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Watershed Development Review: Issues and Prospects

CISED

**Technical Report**

**December 2004**

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# ACKNOWLEDGEMENTS

In the beginning, we should confess that we come from activist backgrounds and have no formal academic training in research. Whatever studies we have participated in and contributed to have focused on questions shaped by that background - either questions that have directly been asked by activists or those that we had to ask as we attempted to support activists and activist groups. Old habits die hard. So be forewarned, the activist has sometimes got the better of the researcher!

It was an interesting experience working as part of the CISED team during the course of this review. The discussions and debates we had with and the feedback we got from the CISED faculty at various stages of this review helped sharpen our own ideas that have been largely formed while working in the grassroots movements and as part of CASAD and SOPPECOM. We are grateful to CISED, especially Sharachchandra Lele, Coordinator of CISED, for giving us this opportunity.

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# EXECUTIVE SUMMARY

The concept of integrated and participatory watershed development and management has emerged as the cornerstone of rural development in the dry and semi-arid regions of India. The country has made massive investments in this approach. Even more ambitious plans have been made for the future- the government has set a target of Rs.76,000 crores for the next 25 years. As we enter this second generation of watershed-based development programmes with such heightened targets and expectations, it is important to ensure that the experiences from the first generation of widely implemented watershed development are fully understood and internalised. The present review, undertaken by CISED, hopes to contribute to this process.

## *The normative framework underlying the review*

Understanding watershed development requires a "normative framework" embracing the notions of "watershed" and "watershed development', and how they are translated into practice. Such translation may also be based upon additional assumptions about what is possible and desirable, and how to bring these changes about. One may call this set of goals, specific objectives, and assumptions the normative framework of an analysis.

Catchment protection programmes looked upon the watershed as a unit but focused mainly on reducing reservoir sediment load. Soil and water conservation are still central to watershed development, but afforestation, common lands regeneration, agronomic changes, and so on, are also linked to this central theme and watershed development is now being seen as a core strategy for stabilising rural livelihoods in the dry, rainfed regions of India. Further, participation, gender, equity, sustainability, and livelihoods are now much more prominent concerns in the watershed development literature and are increasingly reflected in the official watershed development guidelines.

In a country like India where the vast majority has been dependent on natural resources for their livelihoods, "development" will have to be based primarily on long-term sustainable productivity enhancement and, in the drought-prone regions, on increasing the dependability of production and, consequently, the security of livelihoods.

The interconnectedness of the biophysical and the social is intrinsic to watershed development and draws strength from this interconnectedness. Biophysical and social interventions are not two separate processes, but aspects of a single unified process and ecosystem processes and resources are basic economic resources as well. Moreover, historical processes and factors also interact with the biophysical and social interventions.

Earlier discussions of needs centred on the fulfilment of basic or subsistence needs. Since the early 90s, the concept of livelihoods, and more specifically "sustainable livelihoods" (SL), has entered the rural development discourse prominently. A definition of these terms is offered by the Department of International Development (DfID): *"A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base"*.

Livelihood is conceptualized in this review in a similar manner. However, livelihood needs in the sense the term is used in the study, include not only the basic needs of food, shelter, and clothing, but also include needs that are imposed due to the nature of the livelihood activity. It also includes certain surpluses over and above directly satisfied consumption needs that can be exchanged with the larger system. Finally, it places a higher premium on *natural* as compared to other forms of assets, thus for example, in watershed development, it emphasises the need for creating equal access at least to the increment of these assets it creates.

An important question is how many of these needs should be fulfilled locally and to what degree in kind? As a norm, we should consider basic food, fuel, fodder, and domestic water needs separately, and treat self-reliance (not necessarily self-sufficiency) in these needs as one of the objectives to be achieved at the

watershed level. In most conditions self-sufficiency in these is possible and desirable at the watershed level. Even in exceptional situations where this may not be possible, it should be possible and desirable for a substantial component of these requirements to be produced locally, and the rest to be met from exchange on equal terms with the larger system. The fulfilment of needs also needs to be considered at the level of the watershed ecosystem as well as at the household levels. Elsewhere we have used biomass as the measure to quantify these needs on the basis of a minimum upper bound approach and show that a farmer family of five generally needs a productive potential of about 15 to 18 T (dry weight) annual biomass increment to meet all the above mentioned livelihood needs, including estimated minimum cash requirements.

In the review we use the term sustainability in the specific sense of environmental sustainability and consider maintaining and enhancing the productive and assimilative potential of the ecosystem as the sustainability goal and derive a few operational norms that logically follow from this approach in the context of watershed development. Livelihood needs depends crucially on who has access to how much and what kind of productive resources, that is, equity. In the normative framework the first dimension is the distribution of human well-being across typical barriers of class, caste, ethnicity, and gender, with the implication that one needs to disaggregate the "local community" and consider the differential impacts of watershed development.

The second dimension emanates from spatial or locational inequalities and this is primarily because of the bio-physical characteristics of the watershed itself. Given that the relationship is often fundamentally asymmetric (for example, activities upstream can affect downstream, but not vice-versa), the issue needs to be carefully addressed at all scales: within the micro-watershed, across watersheds, and across the entire basin. It becomes important to see how those asymmetries map on to the historical inequities of access to productive resources and how watershed development interacts with them. The general experience is that the asymmetries map on to the inequities in a way that more likely accentuates rather than attenuates the inequities within the local community unlike environmental sustainability, which watershed development is likely to enhance *per se*. The implication is that if there are no pro-active elements of equity built into the programme it only accentuates inequity.

The normative framework treats water as a common property resource to be managed and regulated collectively in order to ensure equitable and regenerative use. This implies prioritising water use in the following order: drinking water; water for domestic use and for cattle; water required for ecosystem regeneration, water required for livelihood activity, and surplus/extra water that could be used for cash or commercial crops. The normative framework also aims at a fairer distribution of increased resources with privileged access to the resource poor.

It is important to recognise that water is both a local and non-local resource and that the interdependence effects of scales appear as "externalities" and unlike slogans like "*gaonka pani gaonme*" (the rain that falls in a village is for that village) that may help conserve water in the short run, we need collective regulation and control of water resources at increasing scales ensuring inter-watershed or basin-level equity as well. Hence the normative position limits the right of water for every community to assured access to the water from local *as well a*s non-local sources together necessary for assured livelihood. Accordingly, water is first treated as a common pool resource to be managed and regulated collectively in order to ensure equitable and regenerative use for livelihood assurance and ensure equitable sharing of shortages and surpluses. Only the residual resource is treated as a resource to be regulated by the market.

The enhancement of ecosystem resources and productive potential with public funds and collective, community effort has the potential for ensuring equitable access to *the additional resource created, even as prior right to previously existing resources are recognised and left largely undisturbed, thus making equity a positive sum game.*

Participation has gained increased currency in developmental practice and in related research and literature and this increased awareness is

drawn from various sources and standpoints. Participation is often seen as a means to achieve other goals, or as a value or a goal in itself. The framework sees it as both a goal as well as a means of ensuring more equitable, sustainable, and efficient outcomes.

However, in highly differentiated communities, simple transfer of decision making power to "the community" may turn out to be handing over decisions to the dominant sections within the community. It is necessary to recognise the heterogeneity and ensure that pro-active space is created within the local community institutions for all sections, especially the lower, marginalised strata.

The framework also recognises the importance of outside intervention and believes that participation, livelihood assurance, regenerative use, and equitable access should be the explicit foundational objectives of the collaboration between the community and outside agencies. The key role of outside agencies is that of capability building, by providing information and offering a forum for discussion aimed at resolving issues related to the objectives through discussion and debate. It is also important to recognise that there is a need for greater accountability and transparency on the part of the outside agency to the local communities.

### *Impact on livelihoods*

The review finds that watershed development has improved livelihood opportunities for watershed communities though the degree of improvement varies from the spectacular to the "now not very good". The distribution of benefits has not always been even, and there are also reversals though in all cases some livelihood improvement has carried over. On the whole, watershed development shows significant impact in better years, but has not mostly been able to insure against bad years. In certain cases conflict between drinking water and irrigation needs has been accentuated by watershed development. Though watershed development has brought down migration in the initial phases, the post-project phase does not show a uniform trend and in some instances availability of work has been reduced

There is a lack of consideration of the issue of dependability and watershed planning is mostly based on average or mean rainfall or close to 50% dependability. It is imperative that the programme be planned at a dependability of 80% or more to add stability to the programme and achieve planned targets every four out of five years. This makes it easier to build up surpluses during the four better years (of which one or two will be quite good) to tide over the one year in which planned targets may not be met.

### *Impact on sustainability*

The review shows that there has been a beneficial impact of watershed development on watershed ecosystems: soil erosion has been checked, land cover has improved, and groundwater recharge has increased. However, there is no corresponding social regulation of water use or of extraction from the commons. Non-cropped area is brought under cultivation by large scale levelling, and there is a shift away from food crops without an accompanying shift to sustainable crop practices. Watershed activity is possibly showing up in decreased flows into downstream tanks and reservoirs. Drinking water is increasingly being met from deeper aquifers. However, many of these phenomena have not been adequately studied; neither have there been many water balance studies.

Thus, in the context of sustainability, there is an urgent need to 1) promote sustainable productivity enhancement measures, 2) regulate biomass extraction rate, 3) plan watersheds on the basis of ridge to valley without taking a dogmatic position about it, 4) be aware of the balance while planning run-off suppression measures, 5) study and monitor unintended hydrological effects, 6) regulate groundwater extraction, 7) do integrated planning, prioritise and socially regulate water use, and 8) make applied water part of project design.

### *Watershed development and equity*

In respect of equity, the review finds that by itself, watershed development accentuates inequity: favours the landed and the lower reaches; as well as those who have the wherewithal to invest in wells and pumps. In some cases, measures like bans on grazing and cutting trees, closing of commons, and a ban on keeping goats, which are imposed from above, have hit the rural poor, especially the Dalits and

landless, very hard. However, it also finds now a greater awareness of equity issues related to the landless, the women, the Dalits, and the marginal farmers. However, it often sees the solution as non-land based income generation activity, unrelated to watershed development. There is a need for the resource poor to be ensured a share of the increased resources that watershed generates.

Increased awareness of gender has led to establishment of self help groups (SHGs) that have helped women save, obtain credit, and become more active and visible. But this activity has not become an integral part of the watershed development and has had little impact on traditional gender roles.

### *Watershed development and participation*

Similarly, the review finds an increased awareness of the need for participation. However it is mostly viewed as a means to obtain co-operation, raise efficiency, and gain legitimacy rather than an empowering objective in itself. Much of the decision making still remains in the hands of the development agencies and CBOs function mostly as implementing agencies.

In the comparatively newer projects, there is greater emphasis on providing representation to all social groups and hamlets on multiple user committees for sectoral interest groups. Overall, there is an increase in community participation in the operation and maintenance of the structures and assets, though common lands remain neglected.

However, participation of the local communities in crucial decisions has been pretty dismal along with control over fund allocation and expenditure. Major decisions are taken (beforehand) by PIAs and consultation with local people is often synonymous with consultation with the "powerful".

Treating cost sharing as an indicator of participation is also problematic. Though the core idea of cost sharing ensuring people's commitment may be acceptable, the issue of the quantum is not. Resource poor sections may be "priced out" of the programme because they cannot afford the contributions. Sometimes contributions come from withheld wages or from reduction in wages. Effectively this means that the poor, pay on behalf of the landed.

Participatory Rural Appraisal (PRA) is being increasingly used as a tool for data collection, to enlist local participation and to capture local development priorities. Even when not reduced to a bureaucratic procedure it is problematic because often it may represent only the opinion of a few, especially the dominant sections in the village. It is necessary to contextualise PRA and demarcate what it can do and what it cannot. PRA techniques can be an effective tool for a qualitative and rapid understanding of the situation. However, as it does not provide reliable quantitative data regarding resource status or land use patterns, and may leave no space for interactive learning between local knowledge systems and "external", "modern" systems of knowledge.

There is also a lack of adequate space for and articulation with the Panchayati Raj institutions and the relationship between them and watershed development organisations remains problematic. Greater attention is needed to address 1) participatory monitoring and evaluation, 2) the role of local communities as regulatory layers, 3) lack of nested institutions, and 4) the conditions for effective participation, for moving on from participation to self-governance.

### *Research needs*

The review also identifies the following research needs: a) Development of easy, practical and robust models for water balance studies that can give good, workable, first approximations with sufficient scope for improvement and adaptation as precise data become available; b) Study of the serious hydrological changes being brought about by watershed development at the micro-watershed as well as at sub-basin and basin levels; c) Long term, co-ordinated, multi-locational studies through collaborative research network to capture impacts of watershed interventions, especially the ecological impacts, which take a longer period to work themselves out; d) Inter-disciplinary studies to understand the interventions, processes, and outcomes in a more holistic and integrated manner and capture the multi-dimensionality of the problem in an integrated manner.

The review also makes specific suggestions for research in different areas as listed below:

***Hydrological:*** a) cross-scale and inter-scale hydrological effects (upper to valley portions, intra- and inter-watershed relations up to basin-scale); b) surface water-groundwater interactions; c) aquifer behaviour, in particular balance between shallow and deep aquifers, their sizes, recharge rates, locations, and so on; d) net effect of different soil and water conservation measures as well as afforestation and agricultural practices on quantities like infiltration and erosion under different geo-physical conditions.

***Land-Vegetation-Water interactions:*** a) agro-ecological relationships and impact on one another as an ecosystem; b) grazing and forest management, in particular productivity, sustainability, and offsite effects.

***Socio-Economic and Institutional aspects:*** a) compare asset-based approaches with income-based approaches, in terms of benefits, their distribution and sustainability; b) scope for biomass-based value addition — biomass, labour, energy, capital and financial requirements, and identification of possible bottlenecks; c) scope of watershed and NRM-based development in different regions, limits, and implications, especially in resource poor areas; d) indigenous knowledge, its scope, and issues in its interface with modern knowledge; e) role of CBOs and SHGs in improving participation and sustaining benefits beyond project period; f) ways of better addressing the problem of local heterogeneity by equitable and sustainable reconciliation of interests and conflict resolution; g) social and institutional mechanisms and capability building for incorporating rigorous participatory grassroots benchmarking, monitoring, and assessment in watershed based development programmes.

## *Need to re-orient the approach and policy*

The review also highlights an immediate need to re-orient the present approach to watershed development and put an enabling policy framework in place to ensure that watershed development programmes adequately meet the requirements of the four central concerns, namely, sustainability, livelihoods, equity, and participation/self-governance. It calls first of all for a reorientation of approach to watershed development based on the following: a sustainable productivity enhancement orientation; pro-active measures to deal with sustainability and equity issues; preceding resource generation with institutional arrangements to handle those resources; making adequate technology choices; and taking dependability into account in watershed planning.

There is also an urgent need for an enabling legislation for collective regulation of groundwater use and eventually moving towards IWRM from below. Many policies, which may not be directly related to watershed development programmes *per se*, also impinge on the outcomes, including electricity tariffs, irrigation policy, agriculture research and extension policy, fertiliser and agricultural produce pricing, and forest policy. There is also a need to restructure the watershed development programme by increasing the watershed development allocation and period, and conduct it in phases. The suggested first phase consists mainly of upper reach programmes, plantation activity, capability building, and institution building; it does not include constructing any major water harvesting structures. The second phase deals mainly with full drainage line treatment and the third phase with what is now being called watershed plus targeted mainly at the resource poor. Funding for each phase should be conditional on fulfilling the conditions for the earlier phase. Such a restructuring and phasing will provide an enabling environment and incentives for groups and organisations who want to fully address the foundational objectives of watershed-based development, namely, sustainability, livelihoods, equity and participation/self-governance.

## *Watershed: The last frontier*

The review concludes with a word of both caution as well as hope. What makes watershed development issues in India of crucial importance is the historical conjuncture that we find ourselves in. In the process of globalisation and privatisation that is sweeping the country now, the local natural resources, synonymous with watershed ecosystem resources, represent the last frontier; they are the last of the

productive resources that the rural poor have access to. Watershed development represents a dual possibility in this respect. It may, with the right policies and political will, provide an opportunity to bring more and more of the ecosystem resources under social control, provide preferential access and ensure expanding sustainable livelihood opportunities for the rural poor and carrying them beyond subsistence. On the other hand it may result in the augmentation of ecosystem resource potential only to put it to unsustainable use, benefit the already better off, leave the impoverished no better off than they were earlier, and in the process also undermining both sustainability and equity. Actualising the former potential requires concerted action by all stakeholders in watershed development – Panchayati Raj institutions, community based organisations, government agencies, non-government development agencies, academic community, and donors. They need to come together and discuss and evolve a course of action that comprises a set of focused options in respect of further changes in approach, research, and policy.

