved economically (Sahoo and Verma, 2002).

After a careful delineation of these areas, an Action Plan for Watershed Management in the Waterlogged Areas of North Bihar could be drawn up. This Action Plan would have the following components.

Construction of Drainage System: The idea is to link up the *chaurs* with the nearest watercourse. Here, the land slopes of North Bihar play an important role. In some *chaurs* the distance between the head of the waterlogged portion and the nearest water course is about 6 km. But the elevation difference is only 6 metres (0.1% slope). Linking channels could be constructed for effective drainage in upland areas separating two low-lying *chaurs*. Since *chaurs* cover a large area spanning several villages, the key question is that of coordination across villages for construction of drainage system. In the absence of such coordination and a plan for drainage starting from the lowest point (the watercourse) to the highest, there is the danger that water from one *chaur* may get drained into the next *chaur* inundating the low-lying areas of the latter. This is a major social

mobilisational challenge. The ICAR Water Technology Centre for Eastern Region (WTCER), Bhubaneshwar has developed a drainage system of a much smaller scale (62 ha) in Biswanathpur block of Bhubaneshwar district. The system has a main drain of 2560 metres length, 4 link drains with a total length of 1550 metres, field channels, ponds and 10 connecting structures. The total cost of the system, completed in 2003, was Rs. 7.44 lakhs or a per ha cost of Rs. 12,000.

Desilting and Repair of Existing Drainage Channels: In many places existing drainage channels have either got obstructed due to cultivation or encroachment or are wrongly constructed so that water does not drain out. In many places, natural drainage has got disturbed due to construction of railway lines, roads, embankments and irrigation canals. Part of the drainage system construction, thus, would involve cleaning the already existing drainage channels and correcting their location. This is also an activity, which would require coordination across several villages and active participation of the local communities.

Rice-Fish Combination on Lowlands: Of the 42 mha of lowland paddy in India, about 20 mha are suitable for rice-fish integration. However, at present only 0.23 mha are under this rice-fish culture. WTCER, Bhubaneshwar has formulated a design of a rice-fish combination with the field partitioned into two parts of variable depths. Instead of conserving all rainwater *in-situ*, part of it is conserved in the shallow part of the paddy field and the excess amount spills over to the deeper part where fish and prawns are grown. When water recedes after December, all fish will move to the deeper part (the "refuge") and on the shallow part a second crop of pulses is usually taken. Water stored in the "refuge" can also be used for supplemental irrigation after the harvest of fish. This system thus has the advantage of risk minimisation due to multiple harvests from conserved water. This system can be implemented in rainfed lowlands with a standing depth up to 50 cm (Sahoo and Verma, 2002).

Small Multipurpose Farm Ponds (Subsurface Ponds) for Integrated Farming System: These ponds are constructed on areas with severe waterlogging. The mud of the pond is raised on the side as embankments on which crops like banana, papaya, mango, pigeonpea and cashew nut are taken. The pond water is used to irrigate the non-waterlogged, upland area where vegetable crops are grown. Because of high water table, the farm pond gets recharged quickly and draws in water from the nearby fields. Since recharged water is the main source of irrigation from these ponds, these are called subsurface ponds.

Cultivation of Water Plants like the Water Chestnut (*Trapa bispinosa*): Experiments have shown that in waterlogged areas, cultivation of *Trapa bispinosa* (*jal singada*) can be quite profitable. It can be grown in ponds, which are otherwise unsuitable for fish culture. Though it grows to a depth of 3 metres, water chestnut performs best in shallow perennial ponds (depth between 1 and 1.5 m) holding water throughout the year. The cost of cultivation and returns per ha of *Trapa* as compared to that of high-yielding wheat show it to be a much more profitable option (Reddy *et al*, 2002).

Biodrainage: The idea is to grow trees that have greater evapo-transpiration potential so that they move water out of the logged area and to the atmosphere. The driving force behind the biodrainage concept is the consumptive water use of plants. Early studies in Australia (e.g., Greenwood *et al*, 1985) suggested that the rates of transpiration and groundwater uptake by trees underlain by relatively shallow (5-8 m below surface) water tables, were very high. These exceeded the annual evaporation from pasture (about 400 mm) by a factor 3-6 (1200-2300 mm/yr). These results, coupled with a growing interest in timber production in Australia, led to the popularity of the tree-based water management strategy for agricultural areas. Morris *et al* (1998) found that *Eucalyptus camaldulensis* and *E. grandis* grown on a shallow saline water table both used approximately 300 mm per year. They also stated that the plantation's ability to transpire groundwater is reduced where the groundwater table is drawn down in soils of low hydraulic conductivity. In the experiments carried out by the WTCER, the trees chosen for this purpose are casuarina and Australian teak (*Acacia mangium*) in saline areas and *Acacia auriculiformis* and eucalyptus in non-saline areas. Further experimentation is needed to verify whether the species chosen have so much transpiration potential and to ascertain the optimum density of the tree crop required to have a significant impact.

Identification, Trials and Popularisation of Extra-tall (>150 cm), Flood Tolerant, Long-duration Varieties of Paddy: Nearly 10 mha of paddy (22% of total paddy area in the country) are in waterlogged condition (water depth >50 cm) considered unfavourable for a high yield. Only local varieties are grown in such areas (including *chaurs*, like *jager* and *darmi*) which are of extremely low productivity. The cultivation is also highly chancy and risk-prone. Research and field level trials should proceed towards identification of extra-tall varieties of paddy that can grow fast and can tolerate waterlogging. Some of the released varieties with these characteristics are *Durga*, *Sarala* and *Panidhan*. More such varieties should be identified through field level trials. These varieties can tolerate standing water up to 1 metre. Many more varieties are being released but their cultivation is a very specialised task, with a very different fertiliser dosage and regime, weeding requirement and timing of operations.

Treatment of Upper Catchment: The waterlogged situation in many places is aggravated by the mismanagement of rainwater in the upper catchment (contributing areas). *In situ* rainwater conservation in the upper catchment through field bunding and channelising excess runoff into low-lying areas, collection of excess water in rainwater harvesting ponds which would also provide supplemental irrigation to the upland crop and conjunctive use of groundwater through shallow tubewells are some of the possible interventions.

Appropriate Land-use Package for Non-waterlogged Areas for Enhancement of Livelihood Options: Along with activities undertaken for reclamation of waterlogged areas, intervention is required in the non-waterlogged, upland portion to enhance productivity. Even though soil in this area is highly fertile and currently supports three crops, the productivity levels of the two principal crops, rice and wheat, are lower than the national average. Through integrated management of land, water and nutrients, agricultural productivity of these uplands could be considerably enhanced. At present, only 33% of the cropped area in the region is irrigated. The region is rich in groundwater resources and at present the utilisation of groundwater is less than 40% of annual recharge (CGWB, 1998). Hence, it is possible to considerably expand area under irrigation by sustainable development of groundwater through shallow tubewells. The main constraint on this strategy is the absence of electricity. Tubewells of the area are mainly energised by diesel at present and this is an expensive alternative. In addition to tubewell irrigation, allied activities like dairying, vegetable cultivation, poultry, fisheries, etc. could also be developed to enhance livelihood options of the people.