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# LIST OF ABBREVIATIONS

| | | |
|---|---|---|
| AFARM | : | Action For Agricultural Renewal in Maharashtra |
| AG | : | Area Group |
| AGY | : | Adarsh Gaon Yojana |
| AKRSP | : | Aga Khan Rural Support Programme |
| AME | : | Agriculture, Man and Ecology |
| BAIF | : | Bharatiya Agro Industries Foundation |
| BIRD-K | : | BAIF Institute for Rural Development - Karnataka |
| CAPART | : | Council for Advancement of People's Action on Rural Technology |
| CBO | : | Community Based Organisation |
| CBP | : | Capacity Building Phase |
| CISED | : | Centre for Interdisciplinary Studies in Environment and Development |
| CPR | : | Common Property Resources |
| CSWCRTI | : | Central Soil and Water Conservation Research and Training Institute |
| CWC | : | Central Watershed Committee |
| DANIDA | : | Danish International Development Agency |
| DDP | : | Desert Area Development Programme |
| DDS | : | Deccan Development Society |
| DID | : | Department of International Development |
| DLDB | : | Dry Land Development Board |
| DNRM | : | Decentralised Natural Resource Management |
| DPAP | : | Drought Prone Area Programme |
| DPG | : | Development Promotion Group |
| DRDA | : | District Rural Development Agency |
| EAS | : | Employment Assurance Scheme |
| FES | : | Foundation for Ecological Security |
| FFS | : | Farmers Field School |
| GIS | : | Geographic Information System |
| GKK | : | Gramina Gyan Kendra |
| GMASK | : | Gramina Mahila Aratika Seva Kendra |
| GO | : | Government Order |
| GoI | : | Government of India |
| GoK | : | Government of Karnataka |
| GTZ | : | Gesellschaft für Technische Zusammenarbeit |
| HYV | : | High Yielding Variety |
| IA | : | Implementing Agency |
| ICAR | : | Indian Council for Agricultural Research |
| ICEF | : | Indo Canadian Environment Facility |
| ICRISAT | : | International Crops Research Institute for the Semi Arid Tropics |
| IGWDP | : | Indo-German Watershed Development Programme |
| INM | : | Integrated Nutrient Management |
| IPM | : | Integrated Pest Management |
| IRDP | : | Integrated Rural Development Programme |
| ISEC | : | Institute for Social and Economic Change |

| | | |
|---|---|---|
| ISEER | : | Indian Society for Environmental Education and Research |
| ISPWDK | : | Indo-Swiss Participative Watershed Development Project Karnataka |
| IWRM | : | Integrated Water Resource Management |
| IWDP | : | Integrated Wasteland Development Programme |
| JFM | : | Joint Forest Management |
| JFPM | : | Joint Forest Planning and Management (acronym used in Karnataka) |
| JRY | : | Jawahar Rozgar Yojana |
| KAWAD | : | Karnataka Watershed Development Society |
| KFD | : | Karnataka Forest Department |
| KT weirs | : | Kolhapur Type weirs |
| LBA | : | Land Based Activity |
| LCC | : | Land Capability Classes |
| LEISA | : | Low External Input Based Sustainable Agriculture |
| MoA | : | Ministry of Agriculture |
| MoRD | : | Ministry of Rural Development |
| MSSM | : | Maharashtra Sheti Sahayak Mandal |
| MTE | : | Mid Term Evaluation |
| MWSDC | : | Micro Watershed Development Committee |
| MYRADA | : | Mysore Rural Development Agency |
| NABARD | : | National Bank for Agriculture and Rural Development |
| NADEP | : | Method of composting invented by N. D. Pandharipande (popularly known as Nadepkaka), a farmer from Maharashtra |
| NGO | : | Non Governmental Organisation |
| NLBA | : | Non Land Based Activity |
| NREP | : | National Rural Employment Programme |
| NRM | : | Natural Resource Management |
| NWDPRA | : | National Watershed Development Programme for Rainfed Areas |
| ORP | : | Operational Research Project |
| PIA | : | Project Implementation Agency |
| PIDOW | : | Participative Integrated Development of Watershed |
| P-NGO | : | Partner Non Governmental Organisation |
| PRA | : | Participatory Rural Appraisal |
| PRI | : | Panchayati Raj Institution |
| PRM | : | Participative Resource Mapping |
| PTD | : | Participatory Technology Development |
| RDT | : | Rural Development Trust |
| RS | : | Remote Sensing |
| RVP | : | River Valley Project |
| SC | : | Scheduled Caste |
| SDC | : | Swiss Development Cooperation |
| SHG | : | Self-Help Group |
| SIDA | : | Swedish International Development Agency |
| SOPPECOM | : | Society for Promoting Participative Eco-system Management |
| SSR | : | Standard Schedule of Rates |
| ST | : | Scheduled Tribe |

| | | |
|---|---|---|
| SWC | : | Soil and Water Conservation |
| TRYSEM | : | Training of Rural Youth for Self-Employment |
| UAS | : | University of Agricultural Sciences (Bangalore) |
| UG | : | User Group |
| UNDP | : | United Nations Development Programme |
| VDS | : | Village Development Society |
| VFC | : | Village Forest Committee |
| VWC | : | Village Watershed Committee |
| WA | : | Watershed Association |
| WASSAN | : | Watershed Support Services and Activities Network |
| WB | : | World Bank |
| WC | : | Watershed Committee |
| WDSCA | : | Watershed Development in Shifting Cultivation Areas |
| WDT | : | Watershed Development Team |
| WGDP | : | Western Ghats Development Programme |
| WMC | : | Watershed Management Committee |
| WMMC | : | Watershed Management and Maintenance Committee |
| WOTR | : | Watershed Organisation Trust |
| WUA | : | Water Users' Association |
| ZP | : | Zilla Parishad |

# CHAPTER 1
# INTRODUCTION

## 1.1 Watershed development: From an experiment to the centre-stage of rural development

In the 1970s, watershed development held no special significance for the development community in India. Projects such as Sukhomajri and Ralegaon Siddhi that subsequently became success stories and household names were already underway, but received little attention. However, by the end of the 1980s the situation changed radically. Sukhomajri and Ralegaon Siddhi were celebrated by the development community as examples of successful watershed development. A significant outcome of such efforts was the initiation of 42 "model watersheds" all over the country by the Indian Council of Agricultural Research (ICAR) (under the Operation Research Programme)[1] during the 1980s.

Following these developments, the concept of integrated watershed development became institutionalised for the first time in the form of the National Watershed Development Programme for Rainfed Areas (NWDPRA) in 1990 under the Ministry of Agriculture. It was allocated Rs.133,800 million in the 8th Five Year Plan. Later the Ministry of Rural Development constiuted a technical Committee headed by Prof. Hanumantha Rao to review the implementation and impact of DPAP, DDP, and IWDP which resulted in the formulation of the "Common Guidelines" of 1994. The Common Guidelines of 1994 brought five different programmes under the Minsitry of Rural Development, viz., DPAP, DDP, IWDP, I-JRY (50% of the funds available under this scheme would be utilised to take up watershed development programmes) and Employment Assurance Programme (50% as in the case of I-JRY), under one set of guidelines (MoRD, 1994). The watershed development programmes taken up under the Ministry of Rural Development from end of 1994 to 2001 followed the Common Guidelines of 1994. Thus one could say that the period 1990-2001 saw the implementation of the "first generation" of watershed development projects - that is, projects carried out under these two guidelines by the two Ministries of Agriculture and Rural Development.

In 2000, NWDPRA, under the Minsitry of Agriculture, revised its Guidelines to make the programme more "participatory, sustainable, and equitable" and called them the WARASA - JAN SAHABHAGITA Guidelines (GoI, 2000). The Common Guidelines issued by the Ministry of Rural Development were first revised in 2001 and were then radically altered and re-issued under the name "Hariyali" in April 2003. The programmes supported by these two ministries under these two sets of revised guidelines mark the advent of a new era and might well be termed the "second generation" of watershed development. The various programmes under the two Ministries of GoI together account for about 70% of the funds spent and area treated under the watershed programme in the country. Besides these, considerable work has been also done in the NGO sector and with the involvement and support of bilateral and other donor agencies.

Watershed development increasingly came to be seen as the lynchpin of rural development in dryland areas – one that integrates and anchors rural development efforts. Notable examples of watershed development appear to offer a way out of stagnation and degradation for all those areas that development had seemingly bypassed: apparently, watershed development had a positive impact on the drylands, the wastelands, the degraded commons and the semi-arid and arid regions perpetually under the shadow of drought.[2]

Watershed development has today virtually become the flagship programme of rural development in India, with an estimated annual expenditure of US$500 million (Farrington *et al.*, 1999) and a target of treating 63 million ha over the next 20-25 years with an estimated total outlay of Rs.76,000 crores (GoI, 2000). It is no longer seen as an "experiment', but accepted by

[1] Among these, two projects, including the well known Mittemari project, were in Karnataka.

[2] For a detailed treatment of the theme "watershed development and drylands" see Shah *et al.* (1998).

governments, donors and non-governmental organisations (NGOs) alike, as a core strategy that subsumes all other activities, such as afforestation or common land regeneration and stabilises rural livelihoods through its multi-sectoral approach, especially in the dry, rain-fed regions of India.[3]

## 1.2 Time for stocktaking

This apparent consensus on the issue and the ensuing massive investment obviates the fact that there does not seem to be a consensus of approach evolved through an internalisation of the experiences and insights gained from the countrywide experience in watershed development so far. There are substantial variations in the emphasis and approach in "watershed development" programmes initiated by different agencies, for example, those of the Ministry of Rural Development, the World Bank, donor agencies such as DfID, SDC or DANIDA, or smaller NGO efforts. Indeed, some agencies have consciously experimented with a variety of approaches within their implementation programmes. The watershed-based approach to rural development has also attracted criticism from several quarters as being too techno-centric, possibly iniquitous, and insensitive to local variations and cross-scale effects as a result of an "one-size-fits all" approach.

It is now almost ten years since watershed development as an approach to rural development was institutionalised. The first generation projects are, in other words, more than ten years old. Most of the projects initiated under the first set of common guidelines have completed their full term, as also a substantial number of NGO and bilaterally funded projects. A wide range of watershed development experiences may be shared and analysed. The time is ripe for formal stocktaking and appraisal.

## 1.3 Watershed studies and literature

The diversity of watershed development projects and approaches is more than matched by the many studies of watershed development that have been undertaken. These studies have been undertaken from very different perspectives, with different sets of objectives, with very different methodologies and range from particular case studies to broad performance evaluations. A significant amount of literature from varied types of studies of watershed development is now available.

A glimpse of this diverse literature is provided here. First, there are a number of evaluation studies on watershed development in India, some of which are based upon rigorous primary data collection from a sample of watersheds in major watershed projects (e.g., Kerr *et al.*, 2000; Reddy *et al.*, 2001; Shah and Memon, 1999). There is also a large case study literature on individual watersheds (e.g., Awasthi and Panmand, 1994; Kerr, 2002a; Farrington and Lobo, 1997) or certain types of programmes (e.g., Deshpande and Reddy, 1994; Ninan, 1998; Iyengar *et al.*, 2001). There are also valuation studies of different programmes and techniques (e.g., Chopra and Kadekodi, 1993; Chopra, 1999; Ninan and Lakshmikanthamma, 2001). Some studies cast a critical look at the issue of women/gender and watersheds (e.g., Seeley *et al.*, 2000; D'Souza, 1997). There are studies that look at the institutional issues in the context of watershed development (e.g., Reddy, 2000; Kolavalli and Kerr, 2002a; Ramakrishnan *et al.*, 2002; Rajasekhar *et al.*, 2003). Besides, there is considerable literature (mostly in the project report cum case study mode) generated by NGOs and implementing agencies themselves.[4]

Though most of these studies are interesting and informative, and highlight the complex and varied nature of watershed projects and their impacts, they often do not give an integrated picture of the outcomes in the wider context of sustainable development goals. This is partly because of the normative frameworks that underlie these studies. Many of these studies use indicators related to increases in variables like cropping intensity, irrigation intensity, input use, or productivity, and were mostly drawn from the conventional green revolution framework, without relating them to the

[3] Indeed, the same approach is being adopted even in moister and forested regions such as the Western Ghats and the Himalayas, whether under the Planning Commission's Western Ghats Development Programme or Hill Area Development Programme or parts of the World Bank-supported watershed programme in Karnataka.

[4] Reddy (2000) provides an exhaustive list of about 22 studies taken up in different parts of the country.

sustainability of the ecosystem. They did not, for example, look at the crop technology used, or at changes in ground water and overall water balance. The biophysical changes on which watershed interventions are actually premised are often studied cursorily and the biophysical assumptions driving the watershed programme are taken as given. Sustainability of these biophysical changes and their relationship to sustainable livelihoods does not seem to have received much attention. In particular, watershed hydrology and the effects of the biophysical interventions remain very poorly addressed in most studies. Those studies that do focus on these aspects are not well-grounded in the social aspects and therefore fail to link biophysical parameters with livelihood and equity concerns. Finally, almost all of these studies are one-time efforts and are not based on long-term monitoring.[5]

## 1.4 The present review and its focus

With this background in mind, and given that natural resource management (NRM) for sustainable rural livelihoods is one of CISED's thrust areas, it was felt that a review of the watershed development experience could set the stage for future work by CISED in this area. Our review, which has been an eight/nine-month exercise, is meant to be an *overview* that draws upon the many studies, reports and documents based on an explicit normative framework described in the following chapter. In order to provide some empirical grounding and also to keep the scope of the review manageable, the study focuses on the watershed development experience in Maharashtra and Karnataka and supplements it by field visits to a few watershed development projects. However, this is neither a hypothesis-driven study based on primary data collection, nor an evaluation study. Rather, it is an attempt to identify key conceptual, policy and research issues from the review of a cross-section of the literature and field experience.

The contribution we hope to make with this review comprises: a) the adoption of a more comprehensive and rigorous normative framework for evaluating the impact of watershed development projects, and b) the collation of insights from the natural/physical and the social sciences through an inter-disciplinary approach for the identification of key linkages between biophysical and social factors that influence success.

Our framework for defining watershed development success is focused on livelihood assurance through local ecosystem regeneration. The review explores the implications of watershed development for the four major concerns of equity, sustainability, livelihoods and participation. It also attempts to present what is considered significant in respect of these concerns to enable the stakeholders to arrive at a consensus and agree on what is needed in order to integrate these concerns into watershed development interventions. It also discusses the macroscopic implications of micro-interventions, such as downstream effects of upstream watershed development.

The present review draws on four types of material:

- Literature related to watershed concepts and strategies – policy and guideline documents, literature dealing with broader concepts like livelihood, sustainability, equity, participation, and institutions; normative and prescriptive documents which guide action;
- Studies which review watershed literature – reviews, evaluation methodologies, etc.;
- Evaluations of watershed experiences and case studies;
- Our own historically evolved and accumulated experience and observations supplemented by field visits that were undertaken as part of the present review.

The draft review report and its major findings were presented and discussed with participants, comprising academics, activists and practitioners, government officials and donors, at a two-day national workshop, before finalization.

## 1.5 Drought as the backdrop

The present study primarily centres around the drought- prone regions of Karnataka and Maharashtra, where watershed development programmes are widely seen as a drought-proofing strategy. Nearly two-thirds of the area in these two states could be classified as drought-prone. In fact, large parts of the country have

[5] For a broad critique of the existing studies see Vaidyanathan (2001).

been going through drought for the last three to four years at a stretch. For instance, the drought of 2001 affected about 120,000 villages and a total population of around 160 million. The total crop area affected was about 20.5 million ha covering an area of approximately 180 districts in eight states of the country (Mahapatra, 2001).

Drought is often defined in terms of rainfall failure and the resultant deficiency in water availability and moisture stress. Terms like "meteorological drought', "hydrological drought', and "agricultural drought" are all examples of this. With such a narrow interpretation, two issues emerge: one, human interventions that shape overall modes of production, and state policies and development packages are missing from such definitions and debates; and two, it becomes difficult to understand the differential impact drought has on different social sectors, for example, on women. Hence, drought is perceived as a social event triggered by a "failure of rains". In systemic terms, when the quantum of rainfall in an area falls below a critical value, a number of socio-economic and ecological factors interact to produce a situation where the subsistence cycle of a large population in the area is severely disrupted.[6]

Drought-proneness is, therefore, essentially dependent on the socio-economic and ecological sub-systems prevalent in the area. It arises out of the juxtaposition of and interaction between two distinct types of sub-systems: the ecological sub-system characterised by scarcity of water resources and an uncertain and variable rainfall pattern; and as importantly, a socio-economic sub-system characterised by the virtual absence or insignificance of non-agricultural incomes for an overwhelming majority of the population. The degree of sensitivity of this subsistence to the uncertainty and variability of the rainfall pattern then provides the basis and the criterion for classifying drought-prone areas (Datye *et al.*, 1987). In fact, this understanding of drought in more systemic terms is reflected in our normative framework as well as the review. Such an understanding is also more useful when looking at the impact of watershed development.

## 1.6 The study area: Karnataka and Maharashtra

### 1.6.1 Agro-climatic profile of Karnataka and Maharashtra

Karnataka and Maharashtra are usually divided into ten and nine agro-climatic zones respectively (Table 1-1). In Karnataka, the average rainfall ranges from 576 mm (Northern Dry Zone) to 3765 mm (Coastal Zone) and in Maharashtra, it varies from 450 mm (Scarcity Zone) to 3750 mm (Southern Konkan Coastal Zone).

**Table 1-1: Agro-climatic zones and rainfall: Karnataka and Maharashtra**

| Karnataka | | | Maharashtra | | |
|---|---|---|---|---|---|
| **Sr. No.** | **Zone** | **Average Rainfall (mm)** | **Sr. No.** | **Zone** | **Average Rainfall (mm)** |
| 1. | North Eastern Transition | 889 | 1. | Southern Konkan Coastal Zone | 3750 |
| 2. | North Eastern Dry Zone | 935 | 2. | Northern Konkan Coastal Zone | 3281 |
| 3. | Northern Dry Zone | 576 | 3. | Western Ghat Zone | 2684 |
| 4. | Central Dry Zone | 607 | 4. | Western Ghat Zone | 2137 |
| 5. | Eastern Dry Zone | 768 | 5. | Western Maharashtra Plain Zone | 791 |
| 6. | Southern Dry Zone | 730 | 6. | Scarcity Zone | 450 |
| 7. | Southern Transition Zone | 864 | 7. | Central Maharashtra Plateau Zone | 983 |
| 8. | Northern Transition | 751 | 8. | Central Vidarbha Zone | 883 |
| 9. | Hilly Zone | 2172 | 9. | Eastern Vidarbha Zone | 1462 |
| 10. | Coastal Zone | 3765 | | | |

*Sources:* DES (2003?) and GoM (2003a).

[6] Subsistence cycle implies income-generating productive activities carried out for subsistence.

Table 1-2 below gives details of land use in Karnataka and Maharashtra.[7] One significant difference between the two states is in the 'area sown more than once" and consequently in the Gross Cropped Area. In the case of Karnataka, the area sown more than once is about 8.5% whereas in Maharashtra, it accounts for about 14.5%. In both the states, area under irrigation is limited and in the case of Maharashtra, it is said that even with the full utilisation of its irrigation potential, the total area under irrigation (in the conventional sense) would not cross 30%. Also, in both the states, wells – dug wells and borewells – contribute significantly to irrigation.

**Table 1-2: Land use pattern in Karnataka and Maharashtra (1997-98)**

| Land use categories | Karnataka | Maharashtra |
|---|---|---|
| Total geographical area (Reported area) | 19,050<br>(100.0) | 30,758<br>(100.0) |
| Forest | 3,063<br>(16.1) | 5,365<br>(17.4) |
| Barren, unculturable land | 801<br>(4.2) | 1,701<br>(5.5) |
| Land under non-agricultural use | 1,284<br>(6.7) | 1,238<br>(4.0) |
| Culturable waste | 439<br>(2.3) | 888<br>(2.9) |
| Permanent pasture & other grazing land | 1,005<br>(5.3) | 1,340<br>(4.4) |
| Land under trees & groves | 313<br>(1.6) | 221<br>(0.7) |
| Current and other fallows | 2,070<br>(10.9) | 2,270<br>(7.4) |
| Net Cropped Area | 10,075<br>(52.9) | 17,731<br>(57.6) |
| Area sown more than once | 1,621<br>(8.5) | 4,423<br>(14.4) |
| Gross Cropped Area | 11,696<br>(61.4) | 22,154<br>(72.0) |
| Gross irrigated area (percentage) | 25.0 | 17.9 |

*Sources:* DES (2003?) and GoM (2003b) Areas are in 000s ha; figures in parenthesis are percentages.

[7] The attempt here is limited to familiarising the readers with certain basic features of both the states so that they can situate the study in the overall agro-climatic context of both the states. Though we have given data only for one year, the time series data shows that except in the case of few land use categories, there have not been significant shifts in the land use pattern. In the case of Karnataka during the period between 1982 to 1997-98 the significant changes have been in the case of area under different types of fallow (increased from 8.5% to about 11%), area sown more that once (increased from 4.2 to 8.5%), net area sown (declined from 54.4 to 52.9%), gross cropped area (increased from 58.5 to 61.4%) and the gross irrigated area (increased from 9.4 to 15.3%). In the case of Maharashtra the decadal variation from 1970 to 1997-98 shows shifts in the case of area under non-agricultural use (increased from 2.8% to 4%), cultivable wastes (decreased from 4.8 to 2.9%), area under pastures and grazing (declined from 5.4 to 4.4%), area sown more than once (increased from 3.5 to 14.4%) and gross cropped area (increased from 60.9 to 72%). Further details for both the states can be obtained from various publications of the Directorate of Economics & Statistics, Bangalore and the website of the Department of Agriculture and Statistics *(http://agri.mah.nic.in/agri/stat).*

Data on area under important crops in both the states since the sixties are presented in Table 1-3 and Table 1-4. Cereals occupy a little less than 50 percent of the gross cropped area or GCA (about 49% in Karnataka in 1990-91 and about 44% in Maharashtra in 2000-01) though in both the states, there is a trend towards decline in the area under cereals. In both the states, the proportion of area under pulses and oilseeds shows an increase. There has been an increase in productivity for almost all the crops. Only in the case of a few crops like Rice and Tur in Maharashtra and Jowar in Karnataka, there is evidence of some decline in productivity. The productivity gains for most of the crops in Karnataka are higher than in Maharashtra. Area occupied by sugarcane is relatively small in Karnataka (about 3% of GCA), but it should be noted that the area under this crop has been steadily increasing in both the states. Sugarcane, being a very water-intensive crop, consumes the bulk of the irrigation water.

**Table 1-3: Area and productivity of major crops in Karnataka**

| Crops | 1960-61 | | | 1980-81 | | | 1990-91 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Area | % | Yield | Area | % | Yield | Area | % | Yield |
| Rice | 1,028 | 9.7 | 1,292 | 1,114 | 10.5 | 2,027 | 1,183 | 9.8 | 2,006 |
| Jowar | 2,969 | 28.0 | 389 | 1,991 | 18.7 | 756 | 2,339 | 19.3 | 689 |
| Ragi | 996 | 9.4 | 757 | 1,057 | 9.9 | 1,007 | 1,167 | 9.6 | 1,141 |
| Maize | 11 | 0.1 | 1,091 | 157 | 1.5 | 2,427 | 253 | 2.1 | 2,802 |
| Bajra | 500 | 4.7 | 258 | 564 | 5.3 | 340 | 514 | 4.2 | 547 |
| Wheat | 324 | 3.1 | 238 | 322 | 3.0 | 540 | 248 | 2.0 | 504 |
| All cereals | 6,273 | 59.2 | 570 | 5,573 | 52.3 | 1,025 | 5,909 | 48.8 | 1,102 |
| Tur | 296 | 2.8 | 311 | 336 | 3.2 | 372 | 482 | 4.0 | 378 |
| Bengal gram | 158 | 1.5 | 348 | 148 | 1.3 | 426 | 224 | 1.8 | 335 |
| All pulses | 1,306 | 12.3 | 270 | 1,531 | 14.4 | 319 | 1,647 | 13.6 | 332 |
| Groundnut | 915 | 8.6 | 490 | 790 | 7.4 | 601 | 1,194 | 9.9 | 781 |
| Sesamum | 64 | 0.6 | 172 | 118 | 1.1 | 339 | 153 | 1.3 | 320 |
| Safflower | 144 | 1.4 | 174 | 158 | 1.5 | 513 | 198 | 1.6 | 596 |
| Sunflower | — | — | — | 38 | 0.4 | 421 | 581 | 4.8 | 404 |
| All oilseeds | 1,247 | 11.8 | 409 | 1,251 | 11.7 | 520 | 2,265 | 18.7 | 612 |
| Total GCA | 10,588 | 100 | | 10,660 | 100 | | 12,115 | 100 | |

*Source:* Anonymous (1993). Area in 000s hectares, yield in kgs/ha, GCA= Gross Cultivated Area

**Table 1-4: Area and productivity of major crops in Maharashtra**

| Crops | 1960-61 | | | 1980-81 | | | 2000-2001 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Area | % | Yield | Area | % | Yield | Area | % | Yield |
| Rice | 1,300 | — | 1,054 | 1,459 | 7.43 | 1,587 | 1,512 | 6.82 | 1,277 |
| Jowar | 3,638 | — | 810 | 3,999 | 20.36 | 822 | 2,977 | 13.44 | 1,039 |
| Wheat | 907 | — | 442 | 1,063 | 5.41 | 834 | 754 | 3.40 | 1,256 |
| Bajra | 1,473 | — | 306 | 1,350 | 6.87 | 451 | 1,639 | 7.40 | 590 |
| Total cereals | 10,604 | — | 637 | 10,976 | 55.88 | 788 | 9,824 | 44.35 | 865 |
| Gram | 402 | — | 334 | 410 | 2.08 | 335 | 676 | 3.05 | 519 |
| Tur | 530 | — | 884 | 644 | 3.28 | 495 | 1,096 | 4.95 | 602 |
| Soyabean | — | — | — | — | 0 | — | 1,142 | 5.15 | 1,117 |
| Total pulses | 2,351 | — | 421 | 2,685 | 13.67 | 307 | 3,557 | 16.06 | 460 |
| Groundnut | 1,083 | — | 739 | 674 | 3.43 | 621 | 433 | 1.96 | 904 |
| Total oilseeds | — | — | | 1,708 | 8.69 | 426 | 2,559 | 11.55 | 820 |
| Total GCA | — | — | | 1,9640 | 100 | | 2,2150 | 100 | |

*Source:* GoM (2003a). Area in 000s hectares, yield in kg/ha, GCA= Gross Cultivated Area

### 1.6.2 Watershed development programmes in Karnataka and Maharashtra

The earliest evidence of the awareness of the need for soil and water conservation as a means for increasing productivity and contributing to the welfare of the farming community may be seen in the writings of Mahatma Jyotiba Phule. More than hundred years back, he wrote:

"And so, in order that the vital element from the rotting of meat and bones, dead insects and animals, leaves and flowers shed by trees, grasses growing in the hills and mountains shall not be washed off by the early rains and carried away by the floods to be wasted in the streams, the industrious government should get all these superfluous men from amongst the black and white soldiery and constabulary to judiciously build dams and obstructions in one and many places in such a manner that the rains shall first wet and enter the fields fully before it flows into the streams..."

"Similarly our kind government should build as many as possible tanks and ponds in all our hills and mountains, our valleys and gorges. Thereby, because all the streams and nallahs downstream of them will have water throughout the summer, they can be dammed and will serve all the wells with ample water and will green all the fields benefiting the farmers along with the government." (*Shetkaryancha Asud*- The Whip of the Peasant, 1883, cited in Paranjape *et al.* (1998).

The soil and water conservation programme for dryland farms in the erstwhile Bombay province and the bunding programme of the 1950s and 60s could be seen as the precursors of the present-day integrated watershed development programme.[8] Both Karnataka and Maharashtra have been in the forefront of watershed development activities in the country. Some of the oft-quoted examples of first generation 'successful" watershed development projects like Mittemari, Golhalli, Kabbananala, Ralegaon Siddhi and Adgaon are located in these two states.

Tables 1-5, 1-6 and 1-7 give details of the programme coverage under different schemes in both the states. The tables show that since the early 1990s, a large proportion of what has been identified as treatable area in the two states has been covered under different watershed development programmes and schemes.

**Table 1-5: Details of watershed programmes in Karnataka (1984 to 2000)**

| Name of the Project | Area Treated (ha) | Expenditure (Crore Rs.) |
|---|---|---|
| World Bank (1984-1993) | 136,337 | 37.564 |
| District Watersheds | 515,200 | 121.978 |
| NWDPRA | 872,872 | 182.995 |
| DANIDA | 23,000 | 16.036 |
| PIDOW (1985-1993) | 9,680 | 4.140 |
| ISPWDK (First Phase: 1995-1999) | 30,000 | 12.595 |
| KFW | 24,600 | 16.221 |
| RVP | 541,800 | 91.119 |
| DfiD | 52,719 | 83.400 |
| Total | 2,206,208 | 566.48 |

*Source:* Watershed Development Department, GoK.

[8] For a chronology of soil and water conservation works and watershed development programmes in India, see Shah (1998).

**Table 1-6: Details of watersheds programmes in Maharashtra (up to 2002)**

| Schemes | No. of watersheds started | No. of watersheds completed | No. of watersheds incomplete | % watersheds completed |
|---|---|---|---|---|
| IWDP | 22,302 | 7,048 | 15,254 | 31.60 |
| NWDPRA | 917 | 646 | 271 | 70.45 |
| WGDP | 97 | 43 | 54 | 44.33 |
| RVP | 114 | 59 | 55 | 51.75 |
| EAS | 1,549 | 222 | 1,327 | 14.33 |
| DPAP | 909 | 175 | 734 | 19.25 |
| Model Village Scheme | 645 | 100 | 545 | 15.50 |
| IGWDP | 102 | 29 | 73 | 28.43 |
| CAPART | 78 | 0 | 78 | 0.00 |
| Total | 26,713 | 8,322 | 18,391 | 31.15 |

*Source:* Commissionerate of Agriculture, GOM, Pune.

**Table 1-7: Details of land use classes and progress of watershed development in Karnataka and Maharashtra**

| Watershed area details | Karnataka | Maharashtra |
|---|---|---|
| Geographical area (ha) | 19,049,836 | 30,758,300 |
| Cultivated land (ha) | 11,696,000 | 17,731,600 |
| Forest (ha) | 3,063,000 | 5,365,500 |
| Non-agricultural use (ha) | 1,284,000 | 1,238,700 |
| Irrigation capacity (ha) | 2,912,000 | 3,416,480 |
| Area not available for watershed development (ha) | 6,480,595 | 10,020,680 |
| Area available for watershed development (ha) | 12,569,241 | 20,737,620 |
| Treated land under completed watersheds (ha) | 2,641,785 | 2,615,948 |
| Area remaining for watershed development (ha) | 9,927,457 | 14,622,244 |
| Amount spent (in crore Rs.) | 6478.52 | 2251.76 |

*Sources:* Watershed Development Department, GoK, and Commissionerate of Agriculture, GOM.

## 1.7 Sites of field visits

The sites for field visits were not selected on the basis of strict sampling. The primary aim was to cover different types of programmes that would provide a cross-section of the range of experience in both these states. We primarily concentrated on agro-climatic zones with (average) rainfall ranging from about 450 to about 1000 mm/year. The list of villages/ watersheds that were visited is given in Table 1-8 and Table 1-9.

Besides these watershed development efforts, we also looked at relevant experiences that are not typical watershed interventions. Some such examples are the Pani Panchayat (Pune district), known for its strong commitment to equity; the Ozar Water Users" Associations (Nashik district), known for their integration of canal water and local water harvesting; Bali Raja Dam (Sangli district), a small dam built by the people themselves and again recognized for equitable water distribution; and Khudwadi (Usmanabad district), which is known for the resourcefulness exhibited by a poor womens group in getting a share of the canal water and farming the private wasteland on a produce-sharing basis.

The sites of the field visits are shown in Figure 1-1 and Figure 1-2. Besides these field visits, we also had extensive discussions with the staff of Indo-Swiss Participative Watershed

Development Project Karnataka (ISPWDK), Agriculture Man Ecology (AME), Mysore Rural Development Agency (MYRADA), Operational Research Project (ORP) of University of Agricultural Sciences (UAS), Karnataka Watershed Department, Karnataka Watershed Development Society (KAWAD), Central Soil and Water Conversation Research and Training Institute (CSWCRTI), etc. We also benefited from two workshops on watershed: one organised by KAWAD and another by the DNRM study team.[9]

**Table 1-8: List of villages and watersheds visited in Karnataka**

| Programme | Organisation | Village (Watershed) | District |
|---|---|---|---|
| ICAR Model Watershed | ORP, UAS | Chikamapalli (Mittemari watershed) | Kolar |
| DLDB (one of the 19 model watersheds) | KFD | Seebi Agrahara (Kallambella watershed) | Tumkur |
| DLDB | ORP, UAS | Golahalli (Chitravati watershed) | Kolar |
| NGO | MYRADA | Hokali, Gogi | Gulbarga |
| NWDPRA | ORP, UAS | Manjenahalli (Gandasi watershed) | Hassan |
| DPAP | MYRADA | Sonth | Gulbarga |
| NGO | BIRD-K | Adihalli-Myllanhalli | Tumkur |
| KAWAD (DfID supported) | ISEER | Jigajevani (Doddahalla watershed) | Bijapur |
| KAWAD (DfID supported) | DPG | Khana Hosahalli (Upparahalla watershed) | Bellary |
| NGO | FES | Jaragahalli and Tambalapalli (Papagani watershed) | Kolar |

**Table 1-9: List of villages and watersheds visited in Maharashtra**

| Programme | Organisation | Village (Watershed) | District |
|---|---|---|---|
| Government Department (Soil Conservation) | Marathwada Sheti Sahayak Mandal, Aurangabad | Adgaon | Aurangabad |
| Government Department (Soil Conservation, Social Forestry, etc.) | Local organisation led by Anna Hazare | Ralegaon Siddhi | Ahmednagar |
| Adarsh Gaon Yojana | Yashwant Agriculture, Village and Watershed Development Organisation | Hivre Bazar | Ahmednagar |
| IGWDP | WOTR | Vaiju Babhulgaon | Ahmednagar |
| IGWDP | SEWA | Ambewadi | Beed |
| NGO | Manavlok | Bhavthan | Beed |
| NGO | AFARM | Dornali | Nanded |
| DPAP–Common Guidelines | Gomukh Trust | Chale | Pune |

[9] KAWAD organised a two-day experience sharing workshop in Bangalore in January 2003 to discuss the strategies that have worked on the ground and a wide spectrum of organisations—government, non-government and donor-participated in the workshop. 'DNRM study team" refers to a group of institutions that conducted a study on Panchayati Raj and natural resource management across the three states of Madhya Pradesh, Andhra Pradesh and Karnataka (Ramakrishnan *et al.*, 2002). Watershed development was one of the programmes covered under this study. The draft study report was presented and discussed in a two-day workshop in New Delhi in November 2002.