Cost Aspects of the Drainage Plan: The drainage system developed by WTCER, Bhubaneshwar has reclaimed 62 ha of waterlogged area at a cost of 7.44 lakhs. This amounts to a cost norm of Rs. 12000.

5.9 Western Himalayas (Mountainous)[57]

AESR	14.1
Bioclimate	Sub-humid
Soils	Brown Forest and Podzolic Soils
LGP	180 to 210+ Days

57 We gratefully acknowledge the inputs provided by Ravi Chopra (Director, People's Science Institute) for this section.

5.9.1 Himalayan Region – A Background

Out of 328 mha geographical area of the country, about 93 mha is mountainous. A major part (51.43 mha) of it lies in the Himalayan region. Broadly, the Himalayan region can be classified into three longitudinal zones:

- Great Himalayas (above 3000 m elevation);
- Lesser (Middle) Himalayas with width ranging from 65 to 75 km and average height from 900 m to 3000 m; and
- Outer (Shiwalik) Himalayas with average height of less than 900 m.

The annual precipitation varies from 8 cm in Ladakh (cold desert) to 115 cm in Jammu, 50 to 350 cm in the hills of Himachal Pradesh and a mean of 280 cm in the northeast. Since, the Himalayan region is characterized by steeply sloping topography, unstable and weak geological formations, high rainfall and poor socio-economic conditions, there is potential danger to the eco-system through excessive land degradation problems. Forests are the backbone of the region's environment. They provide the local population with food, fruits, fuelwood, fodder and livelihood resources like fibre. They also moderate stream flows, ensuring perennial water supply in their vicinity.

The central problem of the region is the loss of forest cover. For example, there are over 30 million cattle in the Himalayas and the carrying capacity is sufficient for only about 60% of the existing livestock. Once forests are cut down in the mountain areas, there is increased surface runoff and soil erosion. Fodder and year-round water availability decreases. As fodder becomes hard to get, mountain families tend to reduce their cattle heads, leading to reduction in farmyard manure, loss of soil fertility and reduced agricultural production. When a family's foodgrain production falls below sustenance levels, a typical response is the migration of an able-bodied male family member. The reduced availability of labour in the family increases the burden on the women. They react by further reducing the number of cattle, sending the family's agricultural production into a downward tailspin.

The improper and unscientific management of catchment areas of hilly watersheds has resulted in serious sedimentation problems in many reservoirs. In the Himalayan region, the problem of soil erosion is further aggravated due to landslides, torrents, road construction and mining activities.

The problems highlighted above call for serious efforts through watershed development for enhancing biomass production, livelihood security and ecological stability.

5.9.2 Watershed Guidelines – Special Provisions for Himalayan Region

Following provisions/modifications are suggested for watershed guidelines, specifically for the Himalayan region:

- Almost two-thirds of the geographical area in the Himalayan states like Himachal Pradesh and Uttaranchal is classified as forest area (today actual forest cover is more like 31 percent of Himachal Pradesh and about 42 percent of Uttaranchal.) Provision should be made for considering watersheds with up to 60 percent forest area. However, treatable area alone need be considered for financial allocations.

- Steeply sloping topography, unstable and weak geological formations, and inaccessibility of the region, increases the cost of watershed treatment. Therefore, the per ha cost norms need to be raised.

Since, in the Himalayan region even a micro-watershed of 500 ha may consist of a large number of revenue villages, it would be worthwhile to consider formation of separate Village Development Committees and Village Development Fund (*Gramkosh*) at the village level apart from a watershed committee as an apex body.

5.10 The North-East Region[58]

5.10.1 Climate, Rainfall and Land-use

The North-East (NE) region comprises the states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The major AESRs of NE India are given in Table 5.13.

58 We gratefully acknowledge the inputs provided by J. Venkateswarlu (former Director, CAZRI) for this section.

TABLE 5.13: AGRO-ECOLOGICAL SUB-REGIONS OF NE INDIA

AESR No.	Location	Code	Bio-climate	Soils	LGP
15.2	Middle Brahmaputra Plain (Assam - South)	Q8B8	Humid	Coarse, Loamy Mixed Soils	240-270
15.3	Teesta, Lower Brahmaputra Plain and Barak Valley (Assam and Tripura)	Q8A9	Humid to Per Humid	Flood Plain Soils	270-300+
15.4	Upper Brahmaputra Plain (Assam - North)	Q8B10	Per Humid	Hilly Upland Soils	300+
16.3	Arunachal Pradesh (Subdued Eastern Himalayas)	CIA10	Per Humid	Red Loamy Soil	300+
17.1	Meghalaya Plateau and Nagaland Hills (Meghalaya, Nagaland and parts of Assam)	D2A9	Humid to Per Humid	Loamy, Lateritic Red and Yellow Soils	300+
17.2	Purvanchal (Eastern Range) (Manipur, Tripura and Mizoram)	D3A10	Per Humid	Moderately Deep, Red and Yellow Soils	300+

The bio-climate of the NE region ranges from humid to per humid, with an assured moisture availability period ranging from 270 to 300 days. Its land terrain is bestowed with high and multiple slopes. Cultivation even in lands beyond 30% slope is not uncommon. Shifting cultivation (*jhum*) is an indigenous system of farming here. The NE region is divided into discrete plains, regions encompassed within hills, with a number of agro-climatic zones within them. Broadly, the area can be classified into hilly regions (16.3, 17.1 and 17.2) and plains (15.2, 15.3 and 15.4). These are characterised by heavy precipitation, extremely rich bio-diversity, fragile hills, high seismicity, and a drainage pattern marked by lateral valleys in the north and transverse valleys in the south, dissected by huge rivers and raging torrents (Planning Commission, 1997).

The land-use pattern of the NE region, as in 2000, is shown in Table 5.14.

TABLE 5.14: LAND-USE PATTERN IN NE STATES

State	Reporting area ('000 ha)	Forests (%)	Lands available for grazing area (%)«	Cultivated area (%)	Net irrigated area (%)	Percent SMF ««
Arunachal Pradesh	5498	94	96	3	21	39
Assam	7852	25	34	34	21	83
Manipur	2211	27	28	5	46	83
Meghalaya	2227	43	80	11	20	73
Mizoram	2109	77	97	4	9	79
Nagaland	1388	62	88	19	24	20
Sikkim	710	36	49	17	13	77
Tripura	1048	58	61	40	8	95

(«)Includes forests, pastures, miscellaneous tree crops, cultivable wastelands and fallow lands

(««)Small and marginal farmers

Substantial area of the NE region is under forests. Arable farming is a major occupation only in Assam and Tripura. Holdings are extremely small and small and marginal farmers predominate in all states except in Arunachal Pradesh and Nagaland. The livelihoods in the NE region, thus, are largely dependent on forests (NTFP procurement and livestock rearing).

The NE region has a dense network of drainage channels with as many as 7-river basins. The NE states have a relatively small population. But with the growth of population and limited cultivable area, the land-man ratios are increasingly becoming adverse. The economic backwardness of the NE region is also reflected in its low level of human development (4 out of 7 states in the region were ranked below 20 in terms of HDR) (Planning Commission, 2001).

North-East India is one of the wettest regions of the world with an average annual rainfall of over 2000 mm (Table 5.15).