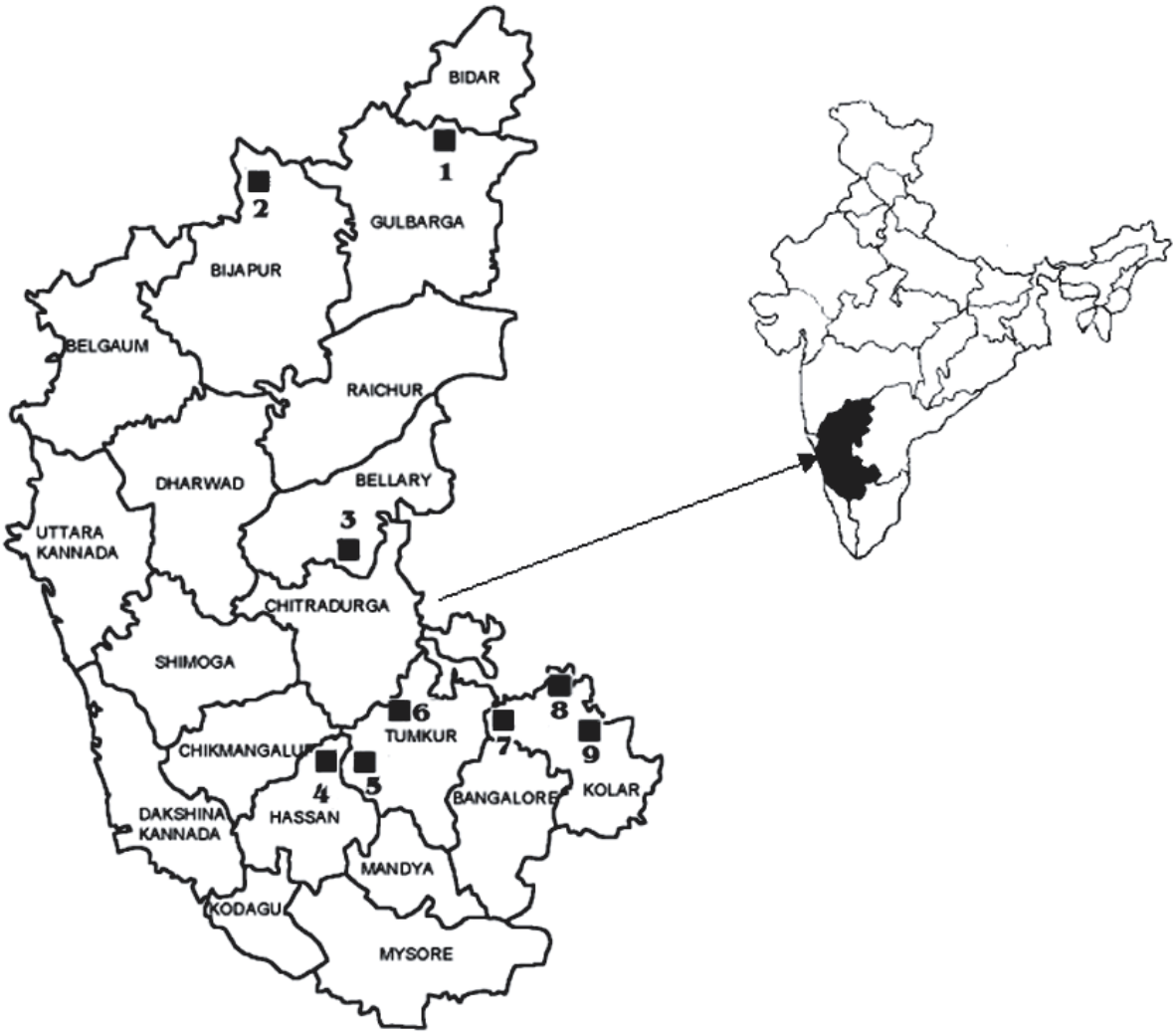
A strict classification of projects in terms of their mode of implementation was not attempted. We have tried to capture the broad trends through the following classification: a) the early efforts initiated by the community, but implemented by government departments (Ralegaon Siddhi and Adgaon); b) the ICAR initiated model watersheds (Mittemari); Department of Land Development- initiated model watersheds (Kallambella and Chitravati watersheds); c) NGO efforts, where the NGOs got money on their own and had the flexibility to develop their own implementation norms (such as the Indo-German Watershed Development Programme, BIRD-K efforts in Adihalli-Myllanhalli; AFARM's watershed programme, and FES work in Papagani watershed); d) Adarsh Gaon Yojana (Ideal Village Programme) which was an effort by the government to replicate the Ralegaon Siddhi model in 300 villages in Maharashtra (Hivre Bazar is an example of this programme); e) programmes under the GoI Guidelines, both NWDPRA and Common Guidelines (Chale and Sonth under DPAP, Manjenahalli under NWDPRA, etc.); and f) bilateral projects (DfID-supported KAWAD projects in Bijapur and Bellary, SDC-supported PIDOW project in Gulbarga). We did not review the World Bank-supported Sujala project because it had barely entered the implementation stage at the time of our field work. In the report, as far as possible, we have tried to give the name of the programme/scheme under which the project falls and the name of the implementing agency along with the name of the watershed/village so that the readers can identify the particular programme/mode of implementation in the watershed.[10]

## 1.8 Structure of the report

The review report is organised under eight chapters. After the current chapter about the context and objectives of the study, the second chapter details the normative framework that underpins the review. Chapter three gives details of typical watershed interventions. Chapters four, five, six and seven are the review chapters: chapter four discusses the livelihood impacts, chapter five discusses the impact of watershed interventions on sustainability, chapter six is about the equity dimension in terms of class, caste and gender, and chapter seven discusses the issue of participation. The concluding chapter, chapter eight, discusses the changes required in approach, research and policy if concepts like sustainability, livelihoods, equity and participation are not to remain mere rhetoric but become a reality. A summary of the discussions and deliberations that occurred during the two-day national workshop on the draft review report is given in appendix 1.

[10] Though we have not gone into the details of each of these programmes or their distinguishing features, four types of funding sources are identified, based on differences in implementing policies, namely, the Government of India, multi-lateral donors, bilateral donors, and others. GoI sources are MoA and MoRD, multi-lateral is basically the World Bank. Bilateral includes DANIDA, SDC, ICEF, SIDA, GTZ, etc. Others include various national and international non-profit organisations that support projects implemented by NGOs (Kolavalli and Kerr, 2002a). Kerr *et al.* (2000) in their study classify projects in terms of a) projects under Ministry of Agriculture (like NWDPRA, ICAR projects); b) engineering-oriented projects (Soil Conservation, DPAP, etc.); c) NGO projects; and d) collaborative projects between government and NGOs (Indo-German Watershed Development Programmes, Adarsh Gaon Yojana, etc.).

**Figure 1-1: Projects visited in Karnataka**




1. Kamalapur – PIDOW-MYRADA
2. Jigajevani - KAWAD
3. Khana Hosahalli - KAWAD
4. Manjenahally - NWDPRA
5. Adihalli Myllanhalli - BIRD-K
6. Seebi Agrahara, Kallambella – DLDB, KFD
7. Golahalli (Chitravati Watershed) – DLDB, ORP
8. Chikamapalli, Mittemari – ICAR Model Watershed
9. Jaragahalli and Tambalapalli – FES

**Figure 1-2: Projects visited in Maharashtra**


1. Ozar - Samaj Parivartan Kendra
2. Adgaon - Marathwada Sheti Sahayak Mandal
3. Ralegaon Siddhi - Local organisation led by Anna Hazare
4. Hivre Bazar - Adarsh Gaon Yojana
5. Vaiju Babhulgaon - Indo-German Watershed Programme - WOTR
6. Ambewadi - Indo-German Watershed Programme - SEWA
7. Bhavthan - NGO - Manavlok
8. Dornali - NGO - AFARM
9. Chale - DPAP - Gomukh Trust
10. Naigaon - Pani Panchayat
11. Khudawadi - SOPPECOM, TISS and Maitreyi
12. Balawadi - Tandulwadi - Mukti Sangharsh Movement

# CHAPTER 2

# WATERSHED-BASED DEVELOPMENT: OUR NORMATIVE FRAMEWORK

Watershed development programmes consist of a set of bio-physical, technological and social interventions aimed at bringing about "watershed development'. Over the past three decades, the concepts that determine the goals of watershed development programmes have also evolved hand-in-hand with the content of the programmes. Understanding the "achievements" and "shortcomings" of any watershed development programme requires an understanding of the notion of "watershed development" and how this broad notion is to be translated into specific objectives in the context of watershed development. Such translation may also be based upon additional assumptions about what is possible and how these may be achieved. One may call this set of goals, specific objectives and assumptions the "normative framework" of an analysis. Whether explicit or implicit, such a normative framework is part of any analysis. When normative positions are involved, it is best to put it forward explicitly so as to allow readers to understand better the normative elements embedded in the analysis.

In this chapter, we outline *our* normative framework in the context of the goals of watershed development in India as they have evolved over the past three decades. These goals, we often find, have not been explicitly and systematically translated into specific objectives. We, therefore, go on to develop the framework further, by specifying how we would translate the broad goals into specific objectives, the assumptions we make in doing so, and the consequent criteria for assessing the quality of watershed development. We conclude with a discussion of how to relate this normative framework with those embedded in the projects or programmes that we shall be reviewing.

## 2.1 The evolution of watershed development concept and goals

### 2.1.1 From soil and water conservation to watershed development and beyond

Catchment protection programmes and soil and water conservation programmes were the precursors of watershed development. Early efforts in treating watersheds were aimed at catchment protection. Catchment protection programmes looked upon the watershed as a unit, but they focused on the character of catchments of particular dams and were mainly aimed at reducing sediment load and siltation of the reservoir. Soil conservation programmes aimed at conserving fertile or productive agricultural soil through bunding, but the bunding component operated at the level of a farmer's field and lacked any larger unit of organisation. Check dams and other waterline treatment carried out for water conservation were taken up in an isolated manner without being integrated into a watershed-scale programme.

With the emergence of watershed development as a distinct programme, soil and water conservation acquired a unit of organisation – the watershed. Soil and water conservation are still central to watershed development. Components such as afforestation and common land regeneration or agronomic changes are linked to this central theme. However, more recently, watershed development is being seen by concerned governments, donors and NGOs more as a core strategy for stabilising rural livelihoods, especially in the dry, rain-fed regions of India. All other developmental issues, including employment generation programmes, rural credit, women's empowerment, prohibition – and even population control as in the case of Adarsh Gaon Yojana in Maharashtra – are being subsumed under this concept. In short, watershed development programme seems to have become the flagship of rural development programmes.

### 2.1.2 From production to "sustainable development': livelihoods, sustainability, equity, gender and participation

There has also been a shift in the goals of watershed development. Earlier, along with soil and water conservation concerns, there was a preoccupation with production goals and targets.

Increasing production, as characterised by the Green Revolution agricultural strategy, became the overriding goal. This scenario has now begun to change. Increasingly, attention is being paid to issues like a) how the increase in productivity is brought about, b) what happens to the bio-physical system and processes (or the conditions of production) in the process of production itself, and finally c) how does it contribute to the quality of life. Terms such as participation, gender, equity, sustainability and livelihoods are now much more prominent, if not commonplace, in watershed development literature. These concerns were increasingly reflected in the provisions of the 1994 Common Guidelines (GoI, 1994) and the Revised Common Guidelines of 2001 (GoI, 2001) for watershed development programmes issued by the Ministry of Rural Development at the centre.[11] For example, the Common Principles for Watershed Development talk about promoting equity for the resource poor and women and suggest, amongst many other things, "equitable right to all households in any new water resources developed under the project" as one of the ways to achieve this (MANAGE, 2000).[12] Different NGOs, State governments and the Central government have included these concerns in one way or the other in their watershed programmes. The most extreme example of this shift is that of KAWAD, which prefers to call its programme a "livelihood programme with a watershed approach'.

These shifts in the goals, or at least the rhetoric, of watershed development are a reflection of the changes that took place in developmental thinking during the 1980s and 1990s. In particular, following the Brundtland Commission's report, "sustainable development" became the new catch-all phrase (WCED, 1987), and "participation" the new *mantra* for development success. More recently, the focus has shifted to "sustainable livelihoods" (Ashley and Carney, 1999). In any case, the need to ensure the environmental sustainability of the development process and to empower the poor and marginalised communities has become more clearly articulated and widely accepted in development discourse.

## 2.2 Our normative framework

There can hardly be any disagreement that livelihood enhancement, in a sustainable, equitable and participatory manner, should be the goal of any development process. The devil, however, is in the details: in translating this general proposition into specific objectives and criteria in a specific context. Many assumptions are involved in this translation. These assumptions include both additional value judgements about "what should happen" as well as subjective assessments as to "what can happen" in the given bio-physical and social context.

Outlined below is our understanding of what these broad, often rhetorical terms mean (or should mean) in the specific context of watershed development. We should state two underlying assumptions at the outset. Firstly, in a country like India where the vast majority of the population – farmers, agricultural labourers, adivasis, pastoralists – have been historically dependent on natural resources for their livelihoods, "development" will have to be based primarily on long-term, sustainable productivity enhancement of, and economic value addition to, the natural resource base, including in the long run, local renewable energy sources. Secondly, in the dry or drought-prone regions of the country, development is not just about raising the average productivity of resources, but also about increasing the "certainty" or reliability of production and the consequent security of livelihoods, often threatened or undermined by drought.

[11] This is not to say that there are no problems with these guidelines. In fact, there has been a fair amount of criticism of the Revised Common Guidelines of 2001 and their subsequent version, the Hariyali Guidelines of 2003. The supposed aim of the latter is "to further simplify procedures and involve the Panchayat Raj Institutions (PRIs) more meaningfully in planning, implementation and management of economic development activities in rural areas'. The main criticism is that there has not been enough devolution of powers and also that the space of NGOS and CBOs has been reduced. For a detailed discussion, refer to Shah (2003a). The WASSAN website, www.wassan.org, also contains material on Hariyali: workshop reports, recommendations, consultations with CBOs/PRIs/NGOs and concept papers.

[12] This is also reflected in the detailed "success criteria" given in the revised NWDPRA guidelines (GoI, 2000).

### 2.2.1 Interconnectedness of the bio-physical and the social

Before proceeding further, it may be necessary to focus on the interconnectedness of the bio-physical and the social – especially because this interconnectedness is intrinsic to the very concept of watershed development, and the final outcome of any intervention is a combined effect of both. Indeed, watershed development as an approach to sustainable rural development draws its strength from this interconnectedness.

Watershed as a bio-physical entity is an ecosystem (though not necessarily an ecosystem type) comprising of all bio-physical processes within the watershed and their interactions with the larger systems. Bio-physical interventions constitute modifications of these processes. However, the very same interventions are also social processes. Bio-physical and social interventions are not two separate processes, but aspects of the same unified process. What appears as soil erosion in the former case may appear as the inability to meet food needs in the latter case. What appears as expenditure in production inputs – buying fertiliser, for instance – may reflect in the other as pollution. In fact, ecosystem processes and resources are our basic economic resources as well, and watershed development has brought this unity to the forefront.

Moreover, there are historical factors at work. Watershed development is not a matter of writing on a clean slate. Historically determined processes and factors inherent in the situation in the watershed interact with the bio-physical and social interventions and often prove crucial in determining the acceptance and implementation of technologies and rules for resource use. It is important to know the social context of intervention so as to understand fully how the ecosystem processes generate indirect impacts on different groups over different temporal and spatial scales, so that one can go beyond the immediate reaction that local communities might offer to the direct benefit flows.

Our main aim here is to focus on the interconnected themes of livelihoods, sustainability, equity and participation. Our discussion, therefore, centres mainly on aspects relevant to these themes. We believe that the interconnectedness of the bio-physical and the social has not been given its due importance in the analysis of watershed development, where it is especially relevant. This interconnectedness is the underlying thread that binds the viewpoint that the review represents.

### 2.2.2 Livelihood Needs

#### *Approach to defining livelihood needs*

Earlier discussions of needs centred on the fulfilment of basic or subsistence needs. The issue was how successful a strategy had been in meeting basic needs of food, fuel, shelter, clothing, education and the like (Streeten, 1979; Brandt Commission, 1980). The requirements here are relatively clear and it is reasonably easy to evolve operational indicators for them. The shift to livelihood needs requires a little more discussion.

Since the early 90s, the rural development discourse has prominently featured the concept of livelihoods, and more specifically "sustainable livelihoods" (SL). Most donors (for example, DfID, CARE, Oxfam and UNDP) today use some version of a "sustainable livelihoods" framework in prioritising funding projects and also in evaluating their impacts. One of the SL frameworks that appear prominently in the discourse is that of DfID. DfID's professed aim is to eliminate poverty in poorer countries and the promotion of sustainable livelihoods is one of the means to achieve this aim. For DfID, "*A livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base*". DfID stresses the importance of livelihoods in relation to capital assets and distinguishes five categories of such assets: natural, social, physical, human and financial. Donor organisations like CARE, Oxfam and UNDP also use the SL framework more or less in the same way as all of them focus on assets (though they call them by different names) and micro-macro linkages. DfID's SL framework itself is derived largely from Chambers and Conway's work on "sustainable livelihoods" in the early 1990s.[13]

[13] This is not to say that all the four approaches are the same; they do differ on emphasis (for example, CARE stresses a rights-based approach) and this would be reflected in the actual programmes that these agencies support.