TABLE 5.15: ANNUAL RAINFALL (MM) IN NE STATES

State	Annual Rainfall (mm)
Arunachal Pradesh	2588
Assam	1833-3137
Manipur	1936
Meghalaya	2660
Mizoram	1936
Nagaland	1936
Sikkim	2706
Tripura	1936

About 80% of the annual rainfall is received between late June and late September. High intensity of rainfall leads to considerable soil erosion, more so in areas subjected to shifting cultivation. The annual soil loss in areas practicing *jhum* cultivation in steep slopes (44-53%) is estimated to be about 40 t/ha. When the slope is 60-70%, the loss is more (150, 170 and 30 t/ha during the first, second and third year, respectively). Since 72% of the area of the NE region is hilly, rainwater runs down the hill slopes as sheet floods in these areas leaving little water for crops. Paddy cultivation on the terraced hill slopes is impossible without adequate irrigation facilities. The yield of the primary crop, rice, is very low, ranging from 125 to 830 kg /ha. The plains have large sandy tracts, especially by the side of the present and old river courses. As water percolates down the sandy tracts, no crops can be grown unless they are constantly supplied with water. Although such sandy tracts are otherwise suitable for the growth of various vegetables and cash crops, in the absence of water supply, production from them becomes very low. Integrated management of land and water resources is imperative for rapid growth of this region.

5.10.2 Shifting Cultivation

Shifting (*jhum*) cultivation has been prevalent in NE India since 7000 BC. The *jhum* cycle used to be about 25-30 years. However, with the increased population, the cycle is now reduced to even 3 years, the range in different states being 3 to 12 years. As already mentioned, the *jhum* cultivation leads to enormous soil loss. The NARS suggests bench terracing to overcome the problem. Results of some experiments comparing the soil loss and runoff in shifting cultivation and bench terracing are shown in Table 5.16. It is clear that terracing system is superior to shifting cultivation in terms of lesser soil and runoff losses.

TABLE 5.16: COMPARISON OF SHIFTING CULTIVATION WITH BENCH TERRACING

Component	Shifting Cultivation	Agriculture with Bench Terracing
Soil loss (tonnes/ha)	40.9	2.3
Runoff (mm/yr)	114	95
Runoff (% of rainfall)	7.0	5.8

The energy budgets of both systems were evaluated by North Eastern Hill Universty (NEHU), Shillong. It was found that terracing was less efficient in energy terms when compared to shifting cultivation (Table 5.17).

TABLE 5.17: ENERGY BUDGET OF THE *JHUM* SYSTEMS

System	Energy (MJ / ha / yr)		Output / Input Ratio
	Input	Output	
Jhum			
30 years cycle	1665	56766	34.1
10 years cycle	1181	56601	47.9
5 years cycle	510	23858	46.7
Terrace	6509 (8003)*	4362	6.7

* First year energy input

The output/input ratio with reference to crop yields was of 1.88 for 5-year *jhum* cycle and 1.43 for bench terracing. Further once terraced, the farmer tends to grow only rice. The advantage of mixed cropping (getting all commodities from the holding and providing soil cover with different duration crops along with their synergism) is absent. Thus, the alternatives to *jhum* cultivation seem to be either expensive (bench terracing) or difficult to adopt (such as horticulture or cropping pattern changes away from subsistence crops to cash crop plantations such as spices). Another option is to adopt the alder agro-forestry. Trees like alder (*Alnus nepalensis*) may be grown @ 60±5 trees/ha and be either pollarded or coppiced to take arable crops. Such a practice already exists in the seven sister states of NE region. Alder tree is a multipurpose tree and can be pollarded or coppiced after 6 years growth. Subsequent cutting can be done after

every 4 years. Alder-based tree farming is identified as an alternative to shifting cultivation. Alder trees are planted in the slopy lands of Nagaland. They are allowed to grow for a period of 4-6 years and pollarded. Then cropping is taken up. Maize, barley, millets and pumpkins are grown in the upper reaches of the slope while rice is taken up in the lower reaches. Alder coppices well and in 4-6 years the canopy develops. And the process continues. Alder is planted in a few alternate plots to have continuity in farming. Alder provides large quantities of firewood and provides adequate leaf litter which is burnt on the surface to improve the soil productivity. The lay period, by itself, also improves the soil fertility through recuperation.

Thus, alder agro-forestry could be an alternative to *jhum* cultivation. The difference is that early *jhum* cultivation was practiced by slash and burn of fields every 25-30 years (now shortened to 3- to 12-year cycle) while alder agro-forestry system is in a cycle of 4-6 years. The nutrient additions to soil by both systems are said to be identical. The Government of India, through a project spent Rs. 1434 million covering 174,000 ha (@ Rs. 8,240/ha) to ameliorate the problem in these NE states up to 3rd year of Ninth Five Year Plan. The total area under *jhum* cultivation in the region is 2.7 mha. The results indicated reluctance of the farmers to the change from *jhum* cultivation once the assistance is withdrawn.

Perhaps, once farmers see the merit of such agro-forestry systems (such as alder), external application of finely powdered Mussourie Rock Phosphate and dolomite (@ 200 kg/ha) may be useful in enhancing crop yields and also leading to diversification in crops. However, the government must ensure supply of these two commodities, not necessarily on subsidy, at a cartable distance and also to ensure quality of the products. The premise is that nitrogen for crops is supplied through recycling / regenerative processes.

5.10.3 Traditional Water Harvesting Systems

There are several indigenous rainwater harvesting systems used for cultivation in NE India.

1) *Zabo* systems (Nagaland)

a) Means impounding water

b) Practiced in Nagaland (Phek district)

c) Catchment area is forest land

d) Siltation retention tanks constructed above water harvesting ponds

e) 300-600 cum ponds of 1.5-2.5 m dug below for storage

f) Below storage ponds paddy fields constructed on bench terraces

g) Water let into the paddy fields through G.I. or bamboo pipe

2) *Panikheti* systems (Nagaland, Manipur, Sikkim, Arunachal Pradesh)

a) Angani and Chakkesan tribes of Nagaland follow this system. Also practised in Arunachal Pradesh, Manipur and Sikkim

b) Terraces with strong bunds

c) Terraces formed by cut and fill

d) Bunds rammed properly

e) Paddy grown in terraces and colocasia on risers

3) Bamboo drip irrigation (Meghalaya)

a) Water diverted through bamboo channels

b) Water conveyed @ 18-20 litres per minute over a distance of several hundred metres

c) Even drip systems @ 10-80 drops per minute made feasible in the system

d) Betel leaf and pepper in arecanut plantations irrigated with this system

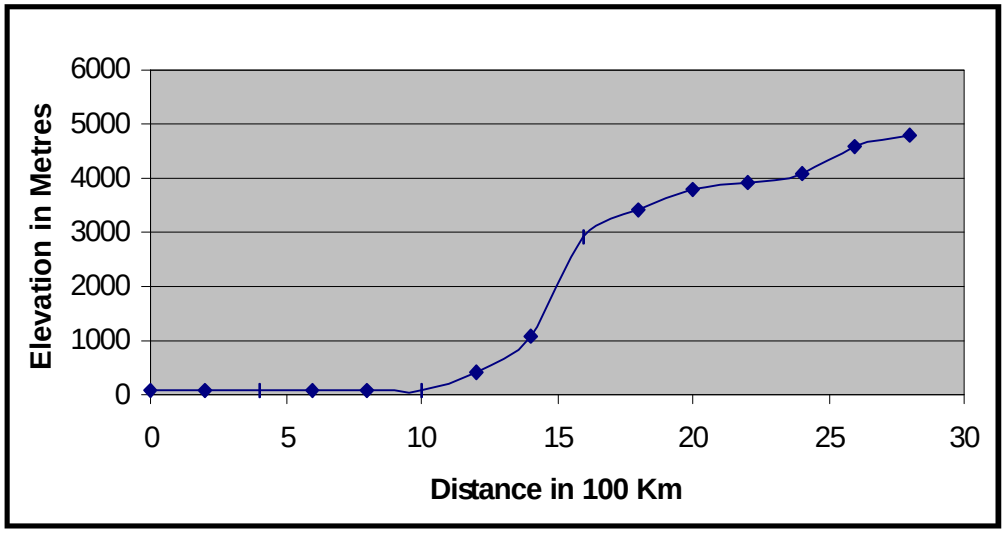
e) Water traverses through rugged terrain