Our understanding of livelihoods and of sustainability (see section 2.2.3) is quite similar to that articulated in the SL framework. However, we prefer to specify livelihood *needs* in more detail. "Livelihood needs', in the sense we use the term, include the basic needs of food, shelter, clothing, etc., besides those imposed due to the nature of the livelihood activity. A farmer would require, for example, means of tillage. He/she would have to satisfy this need either through maintaining a pair of bullock himself/herself, or sharing a pair with someone else, or else having enough cash to hire a pair or a tractor. Similarly, a tanner would require a water source for tanning the hides. Also, our approach differs from subsistence frameworks in the sense that in talking about livelihoods, we also take into account certain surpluses over and above consumption needs which can be exchanged and/or value added. In other words, one may say that basic needs represent human needs unmediated by relation to production (both in the sense of production and exchange), whereas livelihood needs are those that include the needs imposed by the immediate relation to production. One key difference between our notion of livelihood assurance or enhancement and that embodied in the SL framework is that we place a higher premium on *natural capital* as compared to other forms of assets or "capital'. We firmly believe in the primacy of natural capital in areas where the livelihoods of the people are primarily dependent on natural resources. Therefore, we are of the opinion that right to land and water must be a basic component of the livelihood strategy. For example, in the context of watershed development, we clearly recognise the need for creating equal access at least to the additional resources created (in terms of annual flows of water or biomass) as a prerequisite for meeting the livelihood needs of the resource poor.[14]

### *Composition of livelihood needs: food, domestic water, fuel, fodder and other consumption goods*

In the rural Indian context, particularly in drought-prone areas, the minimum livelihood needs consist of domestic water (including drinking water and water for livestock), food, fuel, fodder, some biomass input to the agricultural system to maintain soil productivity and other goods and services that may have to be obtained from the larger system. The last would include needs such as health, education, entertainment and transport. Additionally, since our understanding of livelihood includes the way one earns one's livelihood, access to resources - whether it is land, water, livestock, or any other resource or facility needed for the production process – is also considered part of the livelihood needs.

### *Meeting needs: produced versus purchased*

In the context of livelihood needs, a key question is: how many of these needs should be fulfilled locally (and to what degree) in kind? For example, it could be argued that if farmers produce sufficient cash crops and get high returns, they could then buy food. In other words, it is not necessary for watershed development to contribute to food production if it raises their cash incomes sufficiently to buy the required food. The same argument would apply to fuel or fodder. In many of the areas under the high input-based green revolution agriculture, something of this kind has already happened. Even in many areas where rain-fed cash crops are important, farmers must produce for the market in order to have enough cash to meet food requirements.

However, for a number of reasons, we believe that if food, fodder and fuel requirements are met locally, preferably by every farmer, then there is greater self-reliance and dependability of livelihoods. If farmers have to buy food, fodder or fuel from distant areas with the help of cash, there are many possible points at which the chain may break. Generation of cash does not necessarily mean that it will be spent squarely on those needs. There is a distinct possibility that it may be squandered on other things.[15] Or the terms of trade may turn out to be more and more unfavourable.[16] And finally, if the same argument is applied in the national context and everyone chooses to live this way, cash may be

[14] There is quite a bit of literature available on different SL frameworks. Some examples are Carney *et al.*(1999), Bebbington (1999), and Conway *et al.* (2002).

[15] A reflection of the gendered nature of such expenditures is reflected in the struggles waged by women from miners" households in some of the mines in Madhya Pradesh to force the management to pay half of the wages directly to the women in the household!

[16] For some of the issues related to trade and sustainability at macro level see Lélé (1993).

generated, but sufficient food will not be produced.

As a norm, this review considers food, fuel, fodder and domestic water needs separately, and treats self-reliance in these areas as one of the objectives to be achieved at the watershed level. In most agro-ecological conditions obtaining in the country, it considers self-sufficiency in these livelihood needs possible and desirable at the watershed level. However, it does make a distinction between "self-sufficiency" and "self-reliance'.[17] In exceptional situations where self-sufficiency in these needs may not be possible, it would still consider self-reliance to be possible and desirable, that is, it is considered possible and desirable for a substantial component of these requirements to be produced locally, and the rest to be met from a kind of production that could be exchanged on equal terms with the wider system.

We should also note that livelihood needs would depend upon the livelihood patterns in an area and of different social sections. For example, the fodder needs of a household that is primarily dependent on pastoral activity as the primary source of livelihood would be quite different from that of a typical peasant household. Livelihood patterns have evolved historically and are continuously changing. Older forms are often rooted in older ecosystem contexts that may no longer be prevalent. Similarly, they start from different resource endowments or access that are rooted in the class and caste differentiation as well as historically evolved inequalities. Watershed development itself could change them significantly in one direction or the other.

### *Are needs being met: consumption norms and scales*

How do we assess whether the livelihood needs are met or not? Our normative framework implies that the way is to estimate or quantify each of the needs mentioned above and then see whether the watershed development efforts have been able to meet them. Elsewhere, we have used biomass as the measure to quantify these needs on the basis of a threshold approach (working out minimum upper bounds for the values leaving some scope for later optimisation). Our studies show that a farmer family of five persons generally needs a productive potential of about 15 to 18 tonnes (dry weight) annual biomass increment to meet all the above-mentioned livelihood needs, including estimated minimum cash requirements (Paranjape and Joy, 1995; Datye, 1997; Paranjape *et al.*, 1998).[18]

However, it should be noted that so far, none of the studies under review has taken this approach, nor has any of them provided sufficient data that would allow an estimate. Hence, in this review, due to paucity of data, we restrict ourselves to a relative position. Some studies have looked at what has been the change in availability (in terms of increase, decrease and no change) by comparing the before and after scenario, or comparing the programme villages with control villages and then making an assessment. The review therefore confines itself to tentative conclusions in this respect.

Another related issue is that of scale: should we assess the fulfilment of livelihood needs at the village/watershed level or at the household level? If the assessment is carried out only at the village level, it may hide significant intra-village variations in both needs as well as their satisfaction. It is therefore necessary to consider the fulfilment of livelihood needs at the level of the household.[19] The review, therefore, attempts to see this issue at both levels - at the aggregate level of the watershed ecosystem, to

[17] The term self-sufficiency suggests that all the needs are met locally and there is no relationship with the "external" world. This is very close to the Gandhian concept of self-sufficient villages. However, in the case of self-reliance, the idea is that there should be parity in terms of energy and value in the exchange that takes place between the "local" and the "external'.

[18] This approach is broadly called as the biomass-based planning approach which tries to tie both the sustainability and livelihood needs together. As per this approach the livelihood needs of a typical family is estimated in terms of biomass and the studies show that if a family of five can produce or get access to about 18 tonnes (t) of biomass (dry weight) in a year then it can meet all its needs with a break-up of food (2 t), fodder (5 t), fuel (2 t), recirculable matter for agriculture system (6 t) and surplus biomass for cash income (3 t). So one criterion to judge whether the watershed development has been able to meet the livelihood needs of the people is to see whether the watershed has reached such a production potential (keeping in mind its sustainability). We have not made this part of our normative framework because this may be quite divergent from the frameworks under which the programmes operate.

[19] Given the likelihood of gender-based discrimination, there is also the need to go a step below and de-segregate the household and examine what is happening to women within the household.

see whether the interventions have increased the productive potential to meet livelihood needs, and at the household level to see how these interventions have played out.

***Efficiency considerations***

A common way of assessing the performance of a watershed (or any) development programme is to assess all benefits in economic terms and then carry out a benefit-cost analysis or estimate the Internal Rate of Return. The review does not adopt this approach for several reasons. First, as indicated above, we believe that food, fodder, fuel and some of the other subsistence needs need to be met separately and in kind, not in equivalent cash terms. Second, in a typical benefit-cost analysis, similar benefits flowing to rich and poor households are valued equally. This means that large absolute gains to rich households can offset small absolute losses to poor households, even if the loss to the poor is much higher relative to their income. This does not mean that the analysis cannot be corrected for this. Such bias could be avoided by ensuring that livelihood needs are met at the household level and not merely at the aggregate level of micro-watershed or village level, or having a cut off point for imputed values so that economic gains in excess of livelihood needs are segregated. This requires methodological innovation that seems to be missing from watershed studies based on a cost-benefit approach. We do not think that a favourable aggregate benefit-cost ratio by itself is a measure of performance in so far as watershed development is concerned. This does raise the issue of how to accommodate cost effectiveness in the analysis. Our normative position on this favours the least-cost option that can fulfil specified developmental goals of sustainability, livelihoods, equity and participation in the context of a given watershed.

### 2.2.3 Sustainability

Terms like sustainability and sustainable development are used in very different contexts: from a purely economic angle to mean withdrawal of all state subsidies and support, to a strictly environmental sense.[20] For the purposes of the review, we start from the specific sense of environmental sustainability as mediated by human intervention.

***Sustain what: products or underlying bio-physical processes?***

According to the World Commission on Environment and Development, "Sustainable development is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs" (WCED, 1987). The key point of debate has been what exactly has to be conserved or sustained so that the "ability of future generations" will not be "compromised". Our viewpoint falls broadly into the "strong sustainability" school (Daly, 1991; Costanza, 1991), namely, that which requires conserving "natural capital" independently of other forms of capital. Thus, "maintaining and enhancing the productive and assimilative (as sinks) potential" becomes the objective if sustainability is the goal. In the specific context of watershed development, this implies sustaining the increased productivity and availability of various resources that is supposed to result from the interventions.

To be proactive in our interventions, we have to focus on the underlying processes and see what is happening to this process over time because of a particular type of intervention, rather than wait for the decline in production to show up.[21] We outline below some of the operational norms that logically follow from this approach to sustainability in the context of watershed development.

[20] See Lélé (1991) for a review of the "sustainable development" discourse and Lélé (1993) for a detailed discussion of the concept of sustainability.

[21] One way to understand this, as Lélé puts it, is by looking at what is happening to the physical attributes of the system (like dynamic steady state, reliability, resilience and adaptability) and how certain changes affect these attributes. For example, how do certain shocks like droughts affect the biophysical processes and the ecosystem's (in)ability to cope with such shocks Lélé (1993). Another way of understanding these underlying processes from sustainability point of view is to see whether the primary productivity of that ecosystem is maintained and enhanced through the type of interventions we make Paranjape and Joy (1995), Datye (1997). To operationalise the notion of sustainability, Shah *et al.*(1998) have given some basic guidelines: a) The rate of regeneration of a renewable resource must be greater than or equal to the rate of harvest; b) Waste emissions should not exceed the renewable assimilative capacity of the micro-environment; c) The rate of exploitation of non-renewable resources must always be less than or equal to the rate of creation of renewable substitutes; d) In case an existing renewable resource is to substitute for a depleting non-renewable resource, the rate of harvest of this resource must be strictly less than its rate of regeneration, to the extent necessary to permit this substitution.

### *Use water within renewability limits*

Water is an important resource in the context of watershed development for many reasons (from the point of view of productivity, sustainability, livelihoods and equity) and hence it is important to see what is happening to water as a result of watershed interventions. Here we need to make a distinction between stock and flow. Stock refers to water in the deeper aquifers, which have been built up over very long time spans. Flow refers to the annual availability of water. Very often, increase in irrigated area is taken as a success of watershed programmes and the question whether the increase in irrigation is from the stock or the flow is seldom addressed. Our normative position is that the water use within the watershed should be planned, as far as possible, within the annual flows or within the annual renewability limits. However, there may be "bad" years in which even the domestic water requirements may not be met through the annual flows. In such cases, water from the "stock" could be used with the understanding that the "stock" would be replenished in "good" years.[22]

### *Minimise import of water, do it in a fair manner*

Our normative framework allows for import of water supplements (from outside the micro-watershed like the sub-basin or basin) in cases where the local water resource development through watershed planning cannot fully meet the livelihood needs. We do foresee some situations where a certain amount of water imports would be required, because of the paucity of water resources within the watershed. However, this should be done only if a systematic water balance study shows that there is such a shortfall in meeting the livelihood needs. Even when there is a need to do so, care should be taken that it is done in a fair manner and not at the expense of the "legitimate" claims of others outside the micro-watershed.[23]

### *Use uncultivated resources within renewability limits*

Use of uncultivated biomass resources like fodder, fuel, mulch and timber is an integral part of the rural livelihood strategy. Generally, these products are derived or harvested from own non-crop land or from the CPRs (like forests, village revenue lands). Very often, value judgement creeps in while describing a particular way of utilising these resources. This is particularly pronounced in the case of forest resources. The reason is that there are multiple uses and users at different scales. These issues have been systematically discussed in Lélé (1994). According to him, the term unsustainable use should refer to "a use that results in declines in a particular benefit over time" and changes in the mix of benefits provided by the CPRs (forests) should generally be "non-judgementally termed as land use change". He, therefore, defines sustainability "as maintaining the benefits from biomass flows to the villagers using the forests, and measuring these benefits in physical terms" (Lélé, 1994). He further points out that ensuring this sustainability not only requires harvesting at a rate less than the rate of regrowth, but also ensuring regeneration of the vegetation, maintaining soil fertility and possibly maintaining certain levels of biodiversity.

### *Soil resource quality and potential*

Enhancing and sustaining the productivity of croplands and uncultivated lands requires maintaining the productive potential of soil in these lands. This potential is a complex phenomenon, influenced by various physical, chemical and biological characteristics such as texture, field capacity, nutrient content, organic matter content and presence of useful microbes. However, this would require much more scientific investigation and data, which is not generally available. What we propose to do is to look at some of the visual and qualitative

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[22] Here the distinction between "stock" and "flow" is used to make an overall assessment of water balance within the micro-watershed and it is easier to understand sustainability of water use in terms of annual flows which can be, to some extent, correlated to the utilisable components of the annual rainfall. Of course, in real situations, it may be rather difficult to separate stock and flow. According to Himanshu Kulkarni of ACWADAM, Pune, "stock and flow are integral properties of water, which should not be separated. Availability depends upon both stock and flow. Also, stock could be both renewable and non-renewable and flow would be common to both renewable and non-renewable. Flow would only be unidirectional in the case of non-renewable resources". (From his comments on the draft copy of this report).

[23] For a detailed discussion of the issue of access to exogenous water and how this can be integrated with the local water system and what are the conditions for such imports, see Paranjape and Joy (1995); Datye (n.d.-b).

indicators that may have been recorded by different studies such as erosional characteristics, ability to withstand dry spells and turbidity of stream flow to assess the impacts on soil quality and potential.

***Crop practices and agro-ecological processes***

Crop diversity (as against mono-culture agriculture) is generally taken as an indicator of sustainable agriculture. In our framework, we would also need to look at the impact of watershed interventions, especially on the agronomical practices that are promoted, to see the changes in cropping pattern, crop varieties, and the like. So, we would also look for the changes, for example, in input use, at the extent of chemical versus organic inputs. The normative position consistent with our concept of sustainability demands a shift from the high external input based agriculture to low external input based agriculture practices. The latter represent a wide range of practices that include, but are not restricted to, pure organic agriculture or methods. In fact, practices that do not totally exclude chemical fertilsers, but believe in their minimal and judicious use in ways that are not environmentally damaging are now formally called Low External Input Based Sustainable Agricultural (LEISA) practices.

***Balance between cropped and non-cropped lands***

Watersheds consist of an interconnected system of different types of lands (in terms of slope, uses, capability, etc.). Intervention on one type of land or a plot can have an impact on other types of lands and plots. Complete suppression of soil erosion may sometimes deprive the downstream agricultural plots of valuable nutrients. Sometimes, bringing existing non-crop land under tillage may increase soil erosion; watershed development literature often treats conversion of non-crop land to cropland as a desirable goal and an indicator of success. However, non-crop lands perform various ecological functions. For example, a significant decrease in non-crop land can also decrease the population of predators of pests, which would result in higher pest attacks on crops. So there is a need to maintain a balance between the cropped and non-cropped areas within a watershed.

***Energy and materials – the global aspect of sustainability***

There is another global aspect of sustainability of production practices, namely, the impact of the production practices on the long-term requirement of energy resources. A movement towards sustainability in this sense would imply reduction in the requirement of non-renewable energy sources and materials. The degree of the reduction would indicate the degree of movement towards long-term sustainability. One of the ways to see how this dimension of sustainability plays itself out in the context of watershed development is to look at the use of renewables in various structures – especially water harvesting structures like check dams, nallah bunds, and farm ponds.

***Sustainability as dependability***

Livelihood assurance implies not only the fulfilment of livelihood needs but also their fulfilment with a sufficient degree of dependability. The critical input here is water, because it is the most variable input in the ecosystem. For this reason, the degree of assurance with which water services are planned becomes an important factor.

If livelihoods have to be assured for the rural poor, the degree of assurance has to be sufficiently high. In our opinion, an acceptable degree of assurance has to be 80% or more. This implies that livelihood needs would be fulfilled in four out of every five years. If this is so, then it is feasible for them to build sufficient reserves during those four years (one or two of them would be very good years too) to cover the shortfall that may be created in the fifth year.

With respect to water, this means that water resource planning must be done on the basis of 80% dependability of rainfall. Once we plan in this manner, we also have considerable amount of variable water resources that are available in the good years. The planned system must take this variable resource into account and use it efficiently.

### 2.2.4 Equity

***Different dimensions: class, caste, ethnicity, gender, and offsite impacts***

The fulfilment of livelihood needs depends crucially on who has access to how much and

what kind of productive resources. Thus, the issue of livelihoods brings in its wake the issueof whose livelihoods – in other words, the question of equity. In our normative framework, we are basically talking about two dimensions of equity. The first dimension of equity is "the concern about the intra-generational distribution of human well-being across typical barriers of class, ethnicity, and gender, etc., including concerns about fairness of outcome as well as processes" (Lélé, 2004). This dimension of equity is related to historically embedded inequalities.[24] Class, caste (or community) and gender are the three major dimensions in which inequality manifests itself in India. Of course, there are other forms of inequality also: for example, the division between tribals and non-tribals. The implication here is that in assessing the impact of watershed development, one needs to disaggregate the "local community" in terms of different social sections (class, caste, ethnicity, etc.) and see the differential impact on them. The gender dimension adds one more layer to the issue – one needs to go beyond the household level and see what are the impacts on the women within the households.[25]

The second dimension emanates from spatial or locational inequalities and this is primarily because of the bio-physical characteristics of the watershed itself. Especially in the case of water, one's location in the watershed (upper reaches versus the valley portion) often determines one's access – people who own land in the valley portion benefit most from the augmented resource. This issue of upstream-downstream difference is not limited to these differences within the watershed. It crops up as an issue between adjoining watersheds, between upstream and downstream communities, right up to those differences within the entire river basin itself. Given that the relationship is fundamentally asymmetric – that is, activities of upstream land owners or water users can affect downstream communities, but not vice-versa – the question of what constitutes fair or unfair behaviour by upstream communities (or equitable allocation of resources or benefits between upstream and downstream communities) crops up immediately and needs to be carefully addressed at all scales: within the micro-watershed, across watersheds and across the entire basin.[26]

### *Water use prioritisation: inter-sectoral equity*

The normative framework on which the review rests treats water as a common property resource to be managed and regulated collectively in order to ensure equitable and regenerative use. This implies making distinctions about water use and treating different uses differently. First, it implies defining priorities for different forms of water use. Broadly, the order of priorities in most areas would be: drinking water; water for domestic use and for cattle; water required for ecosystem regeneration and for livelihood activity; and surplus/extra water that could be used for cash or commercial crops. The principle here is that water should become available for the next category of use only after the first use is assured.