Hundreds of years ago, tribals in Meghalaya devised a system of *bamboo drip irrigation*, carrying water from the main channel to their agricultural fields through a system of bamboo pipes. With these, they were able to divert 18 to 20 litres per minute from the main river and feed an indigenous drip irrigation system (Aggarwal and Narain, 1997). This system was originally devised to irrigate betel leaf or black pepper crops. Water diversion from one channel to the other was the key to the whole system. The sections of the channels were adjusted in such a way that the final aim of providing water application in the form of drops per minute was adequately maintained (Aggarwal and Narain, 1997). Mizoram has a highly developed system of *rainwater harvesting from rooftops*. Horizontal rainwater gutters are placed at the base of sloping roofs and these are then connected to large underground rainwater harvesting tanks. These were the main source of drinking water for the local population. In Assam valley, *small width channels* running

to several kilometres in length were dug in the sub-mountainous tracts by Kachari villagers in Kamrup district to carry water over very long distances to irrigate as much as 1000-1500 ha of land (*Assam Imperial Gazetteer of India*, 1909, quoted in Aggarwal and Narain, 1997). The Bodo tribes, who live in slightly higher elevations, used to construct ponds known as *dongs* from which water was taken out for irrigation through a wooden instrument called *lahoni*. There is the urgent need to identify such traditional systems and strengthen them to adequately utilise the vast water resource potential of the region.

Figure 5.3

Slope Profile of Brahmaputra



The Assam Plains face the severe problem of river flooding from Brahmaputra. The Brahmaputra basin represents a unique physiographic setting (Figure 5.3). The river flows through mountainous tracts of Greater and Middle Himalayas for a major part of its length, before entering the Assam Plains near Pasighat. The bed gradient of the Brahmaputra in the mountainous tract is as high as 2% (16.8 m/kh) but near Guwahati, its slope is only 0.1 m/km. The size of its catchment, the high rainfall regime and high bed slope explains why the area is prone to heavy floods. Coupled with the indiscriminate deforestation this leads to massive amounts of topsoil coming loose in the rains. The soil flows down into the river and in turn causes the riverbeds of the Brahmaputra and its tributaries to rise. Engineers at the Flood Control Department, Assam, have estimated that nearly 27.3 billion tonnes of silt has accumulated in the Brahmaputra River between 1950 and 1997. The riverbed off Dibrugarh, in upper Assam, has risen by as much as three metres.

5.10.4 Action Plan for North-East India

With the background provided above, it is clear that the NE region needs a special dispensation. With multiple slopes and predominance of the rural poor (40% BPL in 1999-2000), mini-watershed approach in area development would be desirable.

1. The shifting cultivation (*jhum*) is a very wise and novel traditional system. There is a great bio-diversity, simplicity and economics in this practice. However, our concern is two fold. Firstly, the *jhum* cycle is getting shortened from 25-30 years to 3-10 years. In the process more areas may be opened up as against the present estimated 2.7 mha (of which about 17% is annually subjected to this practice). Secondly, there is enormous soil loss due to erosion (with the high rainfall and steep slopes). To contain or mellow the problem we may encourage the community to go for settled farming through agro-forestry systems with tree components of their choice (Alder is one such example. Alder is a nitrogen fixer and the leaves are useful manure for the crops). After all *jhum* is practiced more as a nutrient recycling system.

2. The NE region has a great potential for fruit trees. Minor soil working (e.g., half-moon shaped basins) fruit trees like mandarin, pineapple and other choices of the community may be considered.

3. The traditional water harvesting systems need all the encouragement and upscaling. Several examples are cited above. There could be several others that may also be considered. All these need to be a part of the area development on watershed basis.

4. A special attention is needed to protect the existing agro-biodiversity (e.g., glutinous rice varieties) for which the NARS-NGO-farmer networking is essential.

5. There are several ethnic groups in the tribal regions. Their customs, desires and idiosyncrasies must be respected and maintained. Only then can any acceptance and advancement of new introduction become feasible. [59]

59 We are grateful to P.S. Vijay Shankar (Director, Research, SPS) for putting together the material in this chapter.

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Appendix I

Schedule of Visits, Participation in Workshops, Meetings by the Committee

No.	Date	Location	Purpose
2005			
1.	Feb 24-28	Anand, Gujarat	Participation in "International Water Management Institute (IWMI) – Tata Annual Partners Meet 2005" related to management of water resource in the country
2.	March 18	New Delhi	Orientation meeting for members of the expert committee for DDP / DPAP watershed
3.	May 2-3	New Delhi	Meeting with innovative NGOs (see list)
4.	May 5-7	Gurgaon, Haryana	Participation in national workshop on "Emerging Policy Issues under Watershed programmes" supported by DANIDA
5.	May 31 to June 2	Ahmedabad, Gujarat	★ Meeting with senior officers of the state governments of Maharashtra, Gujarat, Madhya Pradesh and Rajasthan ★ Field visit to watersheds implemented by the state government and NGOs (DSC, AKRSP - India)
6.	June 1	Ahmedabad, Gujarat	Meeting with a network of organizations associated with watershed programme in Gujarat (facilitated by Development Support Centre, Ahmedabad) (see list)
7.	June 2-4	Jaipur, Rajasthan	★ Field visit to watersheds implemented by the state government and NGOs (Seva Mandir / Tarun Bharat Sangh) ★ Meeting with senior officers of the state government
8.	June 7-8	Maharashtra	★ Meeting with senior officers of the state government ★ Field visit to watersheds implemented by the state government and NGOs (WOTR / Hindi Swaraj Trust / Hivre Bazar) ★ Field visit to Darewadi Training Centre of WOTR