This implies that we take into account what has been the impact of watershed interventions on all these dimensions of equity.[27] To be more explicit, in our normative framework, we take the stand that a fairer distribution of increased resources should be ensured with a privileged access to the resource poor. The way to ensure this may differ from situation to situation. We do not prescribe any one way of doing it, since there are many different ways in which it may be done. From the point of view of the review, it would be a significant attempt to try and unravel the different ways in which the issue of equity has been handled on the ground.[28]

### *Practical feasibility: from equality to equity*

We should also take note that equity, a comparatively new term, seems to have replaced

[24] Shah (2003b) clubs all these inequalities under the umbrella term "historically disadvantaged'. For a detailed discussion see Shah (2003b).

[25] For some of the critical issues related to gender and development see Agarwal (1986); Dankelman and Davidson (1988); Rao (1991); Leach *et al.* (1995). For a summarised discussion on the major trends in gender and development writings, see Kulkarni and Rao (2002).

[26] For a detailed discussion of the asymmetries in watershed and other ecosystem processes see Lélé (2004) and Kerr *et al.* (2002b).

[27] For a critical review and detailed discussion on the issue of equity in the context of CPR research, see Menon (1999).

[28] For a detailed discussion on the question of equity in the context of irrigation, see Boelens and Davila (1998). The first three parts of this book deal with the conceptual dimensions of equity and the rest of the book deals with different case studies and experiences.

equality, a good, old-fashioned term that was used to denote issues related to the distribution of and access to resources till the end of the seventies and the early eighties. Equality has been inscribed on the banner of all radical movements for social change. It is defined in relation to what they, meaning the social movements, see as inequality. Moreover, they believe that inequality is the result not of the intrinsic worth of individuals but of the way we arrange our social affairs. It is the result of social structure. The demand for equality has always been a demand for a radical, egalitarian social transformation, for structural changes in society. However, after the eighties, for a host of reasons including globalisation, economic reforms, growth of the voluntary sector and growing NGOisation, the word "equality" that still smelt of the radicalism associated with it began to be increasingly replaced by the word "equity'. With this, the emphasis also shifted from the "radical projects" that characterised the radical mass movements to what is immediately possible and practicable. In the context of watershed development, we use the term equity (and not equality) because we are only talking about what can be done *without* a radical restructuring of social relations. In other words, it refers to and demarcates the space that is still available within the system. This means, for example, that if we create preferential access (not necessarily ownership) to small parcels of land and limited quantities of water for the disadvantaged sections, then inequity will reduce, although equality will not be reached.

### *Contextualising equity in watershed development*

A commitment to equity brings special concerns in respect of watershed development. In view of the asymmetries in watershed processes – for example, those between surface water and ground water, upper and lower reaches, downstream and upstream – it becomes important to see how those asymmetries map on to the historical inequities of access to productive resources and what impact watershed development has on them. The general experience is that the asymmetries map on to the inequities in a way that more often than not accentuates rather than attenuates the inequities within the local community. This is because a) land in the upper reaches is owned more by the poor, in the lower reaches by the rich and upper castes, b) watershed development augments ground water, which is currently private property and can be tapped more by the rich and the landed, less by the rural poor and not by the landless, and c) in any case, increased availability or assurance of water does not directly benefit the landless in the normal course of affairs.

Therefore, unlike concerns in respect of environmental sustainability, which watershed development *per se* is likely to enhance, we are likely to find that there is nothing intrinsic in watershed development to take care of inequity. The implication is that if there are no pro-active elements of equity built into the programme, it only accentuates inequity. There is now a growing realisation of this aspect of watershed development, and lately, there have been greater efforts to include an adequate equity component in watershed development programmes. How effective these have been is an important aspect of the review.

### *Water: local or non-local resource?*

Another important issue relates to the question of contextualising the issue of equity within watershed development. It is important to recognise that water is both a local and non-local resource. The localist viewpoint sees water only as a local resource. However, water flowing down from upstream watersheds is the basis of livelihoods in the downstream regions. It is important to recognise that modifying water regimes in any watershed, however small it may be, ultimately, has *basin*-wide implications. Because watershed development looks at watersheds on the micro-watershed scale, and treats and manages the watershed as an independent entity, the interdependence and the downstream effects appear as "externalities'. However, this is an artefact of the way we define our boundaries, because water is both a local and exogenous resource. Therefore, while slogans like "*gaonka pani gaonme*" (basically meaning the rain that falls in a village is for that village) may help conserve water, they go against the grain of collective regulation and control of water resources. While we can argue in the case of many other local resources (except water) that local communities should have full right over the resources in their areas, the same cannot be said about water.

Recognising that the impact of watershed development extends beyond the treated watershed, a commitment to equity means ensuring inter-watershed or basin-level equity as well. Here, our normative position is that every community has a right to water as part of its right to assured livelihood. This implies that the local communities should be assured of adequate access to the water necessary for their livelihood – from local *as well as* non-local or so-called exogenous sources together (as we have qualified in the section on sustainability). From this perspective, all communities should have a right to utilise as much of the local water resource as they can to fulfil their livelihood needs. But this also means that the water that does not go to fulfil livelihood needs does not form part of this right. To put it another way, everybody in the watershed has a right to a basic quantum of water (which also includes the aspect of quality in the case of the drinking water component) as part of his/her right to livelihood. Only after meeting the basic needs or service of all should "surplus" water be provided to people as extra, economic service for commercial production, whether agricultural or industrial.

The normative framework on which the review rests treats water first as a common pool resource to be managed and regulated collectively in order to ensure equitable and regenerative use, and only secondarily in respect of the residual resource, as a private resource regulated by the market. With this background, it becomes important to explore how far watershed development has brought about collective management and regulation of water use and created equitable access (in terms of basic service). Just as important are the actual priorities of water use on the ground.

Equally important in this respect is the principle of equitable sharing of shortages and surpluses. Without such a viewpoint, we cannot expect downstream-upstream conflicts to be resolved. In the absence of an understanding based on such a principle, generalisation of watershed development activity, far from mitigating this conflict, is likely to sharpen it further. But watershed development activity also creates the potential to inculcate these principles from the bottom up, instead of their having to be enforced top-down.

***Watershed also creates conditions for a positive sum game***

Although it is true that the asymmetric nature of watershed processes makes watershed development "naturally" prone to aggravating intra- and inter-village/watershed inequities, we should also take note of the immanent potential that watershed development has for equity, though it may be realised only where strong pro-active initiatives exist.

Watershed development results in the enhancement of ecosystem resources and productive potential. Moreover, this enhancement takes place on the basis of public funds and through collective, community effort. Thus, it can be argued that *the additional resource that has been created be assured equitably to everyone in the watershed, even as prior right to previously existing resources are recognised and left largely undisturbed*. Thus, without greatly disturbing prior rights and use, potential access to productive resources for the rural poor could be created by watershed development. It creates the possibility of providing equitable access within a positive sum game framework. This, in fact, represents the most important aspect of the potential that watershed development creates. It is for this reason that the review treats these possibilities as important.

### 2.2.5 Participation

***Participation: both a goal and a means***

Over the last two decades or so, participation (variously seen as collective action, community-driven development, decentralised governance, etc.) has gained increased currency both in developmental practice as well as in CPR research and literature. This increased awareness about the need for participation of local communities and the need for decentralised governance draw from different sources and standpoints like a) critique of the centralisation of power in the bureaucracy and alienation of local communities, b) disenchantment with the top-down approach, c) increasing aspirations, awareness and demands from the "subalterns" for their share both in political space as well as in the benefits of development. Hardin's "Tragedy of the Commons", in a way, forced the CPR research community to look at the question of community and community control and institutional issues

much more closely, and this has given rise to a vast literature which also brings out the different strands, trends and nuances of the problem.[29]

Very often participation of the local communities or resource users is seen as a means to achieve certain goals. For example, Water Users" Associations (WUAs) are being formed with the primary aim of increasing cost recovery in terms of collection of water charges and water use efficiency. JFM committees are formed for the protection and "sustainable" use of forest resources. Thus, participation is a means to achieve a goal, which is often set by the state or an outside agency. This is an instrumentalist view of participation. However, there is also the counter viewpoint, which values participation for its own sake, irrespective of what outcomes it leads to, and utilises participatory mechanisms and tools to increase the participation of local communities or users of resources. In our framework, we see participation as a goal of developmental (decentralised) process in that it helps communities make an informed choice and also as a means of more equitable, sustainable and efficient outcomes. In the former context, it means the creation or enhancement of genuine participatory democracy at the grassroots. We outline below what this means in the context of watershed development in India, which is implemented in highly differentiated rural communities and, by virtue of being a financially demanding programme, necessarily means outsider input and intervention.

### *Democracy within local communities*

Given that rural Indian communities often are highly differentiated, decentralised democratic governance is easier said than done. Simple transfer of decision-making power to "the community" may well turn out to be handing over decisions to the dominant sections within the community.[30] Nor is it necessary that such simple transfer will ensure regenerative and equitable use. The quality and nature of within-community participation in democratic local governance depends to a great extent on the characteristics of the local community itself. For example, in a community which is economically, politically and socially extremely stratified and hierarchical, the type of participation forthcoming would be very different from the type that one can expect in relatively homogenous communities bound by more egalitarian and democratic norms of behaviour and relationships. There is, therefore, a need to recognise the heterogeneity (both horizontal and vertical) within the local community while forming the various institutions so that space is created for all sections to participate in the process.

### *Outsider's role*

In almost all watershed programmes in India, outside intervention plays a major role in areas such as funding, implementation, technical guidance and setting up of different organisations. There is no example of watershed development, which is initiated, funded and managed purely by the local communities. Even in the case of Ralegaon Siddhi, though Anna Hazare is from the same village, he had the opportunity of living elsewhere and receiving a different type of exposure that allowed him access to knowledge, contacts and status, which he successfully used for the development of the village. The financial support mainly came from different government departments and other sources. The normative framework that underlies the present review clearly recognises the role of outsiders. It also considers it important to spell out clearly what that role should be and what should be the relationship between the local community and the outsiders.

### *Basis of collaboration with the outsiders*

We feel that informed participation, livelihood assurance, regenerative use and equitable access should be the basic objectives of the collaboration between the community and outside agencies. The latter two concerns do not emerge spontaneously; even if they do, they seldom acquire critical importance, unless conscious attempts are made to address them as issues. This often requires the intervention and support of outside agencies.

[29] For a detailed discussion on the major trends and issues in the CPR research over the last 30 years since Hardin's "Tragedy of the Commons", see Dietz *et al.* (2002).

[30] There is a growing literature, which argues that pre-existing inequities within local communities would distort the outcomes. This literature challenges the earlier assumptions that village communities are relatively homogeneous in their interests and cohesive in their relationships with each other and deconstructs the "local community'. Some of the writings include Li (1996); Agrawal (1997); Menon (1999); Mosse (1997); Shah (2003b).

Outsiders and public funds may have a pro-active role to play in these matters by ensuring that transfer of decision making powers and mobilisation of public funds to the "community" are contingent on the disadvantaged getting a fair share of the benefits, on their getting a greater voice in the decision-making, and on the "community" ensuring regenerative use of ecosystem resources.

### *Two-way capability building – the key role of the outsiders*

However, it should also be emphasised that the process of capability building described above is a two-way process. It has been pointed out in many studies how the pre-conceived mindsets and notions of the outsiders have done grievous harm to development projects. It is important for the outsiders not to start off with any pre-conceived ideas of what should form the foundational objectives of the collaboration in social arrangements and actions. It is rare that a community, its history and ideas will not incorporate the foundational objectives described. Circumscribed as they may be by the constraints of social structure and history, there are forms that aim at equity, a regenerative connection with the surroundings and value systems that allow people control over their own lives. One can then build on these traditions, for example, in Maharashtra on the *phad* system for equity and sustainability or the notion of *kadosariche paise* (the money tied to the end of a sareefold) for independent income for women. The foundational objectives may then be seen as an amplification and extension of principles immanent in these traditions and social forms. Without such an understanding and learning from the community, it is well nigh impossible to make any headway on a voluntary and informed consensus on sensitive questions.

Hence, even though the local-outsider interaction and collaboration may take different forms, for the realisation of the foundational objectives of this collaboration, one of the key roles of the outside agency should be that of capability building, of providing information, and offering a forum for discussion of issues. It should become the conduit of communication for sharing the experiences and the possible options that people elsewhere may have tried out (both successful experiments and failures) and helping the community arrive at a consensus. They have a similar role to play in respect of regenerative use. The path of least resistance in the face of the availability of water leads to an intensive input paradigm. Outsider intervention should be oriented towards participatory experimentation with and adoption of regenerative practices. It is our experience that local communities do change their choices in the light of new information and experiences, if these are discussed and a consensus formed before rights and interests are indiscriminately created.

The role of the outsider, as visualised by the normative framework of the review, may thus be summed up as that of capability enhancement. This involves pooling the knowledge that already exists within the community in a participatory mode and synthesising it with data and information collected by the scientific establishment and government agencies and making it available to the local communities. This would help the local communities get both a qualitative and quantitative understanding of their ecosystem resources. They can then make informed choices between different options. We think capability building through resource literacy is a precondition for the informed participation of the local communities.

### *Accountability of larger structures and agents to the local community*

The relationship between the local and outsider also calls for greater accountability and transparency on the part of the outside agency (larger structures, supra local, etc.) to the local communities. There are different ways in which this can be actualised. One is to state in clear terms the overriding concerns and goals of the outsider agency in intervening in the local situation (for example, the foundational goals of livelihood assurance, regenerative use, equitable access and informed participation discussed above). The underlying principle is that the local people should be engaged in a dialogue on these aims and see where the convergences and divergences occur.[31] It is our belief that an explicit acknowledgement of these foundational goals makes for better participation as well as better performance in this respect. The second aspect is to have financial transparency. The

[31] Sometimes there may not be "community" consensus on these because of the internal differentiation within the community.

outside agency should place information before the people regarding the funding sources – the quantum of money that is coming in and also the way the money is going to be spent. Keeping the account open for public scrutiny can ensure financial transparency and accountability.[32] The third aspect is related to the processes involved – how equitable is the relationship between the two, fully recognising that the outsider agency may be in an advantageous position because of various factors. To put it differently, it is important to see whether the outsider agency has evolved any mechanisms to "democratise" the relationship between outsider and the local community. All these are important in the overall context of increasing NGO presence (or NGOisation) in the developmental sector. Very often, there is a tendency amongst the NGOs to equate community or people's participation with NGOs getting representation in different committees and bodies. In other words, NGOs may end up behaving no differently from government departments that refuse to be accountable to local communities.

## 2.3 Are we setting divergent standards?

We have presented an exhaustive set of norms that, we believe, represent the essence of the broad goals of livelihoods, sustainability, equity and participation. One needs to ask to what extent the normative framework, as described above, overlaps with or differs from the framework of the programme it is supposed to review. It is difficult to answer this question because there is no single framework with which we can compare our framework. All we can say is that in terms of ultimate goals, there is considerable amount of convergence. The professed aims of watershed development programmes, irrespective of the differences in the modes of implementation, are sustainability, productivity enhancement, livelihood assurance, equitable distribution of benefits and participation. Our normative framework also reflects the same concerns.

The devil, however, lies in the details. Very often, the guidelines do not define or specify what some of these terms mean and they are open to a wide range of interpretations.[33] Keeping in view the fact that watershed based development has become the lynchpin of rural development in India, we have tried to interpret and define some of these broad developmental goals such as livelihoods, sustainability, equity and participation and work out a desirable and achievable set of indicators for them.

Though we have tried to keep the set of norms for each of the above mentioned outcomes or goals as broad as possible, there will inevitably be aspects of our normative framework that differ from the frameworks of the different programmes. Sometimes, the difference may be in emphasis or it may be in the norms themselves. For example, our normative framework puts a high premium on the equitable distribution of increased productive potential (for example, water) as an important norm for equity. Most programmes may not share this.[34] Or consider the case of participation. For us, participation is both a goal and a means and it is defined more in terms of people's ability (and space) to make informed choices. However, other frameworks generally look at participation more as an instrument (for instance, to maintain structures). We expect the areas of convergence and divergence to be clarified in the course of the review itself.

The situation is further complicated by the fact that, in most cases, we are not dealing directly with the programmes themselves but

[32] A good example of this is the *Nirak-Parak* condition in the watershed development programmes of the Rajiv Gandhi Watershed Mission in Madya Pradesh. Under *Nirak-Parak* the implementing agencies are supposed to display all details regarding cost estimates for different works, actual expenditures, physical works, etc., on a wall in a prominent place in the village.

[33] For example, in the context of sustainability, though the NWDPRA Guidelines of 2000 mention conservation, development and sustainable management of natural resources including their use, and enhancement of agricultural productivity and production in a sustainable manner as objectives of watershed development, these objectives have not been converted into specific indicators, nor are they included in the "success" criteria.

[34] In the context of water resources, the NWDPRA Guidelines of 2000 mentions that "it may be desirable to locate water harvesting structures nearer to the fields/wells of resource poor farmers" and does not explicitly talk of equitable distribution of the improved water resources as a result of watershed intervention.

rather with studies, evaluations or assessment of these programmes. These studies may have been made from very different standpoints and concerns and may not provide sufficient information on whether our objectives and concerns have been met by the programme studied. We have tried to keep these possibilities in mind while conducting this review. However, the direction and thrust of the review depends crucially on this framework. For this reason, even though we have not been able to bring the entire normative framework to bear during the review, we have chosen to describe it in some detail in a separate chapter.

# CHAPTER 3
# TYPICAL WATERSHED INTERVENTIONS

## 3.1 What constitutes a watershed?

The term "watershed" originally meant the line that defines the water divide; it is the line from which water flows away in different directions. Watershed also referred to the upper portion of a catchment. In contemporary parlance, a watershed is defined as a region bounded by a water divide with a common exit point for the water flowing out of it. This implies that all the water that falls on it flows within it, and there is no surface flow into the watershed. It is also equivalent to the catchment of a given point on a stream that defines the exit point.

This definition, however, does not tell us anything about its size. The definition applies to an area as small as a few hectares and to huge river basins, even comprising many million hectares. Any of the following hierarchy may be called a watershed by that definition:[35]

Basin
Sub-basin
Watershed
Milli-watershed
Micro-watershed

The *operational* unit in all watershed development efforts is the last one, the micro-watershed of the size or the order of 1000 ha (generally between 500 and 1500 ha). So, in what follows, watershed is treated as synonymous with micro-watershed.

## 3.2 Core concepts in watershed development

Controlling soil erosion, increasing infiltration, reducing evaporation, increasing agricultural productivity, management of livestock and common lands – all these are biophysical interventions, or modifications of existing biophysical management practices. Thus technology and technical knowledge plays an important role in watershed development. But these interventions or their modifications are required to be supported by or aligned with social interventions and arrangements. This has been the lesson of the last 25 years or so of natural resource management in general and watershed development in particular.

Social interventions are required to a) convince farmers to change land use and cropping practices and adopt sustainable methods; b) ensure management of common lands; c) ensure management of common resources like water; d) raise community contributions to enable efficient use of finances; e) take allocative (who gains, who loses) decisions about setting up of common structures, management objectives for common lands, cropping and water utilisation norms; and f) promote non-land based activities and other development projects.

A typical watershed development project is planned as a five-year project and could be broadly divided into the following phases – programme initiation phase, planning phase, implementation phase and finally withdrawal at the end of the project. Here, we restrict our discussion to those activities that take place in a micro-watershed or a cluster of micro-watersheds that have been selected by a particular Project Implementation Agency (PIA). The selection of the PIA and the micro-watersheds takes place typically at the district level through the District Watershed Development Committees in the case of

[35] Bali (1979) classifies watersheds in India the following way:

| Category | Number | Size Ranges (Lakh ha) |
|---|---|---|
| Regions | 6 | 27-1130 |
| Basins | 35 | 30-3000 |
| Catchments | 112 | 10-50 |
| Sub-catchments | 500 | 2-10 |
| Watersheds | 3,237 | 0.5-2 |

As given in Shah *et al.* (1998).

projects operated under the 1994 Common Guidelines.[36]

### 3.2.1 Initiation phase

In the initiation phase, the emphasis is on community organisation and mobilisation. Generally, activities like exposure visits to successful watersheds, public meetings and various other awareness building exercises are taken up in this phase. By the end of this phase, the concurrence of the Gram Sabha is envisaged. The Gram Sabha is expected to pass a resolution that the village wants to take up watershed development activity in the village/ watershed and that the villagers and the Gram Sabha agree with the conditions that the programme may place, for example, not allowing open grazing, taking responsibility for maintenance of structures and assets created, and contributory fees.

Participatory Rural Appraisal (PRA) is taken up in the village/watershed incorporating community organisation and data collection and is aimed at understanding the problems and prospects within the watershed. This is also the phase when the Watershed Development Team (WDT) or PIA forms several Community Based Organisations (CBOs) such as Self Help Groups (SHGs), smaller area groups, the Watershed Association (WA) and the Watershed Committee (WC). The WC opens two types of accounts – one for receiving the money for the physical works and the second, known as Watershed Development Fund, where peoples" contribution towards different activities is pooled and later used for maintenance purposes. The manner in which these CBOs are constituted, and their roles and responsibilities are discussed in the chapter on participation. The Common Guidelines also provide for undertaking "Entry Point Activities" that are aimed at bringing people together and involving them in some common activity that is useful to the community such as constructing an approach road, or building a community hall. During this phase, relevant training is given to the different CBOs and also other staff like the Watershed Secretary in different aspects of watershed management and procedures. Thus, the emphasis of the initiation phase, (sometimes termed the capacity building phase), is to create the necessary organisational structure, engage in capacity building of the CBOs, and undertake PRA and entry point activities.

### 3.2.2 Planning

Most of the PIAs and WDTs rely on the data collected through PRA exercises for planning. The Common Guidelines do provide for certain conventional survey activities to strengthen the data collected through PRA. This is often required in the treatment of drainage lines (like nallah bunds). The usual practice is that the WDT (or the technical staff of the NGO) prepares a tentative treatment plan with approximate cost estimates for the entire watershed using the "ridge to valley approach'. This is usually discussed in the WA meetings. Once drafted it is sent to the District Rural Development Agency (DRDA) or Zilla Parishad (ZP), as the case may be, for approval. This is only an indicative plan and the funds are released based on this treatment plan. At this stage, the WDT prepares an integrated and detailed plan (generally known as the Action Plan) with yearly break-ups of activities and costs. Ideally, the watershed community is expected to be involved in the actual planning process. The detailed action plan must be approved by the DRDA/ZP.

[36] Under the Common Guidelines, the PIA can be a) any government department, b) NGO, or c) PRI. The Hariyali Guidelines has shown an explicit preference for PRIs as implementation agencies. Sometimes, there is a division between functions–for example, the task of physical works (known as hardware) is entrusted to the government department and the community organization component is given to an NGO. All the projects operate on the basis of per ha cost and it varies across projects. For example, the GoI projects generally has a cost norm of about Rs.6000 per ha whereas in KAWAD projects, it is about Rs.15,000 per ha. Generally, the Guidelines also prescribe what should be the expenditure pattern against different activities. The Common Guidelines specify that about 75% of the funds are to be spent on physical works and the remaining to be spent on community organisation, data collection, training and administrative overheads. Once the PIA is appointed, the first thing it does is to recruit a multi-disciplinary Watershed Development Team which actually interfaces with the PIA and the CBOs in all aspects of watershed development. If it is a purely NGO operated project (in the sense that it mobilises its own money), then usually the project is implemented by its own staff and no WDT is constituted.

### 3.2.3 Implementation

The approved action plan provides the guidelines required for implementation of the proposed programme. The GoI Guidelines stipulate that the implementation has to be carried out through the CBOs. It also suggests that in implementing common works like check dams, nallah bunds, farm ponds, etc., the User Groups should be involved in the implementation. The usual practice is that work on private lands such as strengthening of field bunds, levelling of farm lands or other such measures are supervised by the concerned farmer, usually the land owner. Payments are made after assessments by the WDT members along with WC members. There is also the system of cost sharing – a type of graded contribution system in which the contribution for activities that benefit individuals is higher than the activities which benefit a larger group (like drainage line treatment). In GoI projects, the contribution by an individual is 10% of the cost of the activity if it benefits the individual and 5% if it benefits a larger group. The PIA is also supposed to prepare progress and evaluation reports to be sent to the DRDA/ZP from time to time as the work progresses.

### 3.2.4 Withdrawal and post-watershed phase

Before the project period ends, the PIA is supposed to prepare a "withdrawal protocol', which essentially means that the PIA has to train and motivate the WC (and eventually the Gram Sabha) to take over the repair and maintenance of the structures and assets created. The WC is meant to continue functioning even after the project period is over and it is entitled to use the Watershed Development Fund for the repair and maintenance of these structures and assets.

## 3.3 Typical biophysical interventions

There are a wide range of biophysical interventions that are implemented as part of watershed development programmes. These interventions may be sub-divided into: a) soil and water conservation measures; b) productivity enhancement measures related to crop production; and c) intervention in other sectors like horticulture, farm forestry and animal husbandry.

### 3.3.1 Soil and water conservation

Soil and water conservation measures are at the heart of watershed development interventions both in terms of the functions they are expected to play and also in terms of the proportionate share of expenditure that goes into them. Review of experience under various programmes and evaluation studies indicates that very often, more than 70% of the works component of the watershed budget is spent on these measures (Soussan and Reddy, 2003; Anonymous, 2001a). Hence, they form the core of watershed development programmes, though in the recent times there is a tendency to supplement them with other types of interventions also.

The main soil and water conservation measures may be broadly classified as follows:

- Vegetative barriers: hedges on field bunds; contour hedges; hedges as part of strip farming
- Bunding: field bunds; contour bunds; terrace bunds
- Trenches: continuous contour trenches; staggered trenches
- Treatment of waterways/drainage lines/ streams: diversion channels, gully plugs, check dams

All these measures are aimed at dissipating the kinetic energy of water flows and increasing the residence time of water within the watershed, a strategy graphically described in an expression often used to sum up the general maxim of soil and water conservation – "make water walk and not run".

Many of these measures are used in combination to increase their overall effectiveness. For example, bunds are strengthened physically and stabilised by planting trees or grasses (like Stylosanthus Hamata), combining bunds and vegetative barriers. Another example is a trench-and-bund planted with trees on the downstream side, which helps to stabilise the structure and also provides a favourable soil and moisture regime for the growth of trees.

Other measures undertaken also have a soil and water conservation aspect, such as: a) afforestation or creation of perennial cover undertaken mainly on common lands; b) change in land use; c) land levelling, and d) agronomic

practices like contour farming, ploughing, strip farming and mulching. Farm ponds and other water harvesting measures also have a soil and water conservation aspect to them, while soil and water conservation measures like check dams also have a water harvesting aspect.

BIRD-K's Adihalli-Myllanhalli watershed project near Tiptur (Tumkur District in Karnataka) illustrates the wide range of soil and water conservation measures that are undertaken in the course of watershed development activity. The interventions include: a) *insitu* conservation measures like contour trenches, recharge pits, development of vegetative cover, afforestation and silvipasture along with drainage line treatment which includes gully plugs made with locally available materials like stone, soil, brush wood or live hedge in the upper reach of the watershed comprising mainly non-crop lands; b) measures like dry stone bunds and earthen check dams in the middle reach; c) conventional structures such as masonry check dams, earthen nallah bund and percolation tank as well as innovative structures like ferro-cement gabion (a ferro-cement core instead of black soil core as black soil is not available in the area) and underground *bandharas* within the lower reach of the watershed and d) an extensive network of farm ponds and diversion of run-off to farm ponds with the help of field bunds and trenches spread out in the entire watershed.

In addition to the above-measures, some groups have used other schemes like dug ponds near the streams to capture the percolation from the streams and nallahs, underground bandharas and water harvesting ponds (both storage and percolation) mainly as water conservation measures.

In the Kolwan Valley Project (Pune District, Maharashtra), implemented by Gomukh Trust under the Common Guidelines (DPAP programme), various techniques for water harvesting were studied and finally three major techniques – cement and earthen bunds, farm ponds and Kolhapur Type (KT) weirs – were selected. They found that these technologies were relatively cheaper, used more locally available material and were easy for the villagers to implement. Development of natural springs was another important measure adopted for water conservation by using techniques like dugout farm ponds and construction of percolation tanks (Anonymous, 2001a).

In the KAWAD projects, the main soil and water conservation treatments promoted are bunding (field bunds), levelling, silt application and check dams (Iyengar *et al.*, 2001). Though contour bunding is generally considered an important component in any watershed development or soil and water conservation programme, in the KAWAD programme there is less emphasis on these measures. An additional conservation measure is the introduction of *gunda*[37]. Except in a few cases like Dornali (AFARM initiated watershed programme) and the PIDOW project in Gulbarga, vegetative methods have not been tried as soil and water conservation measures. In Dornali village, the analysis of the expenditure pattern indicated that about 27% of the total expenditure was spent on vegetative methods and biomass regeneration programmes (AFARM, 1999). PIDOW-Gulbarga has used vegetative checks to stabilise the slopes and check soil erosion by planting Agave (Sisal) along the contours and banks of the gullies. Stabilisation of earthen bunds was also done through planting local grasses and Stylo-Hamata grass on the bunds in some places (Karanth and Abbi, 2001).

In some recent initiatives in Andhra Pradesh, check dams and other mechanical means of soil conservation that typically have been at the heart of conventional watershed approaches, have not been given much emphasis. Instead, horticulture plantations and revival of traditional water bodies such as farm ponds and tanks are conceived as better drought mitigating activities (Soussan and Reddy, 2003). However, with respect to one of the KAWAD projects, though the Partner NGO tried promoting planting of Vetiver grass and Subabul on bunds, not much was observed on the ground. Similar observations were made in other aspects of vegetative measures such as less emphasis on forestry programmes on the common lands.

### 3.3.2 Water harvesting

Most of the soil and water conservation measures also serve the purpose of rainwater or

[37] A traditional outlet made of boulders that helps in conserving soil and water, mentioned in Iyengar (2001).

run-off harvesting and it is difficult to separate them. However, we could broadly divide them into a) measures that increase *in situ* water availability, and b) measures that increase availability of applied water, which is stored off-farm, or below the ground. In this sense, check dams and farm ponds would qualify as water harvesting measures as well. Check dams and all its variants that store water on surface or enhance subsurface storage, including KT weirs and diversion channels for applied water, are of course the most common and ubiquitous. However, the use of farm ponds is not very common.

One of the distinguishing features of BIRD-K's intervention, which differs from other watershed projects, is the presence of a large number of "farm ponds" for water harvesting in the watershed area. BIRD-K has been working in Adihalli-Myllanhalli watershed since 1996. They have completed the watershed project and have withdrawn from the area since March 2003. The total area of the watershed is about 1200 ha of which 750 ha was treated. The total households are about 350. The annual average rainfall is about 550 - 600 mm. According to Dr. Reddy, the Director of BIRD-K at Tiptur, their watershed approach can be characterised as the "3 J Model" - *Jeeva* for life of plants and people, *Jala* for water, *Jaala* for network of life and water.

About 350 ponds were dug in the watershed with an average of at least one pond for every 2 ha. BIRD-K did not use any engineering survey to determine the sites of the ponds. Instead, it went by thumb-rules. The main criterion used in the site selection was to keep the ponds on the same contour. A series of 8-10 ponds were constructed in a row and linked to one another through a contour trench, which is connected to the nallah. This also functioned as the inlet and outlet of the ponds. According to BIRD-K, the lateral flow of excess water from one pond to the other through the trench is supposed to increase the sub-soil moisture for the crops. Each pond has an inlet chamber to trap the silt and an outlet is provided for excess water to flow out, which flows into the next pond in the chain. Stone pitching is provided for inlet and outlet channels to protect them from scouring.

The top and bottom dimensions of the ponds are 30 x 30 feet and 20 x 20 feet respectively. The depth is about 10 feet. Thus, the storage capacity is about 185 $m^3$. The average cost works out to Rs.3,500 to 4,000. Due to time constraints, BIRD-K used mechanical excavators to dig the ponds and the construction was completed in a record 30 days. However, not all of them have held water as expected and they have functioned more as percolation ponds rather than storage ponds.

### 3.3.3 Afforestation and perennial cover

Most of the efforts to carry out afforestation or to extend and increase perennial cover take place on non-crop land. Almost universally, all cropland remains either cultivated or left fallow. Non-crop land can be further sub-divided into two broad categories as per the tenurial rights, namely, common land (such as revenue and Gram Panchayat) and private (individually owned). The extent of common lands in Karnataka and Maharashtra is limited; they comprise 10% and 11% respectively of the total geographical area in these two states (NSSO, 1999).

BIRD-K has made tree-based farming an important part of the intervention. BIRD-K has been working mainly for sustainable agriculture and tree-based farming and its main objectives have been to maximise productivity and ensure security against natural vagaries. In fact, this is one of the reasons they have taken up watershed development programmes. However, for most other projects, the effort is concentrated outside the cropland.

#### *Common lands*

Apart from soil and water conservation measures like various types of bunds, trenches and drainage line treatment (like gully plugs, check dams), the most common intervention in common lands is tree plantation. The review shows that treatment of common lands, which are generally located in the upper reaches of the watershed, depends on the approach the implementing agency takes (which is again guided by the guidelines under which the project is implemented) in the watershed planning and implementation. Projects that adhere to the "ridge to valley" approach start the treatment from the ridgeline and as a result, the common lands get treated. All the early generation projects, projects implemented under the Common Guidelines, or the projects run by the major NGOs like the Indo-German Watershed Development Programme (IGWDP), BIRD-K,

MYRADA, and ISPWDK follow the "ridge to valley" approach and hence treat the common lands on a priority basis.

On the other hand, later initiatives like KAWAD do not follow the "ridge to valley" approach. Instead, they take up treatment on a plot-to-plot basis that is very often dictated by the willingness of a plot owner to pay the prescribed contribution. Though treatment of the common lands is one of the components of the programme in KAWAD, the actual treatment of the common lands has been minimal.