No.	Date	Location	Purpose
9.	June 10-11	Madhya Pradesh	★ Meeting with senior officers of the state government ★ Field visit to watersheds implemented by the state government and NGO (National Centre for Human Settlement and Environment) ★ Visit to Baba Amte Centre for People's Empowerment, Samaj Pragati Sahayog
10.	June 16	Hyderabad	Meeting with innovative NGOs (see list)
11.	June 21-22	Karnataka	★ Field visit to Sujala watershed (funded by World Bank and implemented by state government) and also the watershed funded and implemented by NGO (MYRADA) ★ Meeting with senior officers of the state government of Karnataka
12.	June 22	Karnataka	Meeting with innovative NGOs in Karnataka which are associated with watershed programmes. The participating NGOs include MYRADA, OUTREACH, Indo-Swiss Participative Watershed Development-Karnataka, DANIDA's Watershed Development Programme
13.	June 23-24	Karnataka, Tamil Nadu	★ Visit to resource centre and training centre of MYRADA ★ Field visit to watersheds funded by MoRD ★ Discussion with DHAN foundation regarding their experiences in watershed programme ★ Meeting with senior officers of the state government
14.	July 11-14	Orissa	★ Field visit to bilateral projects namely DANWADEP and WORLP watersheds in Koraput and Bolangir districts ★ Meeting with officers of the state governments of Orissa and West Bengal at Bhubaneshwar
15.	July 15	West Bengal	Field visit to watershed programme funded and implemented by NGO (PRADAN) in Purulia district

No.	Date	Location	Purpose
16.	July 16	Ranchi, Jharkhand	Meeting with a group of NGOs associated with watershed programme in high rainfall tribal area of Jharkhand (see list)
17.	July 20-21	Andhra Pradesh	Meeting with a network of organizations associated with watershed programme in Andhra Pradesh (facilitated by Watershed Support Services and Activities Network, Secunderabad)
18.	July 25	Pune, Maharashtra	Meeting with *Forum for Watershed Research and Policy Dialogue* (see list of participants)
19.	August 18	Hyderabad	Participation in national workshop on implementation of Hariyali guidelines organized by National Institute of Rural Development
20.	August 19-20	Andhra Pradesh	★ Field visit to watershed funded by MoRD and implemented by OUTREACH in Chittoor district ★ Field visit to watershed funded by MoRD and implemented by state government in Anantpur district
21.	August 21	Andhra Pradesh	★ Meeting with a network of NGOs associated with watershed development and also with natural regeneration of biomass in common land in Anantpur district ★ Meeting with representatives of CBOs (including watershed committee, User Groups, SHGs, etc.) associated with selected watersheds in Anantpur district
22.	August 25	Punjab	★ Meeting with senior officers of northern states (Punjab, Haryana and Himachal Pradesh) ★ Field visit to watershed implemented by Government of Punjab and funded by World Bank
23.	August 26	Himachal Pradesh	Field visit to watershed in Hamirpur district (which is funded by MoRD and implemented by state government in collaboration with PSI, Dehradun)

No.	Date	Location	Purpose
24.	August 27	Haryana and Uttaranchal	★ Field visit to watershed funded by World Bank and implemented by Government of Haryana ★ Meeting with senior officers of the Uttaranchal state
25.	August 28	Uttaranchal	Field visit to watershed funded by MoRD and implemented by PSI, Dehradun
26.	August 29	New Delhi	Meeting with World Bank with specific reference to institutional setup at national level
27.	Sep 8	Ahmedabad	Consultation meeting with Shri Anil C Shah and Prof. Pradip Khandwalla regarding institutional design for watershed programme
28.	Sep 22-23	New Delhi	★ Consultation meeting with Planning Commission members Shri B.N. Yugandhar, Dr. V.L. Chopra and Dr. Abhijit Sen ★ Presentation by Dr. J.S. Bali on "Bio-industrial Watershed Management"
29.	October 3	New Delhi	Consolidation of learning from watershed programmes funded by DFID in different states
30.	October 14	Patancheru, Andhra Pradesh	Participation in meeting organized by ICRISAT for sharing experiences on watershed development with expert committee
31.	October 22	Mumbai	Consultation meeting with Livestock Environment And Development Advocacy Network on "Livestock in Watershed Development"
32.	Dec 7-8	Rajasthan	Meeting with AFRI, Jodhpur and field visit to watershed in Jodhpur and Barmer districts implemented by NGO and the state government

No.	Date	Location	Purpose
33.	Dec 9	New Delhi	Briefing meeting with Hon'ble Minister of Rural Development, Government of India, Dr. Raghuvansh Prasad Singh
34.	Dec 16	New Delhi	Consultation meeting with FICCI and CII on Public-Private partnership in watershed programmes
35.	Jan 24 2006	New Delhi	Meeting with officials of North-Eastern states
36.	Jan 24 2006	New Delhi	Meeting with Shri B.S. Lalli, Secretary, Ministry of Panchayati Raj, Government of India on role of PRIs in watershed development programmes

Meetings of the Technical Committee

No.	Date	Place
1	18 March 2005	New Delhi
2	3 May 2005	New Delhi
3	24 May 2005	Hyderabad
4	24 September 2005	New Delhi
5	16 January 2006	New Delhi

Appendix II

List of Organisations Met and Watersheds Visited by the Committee

Sl. No.	Name of Organization	Name of the participant
A.	NGOs	
1	SOPPECOM	Dr. K.J. Joy
2	DSC	Shri Anil C Shah
3	GIDR	Prof Amita Shah
4	WWI	Ms. Vasudha Pangare
5	Seva Mandir	Ms. Neelima Khaitan
6	Gram Vikas	Shri Joe Madiath
7	Agragamee	Shri Achyut Das
8	MYRADA	Shri A.P. Fernandez
9	PSI	Dr. Ravi Chopra
10	PSI	Shri Deependu
11	PRADAN	Shri A. Ghose
12	AKRSP-I	Shri Apoorva Oza
13	AKF	Ms. Tinni Sawhney
14	WASSAN	Dr. N.K. Sanghi
15	SADGURU	Shri Harnath Jagawat
16	Samaj Pragati Sahayog	Dr. Mihir Shah
B.	Government	
1	Planning Commission	Shri B.N. Yugandhar
2	Government of India (MoRD), New Delhi	Shri V.S. Sampath, Additional Secretary

Presentations by NGOs in Gujarat to the Committee, Ahmedabad, 1 June 2005

Sl. No.	Presentation	Name of the presenter and organization
1.	Strategies for tribal area development	Harnath Jagawat N.M. Sadguru Foundation, Dahod
2.	Restructuring of organizations	Pradip Khandwalla
3.	Strategy and approach for capacity building	Kirit Parmar DSC, Ahmedabad
4.	Convergence of schemes / participatory monitoring and evaluation	Girish Sohani BAIF, Pune
5.	Presentation on strategies for saline and coastal areas	Ms. Nafisa Barot Utthan, Ahmedabad
6.	Public-Private Partnership	Haribhai Mori Ambuja Cement Foundation, Kodinar
7.	Equity concerns in watershed	Apoorva Oza AKRSP (I), Ahmedabad
8.	Maintenance of assets	Sachin Oza DSC, Ahmedabad
9.	Functional relationship between CBOs and PRIs	Anil C Shah DSC, Ahmedabad
10.	Decentralization of governance and role of PRIs in watershed	Anil C Shah DSC, Ahmedabad
11.	Development of forestland within watershed	Anil C Shah DSC, Ahmedabad
12.	Agriculture productivity enhancement – watershed plus	Manubhai Mehta SKTGSM, Savarkundla
13.	Development of CPR	Kantisen Shroff VRTI, Mandvi
14.	Genuine Contribution	Premjibhai Patel VPST, Upleta

Meeting at Udaipur, 3 June 2005

No.	Person	Name of Institution
1	R.K. Singh	Astha Sansthan, Udaipur
2	Prem Kumar Luthar	Astha Sansthan, Udaipur
3	Jaya Bharti	Astha Sansthan, Udaipur
4	Rahul Chaturvedi	FES, Bhilwara
5	S.S. Singh	FES, Bhilwara
6	Mital Barwal	FES, Udaipur
7	Shantam Sinha Roy	FES, Bhilwara
8	S.N. Bhise	Seva Mandir
9	Shailesh Nagar	FES, Udaipur
10	N.L. Ameta	Seva Mandir
11	Heeralal Patel	Seva Mandir
12	Sunil Negak	Seva Mandir
13	Narendra Jain	Seva Mandir
14	Vishal Dashottar	Seva Mandir
15	Harish Ahari	Seva Mandir
16	Arun Maheshwari	Seva Mandir
17	Andre Ling	Seva Mandir
18	Kulranjan Kujur	Seva Mandir
19	Hemraj Bhati	Seva Mandir
20	Savli Bai	Seva Mandir
21	Tajendra Singh	Hanuman Van Vikas Samiti
22	Vaisharam Nanama	Bada Bhilwara, Forest Protection Committee
23	Dhuri lal Nanama	Bada Bhilwara, Forest Protection Committee
24	Jhalam Chand Angari	Shyampura – Forest Protection Committee
25	Dinesh Vyas	WDSC.
26	Suresh Heval	Watershed Development Department
27	Narayanlal Wadera	Thalai Village, Van Utthan Sanch
28	Savita Devi	Nayakhola village
29	Mohan Dangi	Prayatna Samiti, Udaipur.
30	Suresh Kumar Sharma	Seva Mandir
31	Mohammed Yakub Khan	Seva Mandir
32	Kishan Lal Vadera	Talai village
33	Kanku Dungri	Mohd. Phalasiya, Van Utthan Sangh
34	Shailendra Tiwari	Seva Mandir
35	Neelima Khetan	Seva Mandir

Meeting at Hyderabad on June 16, 2005

No.	Name of Organization	Name of the participant
A.	NGOs	
1	WASSAN, Hyderabad	Shri M.V. Ramachandrudu
2	CESS, Hyderabad	Dr. V. Ratnareddy
3	WOTR, Ahmednagar	Shri Crispino Lobo
4	OUTREACH, Bangalore	Shri R.M. Palanna
5	BASIX, Hyderabad	Shri Vijay Mahajan
B.	Government organizations	
1	Government of India (MoRD), New Delhi	Shri V.S. Sampath, Additional Secretary
2	Government of Andhra Pradesh, Hyderabad	Shri K. Raju, Principal Secretary (Rural Development and Panchayat Raj)

Presentation by NGOs in Jharkhand, Ranchi, 16 July 2005

No.	Name of NGO	Name of resource person
1	Tata Steel Rural Development Society	Shri Rajan Sharma
2	PRADAN	Shri Deep Joshi
3	Holy Cross Social Service Centre	Shri Anthan Bakhla
4	PRAVAH	Shri Uttam Kumar
5	Vikas Sahyog Kendra	Shri Lalit Kumar

Meeting at Pune with Forum for Watershed Research and Policy Dialogue, July 25, 2005

No.	Name	Organisation
1	A Vaidyanathan	Former Member Planning Commission
2	V.B. Eswaran	Former Chairman, Committee on Training for Watershed Development, MoRD, Government of India
3	B.N. Yugandhar	Member Planning Commission

No.	Name	Organisation
4	K.R. Datye	Society for Promoting Participative Ecosystem Management, Pune
5	Gopal Kadekodi	Centre for Interdisciplinary Studies in Environment and Development, Bangalore
6	Himanshu Kulkarni	Advanced Centre for Water Resource Development and Management, Pune
7	Apoorva Oza	Aga Khan Rural Support Programme, Ahmedabad
8	Suhas Paranjape	Society for Promoting Participative Ecosystem Management, Pune
9	Sharachchandra Lele	Centre for Interdisciplinary Studies in Environment and Development, Bangalore
10	Raju Adagale	Society for Promoting Participative Ecosystem Management, Pune
11	Hasmukh Joshi	Gujarat Institute of Development Research, Ahmedabad
12	Amita Shah	Gujarat Institute of Development Research, Ahmedabad
13	A.K. Kiran Kumar	Centre for Interdisciplinary Studies in Environment and Development, Bangalore
14	K.J. Joy	Society for Promoting Participative Ecosystem Management, Pune
15	Shrinivas Badiger	Centre for Interdisciplinary Studies in Environment and Development, Bangalore
16	Sucharita Sen	Jawaharlal Nehru University, New Delhi
17	Neha Panchal	Gujarat Institute of Development Research, Ahmedabad
18	Keshab Das	Gujarat Institute of Development Research, Ahmedabad

List of Watersheds Visited by the Committee

Sl. No.	Date	State	Name of watershed		Name of PIA
			District	Village / watershed	
1.	May 31 to June 2	Gujarat	Ahmedabad	Nani - Kishol	• Gujarat State Rural Development Co. Ltd.
			Ahmedabad	Kayala	• Forest Department
			Sabarkantha	Valuna	• Development Support Centre (NGO)
			Surendranagar	Mokasar	• Aga Khan Rural Support Program (NGO)
2.	June 2-4	Rajasthan	Udaipur		• State Government
			Udaipur	Ramaj	• Seva Mandir (NGO)
			Alwar	Thanagaji	• Tarun Bharat Sangh (NGO)
3.	June 7-8	Maharashtra	Ahmednagar	Ralegaon Sidhi	• Hind Swaraj Trust (NGO)
			Ahmednagar	Hivre Bazar	• Shri Popat Pawar (Sarpanch)
			Ahmednagar	Vaijubabhul Gaon	• Watershed Organization Trust (NGO)
4.	June 10-11	Madhya Pradesh	Hoshangabad	Belawada	• National Centre for Human Settlement and Environment (NGO)
			Ujjain	Narwar	• State Government (Rajiv Gandhi Mission)
5.	June 21-22	Karnataka	Kolar	Uttanur	• State Government and MYRADA (NGO)
			Kolar	D. Kotendlu	• MYRADA (NGO)
			Kolar	Kamsamudram	• Training Centre and community managed resource centre with MYRADA (NGO)
			Kolar	Boodhikote	• Community managed resource centre, Rado Centre, marketing centre for SAFAL with MYRADA (NGO)

Sl. No.	Date	State	Name of watershed District	Village / watershed	Name of PIA
6.	June 23-24	Tamil Nadu	Dharmapuri	Puluthikarai	• State Government
			Salem	Nagar Koodal	• State Government
7.	July 11	Orissa	Koraput	Madamgandhi	• Block Development Office (BDO)
			Koraput	Malkarbandh	• Block Development Office (BDO)
			Koraput	Tola	• Department of Soil Conservation
	July 12		Bolangir	Kutasinga	• NGO
	July 13		Bolangir	Bindhanpadar	• State Government
8.	July 15	West Bengal	Purulia	Bandudih	• PRADAN (NGO)
9.	August 19-21		Andhra Pradesh	Chittoor	Kotavoor OUTREACH (NGO) and State Government
			Anantpur	K. Pulakunta	• MYRADA (NGO) and State Government
			Anantpur	Manirevu	• RDT (NGO) and State Government
			Anantpur	Mallapuram	• RDT (NGO) and State Government
10.	August 25	Punjab	Roopnagar	Kotla	• State Government
11.	August 26	Himachal Pradesh	Hamirpur	Choru	• State Government (DRDA) and Peoples' Science Institute (NGO)
12.	August 27	Haryana	Ambala	Sambhalwa	• State Government
13.	August 28	Uttaranchal	Pauri-Garhwal	Asni	• Peoples' Science Institute (NGO)
14.	December 7-8	Rajasthan	Jodhpur Barmer	Balesar Kalyanpur	• NGO • Forest Department

Appendix III

Responses of State Governments

Government	Recommendations
Andhra Pradesh	• Existing criteria for identifying areas needing treatment should continue. However, the following also may be considered. 1. While calculating area under irrigation, only area under canal irrigation may be considered since area under wells and tanks largely depend on local rains. 2. The extent of current fallow, fringe forest areas and common property resources and other categories of wasteland also required to be considered. 3. Severely degraded land should be included for treatment; mildly or moderately degraded (<25%) land should not be supported by government funding. 4. Tribal areas (high rainfall and high altitude regions) which do not fall into technical criteria of DPAP/DDP/IWDP also may be considered for watershed treatment. • The catchment areas of several traditional tanks need special attention. • Effective people's participation can be ensured by creating functional and collaborative spaces for various institutions/CBOs: namely, the Gram Panchayat, Voluntary Organizations, SHGs, User Groups, Labour Groups, etc. • Gram Panchayat acts as the PIA, implements the NRM component through the User Groups and Labour Groups with the help of Voluntary Organizations. • Gram Panchayat also takes the responsibility of sustainable management of water and other natural resources. • Water audit is taken up and water plans are drawn up by the Gram Panchayat (under WCM). • Introduction of probation phase for testing the willingness of the community to participate. • Poor need to be identified and organized into SHGs to take up alternate livelihood activities. • Viable activities that are indigenous and traditional to be promoted. • Funds need to be earmarked for Productivity Enhancement so that good practices can be demonstrated.

Government	Recommendations
	• Skill improvement, financial investment through revolving funds and market linkages are crucial.
	• The WDF, created out of local contributions, can be used by the User Groups for maintenance of structures as a revolving fund.
	• Effective extension services to be provided by placing a para professional in the village and linking him/her to the department concerned through convergence.
	• District perspective plans to be prepared keeping the prioritized villages in view and assessing the time-frame and fund requirement for saturation.
	• Livelihood enhancement programmes and other poverty alleviation programmes also can be dovetailed to the area development programme.
	• From the experience in Andhra Pradesh, a separate Agency is needed at the District level to deal with the watershed and livelihood programmes.
	• In view of the expanded activities proposed, the unit cost norm may now be increased at least to Rs. 8000/- per ha.
Arunachal Pradesh	• Suggestions regarding prioritisation of watersheds to be taken up under IWDP – need to involve Zilla Panchayats.
	• NGOs to be cleared by CAPART.
Gujarat	• Categorisation should be based on GIS and satellite based mapping.
	• The above information should be checked with secondary data (census, etc.)
	• This programme should be under one common name instead of DPAP/DDP/IWDP.
	• 20% of watershed project area should be treated specifically in an integrated development manner. The remaining area should be treated with specific works.
	• 40% of the total area under treatment should be that of small and marginal farmers.

Government	Recommendations
	• Role of voluntary organisation is crucial for the purpose of community mobilisation, training as well as capacity building of the community for post-project management.
	• Fund allocation for training and community mobilisation should be increased from 5% to 10%.
	• Special provisions for women in entry point activities should be made for motivation and organisation of women, such as bathing ghats, drinking water stands and community halls.
	• Central authority at the district and state levels to avoid overlap of various projects of different departments.
	• Cost of treatment to be raised from Rs. 6,000/ha to Rs. 10,000/ha.
	• 5% for administration/documentation/training
	• 3% for entry point activity for motivation and organisation of women
	• 2% for independent quarterly monitoring and annual evaluation
	• 10% for community mobilisation and capacity building
	• 80% for physical works
Himachal Pradesh	• Land which is not fully degraded should also be covered in watershed development programmes on priority.
	• Difficult areas such as highly sloping portions of the land should be treated by the line departments only.
	• Rates of treatment for such areas should be high.
	• Annual plan for area treatment should be prepared separately and shall be approved by the concerned Gram Sabha as per provision of funds.
	• Monitoring of projects at the level of Gram Sabhas should be strengthened and qualitative parameters need to be taken care of.
	• DPAP/DDP/IWDP should be integrated with related area development programmes and necessary financial allocations should be provided.
Karnataka	• Existing allocation of Rs. 4500 to 6000 per ha is inadequate for social mobilisation, income-generating activities and maintenance of assets. Additional Rs. 3000 per ha should be provided.

Government	Recommendations
Madhya Pradesh	• Hariyali Guidelines have provision for implementation through Panchayat. It would be better to establish the Village Watershed Committee as a permanent institution. • The present project period of 5 years should be increased to 8 years so that the first year is devoted to community mobilisation. • Instead of adopting uniform criteria for prioritisation of degraded lands for the entire country, state-wise criteria will be more rational as the extent of different categories of wastelands and priority for their treatment vary. • The eligibility of an area to be included under DPAP should not be on the basis of district but on the basis of a block. • Due consideration must be given to number of drought years in the last two decades, their recurring frequency and the rate of groundwater development. • Blocks designated as 'Dark' and 'Overexploited' in terms of groundwater exploitation should be included in the list for IWDP projects. • "Desert-like" region in the western border of Madhya Pradesh (ravine area) should be treated as wasteland urgently requiring investment. • Due emphasis to be given to the development of private land of small and marginal farmers. • Another 25 years required to complete treatment of wastelands in the state. • Evaluation processes should be participatory and more regular. • Effective convergence may be sought between different programmes and other rural development and poverty alleviation initiatives.
Maharashtra	• Existing categorisation of blocks should be changed considering: 1. recurrent long dry spells between rainfall 2. frequency of droughts 3. levels of poverty 4. availability of income-generating opportunities • Some additional parameters have been suggested:

Government	Recommendations
	1. wasteland as % of watershed area 2. net sown area as % of watershed area 3. gross cropped area as % of watershed area 4. preponderance of alkaline/saline soils 5. population of landless and BPL 6. quantum of treatment already carried out in the watershed • Special provisions for forest areas as part of the watershed programme • Watershed committees rather than PRIs should be considered as village level implementing agencies. • Specially designed livelihood programmes should be made an essential part of DPAP/DDP/IWDP. • Women and BPL families should be provided preferential allocation of usufruct rights from common land. • Mechanisms of coordination and synergy should be set up between different agencies. • Private-public partnerships should be encouraged in such fields as regeneration of wastelands for production of bio-diesel.
Meghalaya	• Criteria for prioritisation of lands under IWDP (shifting cultivation areas, ravinous, waterlogged, barren rocky land) • Increased emphasis needed on Training. • Cost norm to be raised to Rs. 10,000 per ha.
Orissa	• NWDPRA, DPAP and IWDP may be merged to form one programme. • Further emphasis should be given to (a) community mobilisation (5%); and (b) impact assessment and monitoring processes (2% part of administration budget of 10%) on a regular basis. • "Livelihood focused watershed programmes" as the "next generation" WSD programme. • A dedicated support center, called Watershed Resource Center at the state level to address capacity building needs and give critical support services.

Government	Recommendations
	• An additional Rs. 3500/ha to be added to the cost norm of Rs. 6000 = Rs. 9500/ha (cost of treatment).
Punjab	• In Central and South Western plain zones, the clear delineation of watersheds is either not possible or is difficult. In these areas, block rather than watershed should be taken as a unit.
	• Flexibility of making a comprehensive plan beyond block boundaries should be given in waterlogged areas.
	• More time needed for community mobilisation and training.
	• Integration in the ongoing IWDP, NWDPRA and IWDP (Hills) projects exists in the state in terms of technology transfer, experience sharing and horizontal convergence.
	• Income-generating activities for the landless and the poor should be incorporated in the projects along with marketing linkages.
	• Private-public partnership in processing and marketing of high value crops should be explored.
	• Cost of treatments should be raised to Rs. 10,000 per ha.
Rajasthan	• There is no need to modify existing criteria for categorization of arid, semi-arid and dry sub-humid areas. However, in view of the extent of wastelands, IWDP be permitted in all districts/blocks.
	• Inadequate project Unit Cost. Wastelands like mining, industrial, barren rocky area, saline and alkaline are not being treated at present as cost norm (Rs. 6000/ha) is not enough.
	• Watersheds cannot be delineated in desert areas. Hence, Index catchment (sandy area with drainage) and Cluster (sandy area without drainage) are being taken in DDP. Here, a separate set of treatment measures need to be adopted (such as construction of *khadins* for improved agriculture, agro-forestry and agro-horticulture, stabilisation of sand dunes and use of inter-dunal space for grass/fodder development for livestock).
	• Responsibility of execution of works to duly constituted Watershed Committees instead of Gram Panchayats.
	• Inclusion of livestock development activity in list of eligible activities of guidelines as livestock population is at par with human population at least in Rajasthan.

Government	Recommendations
	• Community mobilization, capacity building and participation of stakeholders can put life in the programme.
	• There is a need to work more on pre-project implementation phase.
	• If integrated with other programmes, viz., NWDPRA, National Wastelands Development Programme, Food for Work Programme, Employment Guarantee Scheme and other schemes, availability of funds will increase considerably.
	• The programme should be under one Ministry at the Centre. At the state level, a Watershed Mission in State should be created to boost the pace and quality of the programme.
	• Possibility of Private Sector partnership can further increase investments for developing the areas in reasonable time-frame.
Tamil Nadu	• Instead of identifying eligible blocks on the basis of irrigated area as a whole, separate weights should be given to canal irrigation, rainfed tank irrigation and groundwater irrigation.
	• Weights of groundwater irrigation should be a function of the rate of depletion of groundwater rather than absolute level or depth of groundwater.
	• Provision of greater time for preparatory period for community mobilisation and training.
	• Watershed Associations have an important role to play along with PRIs. The Village President should be the ex-officio Chairperson of the WA and its EC. The Ward Member of the panchayat should be the ex-officio member of the EC.
	• The WSD plan must form part of the Village Development Plan prepared by the Panchayat.
	• The WSD plan must have provisions for alternative livelihoods, maintenance of assets, equitable sharing of benefits and assessment of impact.
	• Cost of treatment should be raised from Rs. 6000/ha to at least Rs. 10,000/ha.
Uttaranchal	• Different programmes follow different guidelines. Programme components and conditions for contribution, etc. also differ.

Government	Recommendations
	• Time gap in releasing fund from MoRD to PIA should be minimised.
	• Cost of treatment should be raised to Rs. 10,000 per ha.
West Bengal	• Irrigation potential alone should not be the determining factor for selection of DPAP districts/blocks. Selection should also depend on the extent of degraded land and incidence of poverty.
	• Prioritisation of areas for treatment may be state-specific, depending on various other objective criteria for selection of watersheds.
	• Issues of participation, alternative livelihoods, maintenance of assets etc., are addressed only tangentially in Hariyali Guidelines.
	• Fund under various poverty alleviation programmes should be made available for the watershed programme to take up the issue of alternative livelihoods.
	• Entitlements for equitable sharing of benefits should be decided at the neighbourhood level.
	• Quantum of funds provided for training and community organisation should be enhanced from its current 5%.
	• Watershed development plan may be integrated with the five year overall development plan of Gram Panchayats.
	• It should be considered whether the soil and water conservation programmes can be brought under one umbrella with a view to mobilising adequate resources.
	• Private investors may be sensitised to invest in various software activities associated with wasteland development.
	• Number of instalments for releasing funds may be suitably reduced.
	• Simple reporting formats should be made.

Appendix IV

Terms of Reference of Technical Committee

1. To reassess and suitably modify the existing criteria for categorisation of arid, semi-arid and dry sub-humid areas taking into account the changed climatic/biotic factors and identify the blocks for the implementation of DDP and DPAP

2. To formulate criteria for prioritisation of classified degraded lands to be developed under IWDP

3. To identify the areas under DPAP, DDP and IWDP where existing watershed approach is not feasible for implementation and suggest alternative mechanisms to suitably introduce special provisions in the Guidelines for Watershed Development

4. To examine the issues of people's participation, alternative livelihoods, maintenance of assets and sustainable equity in sharing of resources and recommend strategies thereof for more effective delivery of benefits to the community under watershed programmes

5. Impact Assessment of the existing Area Development Programmes and suggestions for modifications based on the observations

6. To examine the issue of integrating DPAP, DDP and IWDP with their financial allocations as additionality with related area development and poverty alleviation programmes such as NWDPRA, National Wasteland Development Programme for degraded forest lands, Food for Work Programme, Employment Guarantee Scheme, etc. and recommend a suitable strategy for such convergence

7. To examine the possibility and suggest ways of public-private partnership for increasing investment in DPAP, DDP and IWDP to develop the areas in reasonable time-frame

Appendix V

Members of Technical Committee

No.	Name	Designation
1	Shri S. Parthasarathy, IAS (retd)	Chairperson
2	Dr. Mohan Kanda, Chief Secretary, Government of Andhra Pradesh	Member
3	Shri V.S. Dubey, ex-Chief Secretary, Government of Bihar and Jharkhand	Member
4	Dr. T.K. Bhati, Principal Scientist, CAZRI, Jodhpur	Member
5	Dr. K.P.R. Vittal, Principal Scientist, CRIDA, Hyderabad	Member
6	Shri Lobzang Tsultim, Assistant Commissioner, Ladakh Autonomous Hill Development Council	Member
7	Shri P.C. Mishra, Special Secretary, Rural Development, Government of Chhatisgarh	Member
8	Shri Vipul Mitra, Commissioner and Secretary, Department of Rural Development, Government of Gujarat	Member
9	Dr. Aloysius P. Fernandez, Executive Director, MYRADA	Member
10	Shri Anoop Badhwa, DIG (DPAP-DDP), Department of Land Resources, Ministry of Rural Development, Government of India	Member-Secretary

Dr. Mihir Shah, Secretary, Samaj Pragati Sahayog served as Honorary Adviser to the Technical Committee.