In the projects we visited, BIRD-K initiated Adihalli-Myllanhalli watershed, projects like Golhalli (part of Chitravati model watershed) and Manjanahalli (NWDPRA project implemented by ORP, UAS, Bangalore), Dornali village (AFARM), Chale village of the Kolwan Valley Project Gomukh and PIDOW-Gulbarga, efforts have been made to bring the common land under tree plantation or silvi-pasture. In the case of Adihalli-Myllanhalli, the land belongs to the Gram Panchayat and they have worked out a produce-sharing arrangement. About 70% of the benefits from the land go to the watershed committee and 30% to the Gram Panchayat. In Dornali village (AFARM), the purpose of the plantation is to create tree cover on fallow land to reduce degradation of top soil and to provide for needs of timber and fuel. The species planted included Sagvan (teak), Glyricidia, Tamarind, Karanj, Sitaphal, Ghaypat (Agave) and Kateshevri. The organisation also set up a nursery in the village with a capacity of about 40,000 saplings. There was a strict ban on grazing and the beneficiaries themselves prepared a protective compound around the plantation. In the PIDOW-MYRADA project, an initial attempt was made to protect the common lands, which was shrinking due to encroachment and/or government regularising the encroachments. As part of this protection programme, a community wood lot programme in Kalmandargi and Wadigera villages was implemented.

The Foundation for Ecological Society (FES) is an exception in that the entire focus of the intervention is on the common lands. FES has been working in the upper reaches of the Papagani watershed for the last 10 to15 years. The main aim of their intervention has been to regenerate the common lands and restore the ecological security of rural, especially marginal, communities in the upper reaches of the basin. The area of their work is characterised by continued degradation of forests and grazing lands. The main focus of their intervention is threefold: (i) greening common lands in the upper reaches of the Papagani river basin through a process of protection, regeneration and re-vegetation; (ii) improving watershed services (infiltration, recharge, erosion control) through specific interventions such as check dams and gully plugs, in addition to greening of the catchments; and (iii) creating institutions of management and governance at the village or hamlet-level to ensure socially sustainable and equitable outcomes. Though they work within the broad approach of watershed development, their interventions are restricted to the common lands and do not take up any work in the privately owned croplands.

### *Private non-crop land*

One of the cardinal principles of watershed development is that land use should correspond to the land capability classification. It is generally said that Land Capability Classes (LCC) I to IV are suitable for crop production (though III and IV are considered to have strong limitations in this respect) and LCC V, VI and VII are considered entirely unsuitable for crop production or suitable at best for trees, shrubs and grasses (Shah *et al.*, 1998 ; Rajagopal *et al.*, 2002). The review clearly shows that in later projects, the major thrust of the intervention in private non-crop land has been to increasingly bring it under cultivation of crops, that is, to convert it into cropland, often by levelling. In early generation programmes, this tendency is much less pronounced compared to some of the newer initiatives.

In many of the successful early generation projects like Ralegaon Siddhi, some of the ICAR Model watershed projects like Mittemari and some projects undertaken through the Common Guidelines, the emphasis has been on bringing these lands under social forestry programmes. In projects where NABARD is involved, land levelling is not part of project activity. However, later projects have focused on bringing more and more private non-crop land under cultivation. In KAWAD projects, this phenomenon is particularly

visible with land reclamation through land levelling, boulder removal, or jungle clearance, being a major project activity.

Sometimes, horticulture is taken up on these lands. In Adgaon, most of the private non-crop land has been brought under cultivation and much of it is under horticulture. In Vaiju Babhulgaon village under IGWDP, 25 ha of private wasteland have been brought under plantation with the help of the organisation.

### 3.3.4 Cropping practices

#### *Agronomic*

Some agronomic practices like contour ploughing help reduce soil erosion and increase soil moisture, thus contributing to crop productivity and stability. Another set of agronomic practices that includes crop rotation (both annual and seasonal), mixed cropping, alley cropping, tree-based farming, use of different seed varieties (local, improved and hybrid) are aimed at improving the productivity of crops and resistance to pests and diseases. Some practices, such as tree-based farming and alley cropping, also contribute to control of soil erosion as well as increase in soil moisture within the plots. Farmers in dryland areas have been practising some of these agronomic measures like mixed cropping and crop rotation and have often continued to do so with or without support from the watershed programme. Though there are some examples where these practices have been consciously encouraged as part of the programme, they are not uniformly adopted.

In the ICAR-initiated model watersheds in Karnataka, implemented in the ORP mode, and the later projects in which the Agricultural University is involved (for example, Mittemari, Golhalli in Chitravati watershed and the later efforts like Manjanahalli), various agronomic practices besides the usual soil and conservation measures were also tried out. Some of these practices include zingg terracing,[38] broad bed furrow, deep ploughing, contour sowing/ cultivation, and fall ploughing.[39] Many dryland agricultural techniques were also tried or made part of the package of practices promoted in these watersheds because of the ORP component from the agricultural university. They include: deep ploughing, contour cultivation, row spacing, early sowing, seed treatment, improved and/or hybrid seeds, chemical fertilisers, farm yard manure, compost (including vermicompost), different types of mulching, including pebble mulching and ragi husk mulching.

#### *New crops*

In the area of seeds, the emphasis has been on introducing varieties that are drought tolerant as well as disease and pest resistant. For example, the ragi variety Indof 5 was highly susceptible to blast disease. Later in the ORP projects, the University of Agricultural Sciences (UAS) introduced improved varieties like HP- 9-11, GPU-28 and L-5, which were all resistant to blast and also had higher yield. Similarly, they also introduced new varieties of red gram (HY-3C from ICRISAT and TTD-7) and a Maize hybrid composite variety called NAC-6004, which is tolerant to downy mildew.

In the ICAR initiated projects, there was also a conscious effort to promote the use of modern inputs like new varieties of seeds and fertilisers as these inputs were supplied from the project for 2 years at 50 percent cost. Because of this conscious promotion, it is observed that the use of modern inputs was higher in the watershed area as compared to the non-watershed areas (Erappa, 1998). The same study also brings out the fact that the cost component of modern inputs (fertilisers, seeds and pesticides) is higher than the other cost components, namely local inputs (resources available to the farmer such as seeds and manure), human labour (both owned and hired), and animal labour (both owned and hired). The use of modern inputs is considerably higher in the case of commercial crops when compared to food crops.

KAWAD has tried to introduce some new crops, varieties and practices, for example, a new variety of ragi inter-cropped with pigeon pea

[38] In zingg terracing the upper two-thirds of the plot is used as "catchment" area for the lower one-third which is used for crop production. This treatment, seen as an alternative to the usual land leveling, is advocated specially in black soils. For technical details, see Chamberlain (1990).

[39] Fall ploughing is ploughing after the harvest of the kharif crop. Apart from controlling pests and diseases, it is also supposed to be a soil conservation measure. This was practiced earlier, though only relatively rarely. But now, farmers are encouraged to take it up in a big way.

and/or hybrid castor (GCH-4) in irrigated areas. Hybrid castor needs 3 irrigations and is considered water efficient. In fact, KAWAD introduced these crops to discourage farmers from cultivating water intensive crops like sugarcane. PIDOW-Gulbarga has introduced some new varieties as part of the agricultural development component of its watershed development programme. The new varieties introduced by PIDOW include groundnut JL-24, red gram named "Maruti" and Sunflower Mahyco's MSFH-8 and 17. Though efforts were made to introduce high yielding varieties (HYVs) in this area prior to PIDOW, the efforts started yielding good results only after the interventions of PIDOW. Sunflower and maize were introduced in this area as new crops (Karanth and Abbi, 2001).

KAWAD has also tried to introduce water saving varieties and crops in the watershed area. As mentioned earlier, hybrid castor (GCH-4) in irrigated areas needs only three rounds of irrigation, and rapeseed introduced in irrigated areas could replace irrigated wheat or tomato, which need more water. There are also some efforts to shift from sugarcane to horticulture that require less water and can be irrigated efficiently with drip systems. This is being tried out in the Dodahalla watershed in Bijapur.

***Nutrient and pest management***

In most of the watershed programmes that we reviewed, nutrient and pest management is not part of the project design. Generally, there is no financial allocation to promote or undertake these activities, except some low-budget components like awareness building programmes about integrated nutrient and pest management or training programme for compost making (especially vermicompost) in certain cases. The review shows that both types of practices – chemical based nutrient and pest management practices as well as other environment friendly practices – co-exist. There are also many examples where both sets of practices are being promoted or actively encouraged. However, it has been observed that as a result of watershed efforts, along with the increase in irrigation and irrigated crops, use of chemical fertilisers and pesticides too tends to increase. This may be because the marginal increase in crop yields in response to fertilisers is higher when crops have sufficient water, while the risk of pest infection is higher for some irrigated crops.

***Applied water***

Applied water is the water, stored either as ground water or in surface storages, that can be applied to crops to supplement effective rainfall and extend the overall water availability to crops. Applied water systems (and the word irrigation is not used here deliberately because it is generally associated with intensive water use) basically cover protective as well as limited water application systems. If we take limited water application as the focus, then efficient and affordable techniques of water storage, conveyance, distribution and application become quite important.

What distinguishes applied water from other kinds of available water (for example, water available as *in situ* soil moisture) is that there is more control over the quantity and timing of water use. It goes without saying that if limited but assured quantities of applied water is made available to everyone in the watershed, it may be possible to enhance productivity in a sustainable manner that would ensure fulfilment of livelihoods of the people in the watershed. This limited but assured quantity of water can then be judiciously used to cover risk of crop failure due to erratic rainfall, and to utilise land and water resources of resource poor sections more efficiently.

A close look at different watershed programmes reveals that water in watershed development is seen primarily from the point of view of conservation and suppression of run-off and not of optimal productive utilisation. The thrust has thus been on converting surface flows into sub-surface flows. Even though applied water is a key input for productivity enhancement, it has received very little programmatic attention. It is in this context that it is generally said: "water is often missing in watershed planning and implementation." Most often, applied water facilities within a watershed are created and managed outside the programme.

Promotion of water saving and water application technologies is another area in which some initiative is forthcoming. They

range from the conventional high-cost drip systems to low-cost and locally designed systems like bucket drip, or pitcher irrigation. For example, in Jakanhally micro-watershed under ORP, pitcher irrigation for mangoes is being promoted as a water saving technology. KAWAD is also promoting a low-cost drip system – a bucket (or drum) drip in its watershed areas – especially for horticulture.

Manavlok in Bhavthan village has encouraged farmers to go in for shared wells as a part of the watershed programme. Financial assistance was made available to those who came forward in groups to take loans for digging wells. In some of the watersheds known to be successful like Ralegaon Siddhi and Hivre Bazar (both in drought-prone Ahmednagar district), the people have evolved certain norms regarding water extraction and use (encouragement to use collective wells, a ban on borewells, and a ban on water intensive crops like sugarcane and banana).

### 3.3.5 Animal husbandry

Though watershed development is seen as a multi-sectoral intervention, sufficient attention has not been paid to the animal husbandry sector as a whole. Many of these interventions are limited to creating some source of water for domestic and/or agriculture use with a small allocation for livestock needs. There is little planned intervention in this sector as part of the design of the various watershed programmes. Such interventions have been restricted to castration of scrub bulls or supply of poultry varieties like Giri Raj.[40] In Karnataka, this component is more often than not a parallel extension activity undertaken by either the animal husbandry department or the agricultural universities.

BIRD-K, which already had a strong animal husbandry component in their developmental work, takes up certain activities like artificial insemination, fodder and feed improvement programme. In Vaiju Babhulgav village under the Indo-German Watershed Development Programme, we found dairy activity developed towards income generation. People were encouraged to replace existing unproductive livestock with the crossbred cows and improved variety of buffaloes and had some success. The number of bullocks, buffaloes, indigenous cows and goats did not decrease as expected, but the number of cross-bred cows increased by about 40%. However, watershed development seems to have taken a toll on the small ruminants, especially goats, which are seen as the scourge of all eco-regeneration activities and have been completely banned in a number of places.

In most cases, there has been an increase in the number of bigger milch animals after the implementation of watershed programme. As a result, milk production has increased tremendously. Milk co-operatives and dairies have sprung up in these villages. This has led to better linking of milk collection routes, and cities that have centralised dairies. SHG activities also seem to have given a fillip to animal husbandry with loan schemes introduced for buying milch animals.

Overall, the review shows that very few systematic programmes are initiated that link animal husbandry with watershed development activities. It has often been an add-on or a supplement rather than an integral part of the mainstream watershed planning and intervention.

## 3.4 Associated social interventions

As mentioned at the beginning of this chapter, one of the key lessons of the last 25 years or so of watershed development in our country is that technical measures cannot replace social arrangements. No technical measure can succeed unless there is a conducive social environment and appropriate social arrangements. This is illustrated by taking the example of creating a live hedge (a vegetative barrier) on the field bunds, which requires anything up to two years to establish and become operational. This implies that the people have to be convinced enough of its importance to protect and maintain the shrubs or grasses which are planted on the bunds. If this social arrangement is lacking, the most careful choice of species, the most careful working out of spacing and optimal planting techniques will simply fail to bear the expected results and returns. Thus, for the technical

[40] From the discussions with the Deputy Director, Animal Husbandry, Karnataka Watershed Development Department.

measures to succeed, sufficient attention has to be given to social requirements and arrangements. It is also true that social measures and arrangements are required not just to implement technical ones, but also for their own sake. Equitable water distribution, sustainable resource use and many such measures fall in this category. Some of the social measures that the implementing agencies have tried to put in place along with the technical measures have already been mentioned in the earlier section on biophysical interventions.

In the mainstream watershed projects, there are primarily two types of social interventions. One is the formation of CBOs (SHGs, User groups, WCs) to carry out various institutional functions. The second is the "consensus building" exercise within the watershed community with regard to certain norms, procedures and arrangements. Very often, most of these norms and procedures are already given in the project guidelines and the main task of the PIA is to convince the community to abide by such norms and procedures. In the case of common works like the construction of check dams and water harvesting structures like farm ponds, or the development of common lands, there is a greater process of consultation within the watershed community (or user groups) to arrive at certain norms regarding maintenance or access. In the case of common lands, generally the watershed community agrees to restrict open grazing at least till the plantation gets established. Since the water system operates in the private property regime, the watershed community rarely regulates its use. Of course, there are exceptions like Ralegaon Siddhi or Sukhomajri where, to some extent, water is seen as part of the common property regime. As mentioned in an earlier section, all activities taken up on private lands are basically carried out by the individuals and as such there is no question of any social arrangements, except that they are to be maintained by the individuals themselves.

Again, as discussed earlier, PRA is the main tool for interactions and consultations with the people in terms of understanding the problems and identifying possible interventions. The PIA organises various types of training, both to the members of the CBOs (related to SHG activities, importance of watershed activities, maintenance of structures, non-land based activities, administrative and procedural matters, and so on), and to farmers (on various agronomical practices, integrated nutrient and pest management practices, compost preparations, and so on).

## 3.5 Variations on the theme

The interventions described above denote how a typical watershed programme (mainly the GoI funded programmes) operates on the ground. However, there are variations according to the types of projects and their modes of implementation. This variation is reflected in many ways, from the funding norms to the phasing of the programme and in the way they combine biophysical and social interventions. We may illustrate this with a couple of examples.

In the case of the Indo German Watershed Development Programme (IGWDP), there is a clear distinction between the capacity building phase (CBP) and the main implementation phase. During the CBP, along with community organisation and local capacity building, a small portion of the watershed area is worked upon to demonstrate the types of technical and social interventions needed. There is also a very strong component of *shramdaan* (voluntary labour) during this phase. This mainly has a demonstration effect on the people, and only if the people are convinced and show their preparedness to adhere to the various conditions (like voluntary labour, contribution, ban on grazing, and readiness to take up maintenance work) does the project move to the full implementation phase. Another variation in terms of planning is that the IGWDP uses a method called "net area land use planning" where the interventions on individual fields are planned in consultation with the farmers.

In the case of BIRD-K, extensive construction of "farm ponds" has been one of their major physical or technical interventions. They have also put in place certain social arrangements along with this physical intervention. For example, it was decided that a) water from the ponds would not be taken out using pumps; b) each individual farmer on whose plot the pond is located is responsible for the repairs and desilting of inlet and the pond; and c) the

neighbouring farmer who may not have a pond in his/her farm is allowed to take water to manually irrigate horticultural plants and other trees. In Hivre Bazar in Ahmedanagar district, along with the water harvesting and recharging measures, the people decided on two important social measures: a) not to grow water intensive crops, and b) not to sell plots of lands very close to the water harvesting structures to prevent outsiders from buying these favourably located lands who could then dig wells and pump water out of the watershed.[41]

[41] Based on the reports of the organisation and field visits. This is also cited in Paranjape (2000).

# CHAPTER 4
# IMPACT OF WATERSHED DEVELOPMENT ON LIVELIHOODS

Watershed communities are dependent on watershed ecosystems for their livelihoods. All interventions in the biophysical processes occurring within these ecosystems are bound to have an impact on the livelihoods of watershed communities. Earlier, soil and water conservation activity did not directly aim at creating an impact on livelihoods; any such impact was, so to speak, a side effect. The emerging consensus on watershed development, however, no longer accepts such a viewpoint. For example, the recent KAWAD programme views itself as a livelihood programme with a watershed approach. Not all programmes would go to this length. But all agencies accept the central importance of the impact on watershed communities.

This chapter discusses the findings of our review with respect to the impact of watershed development activities on different livelihood components with an approach other than the standard livelihood frameworks that are utilized by most assessments on watershed development.

## 4.1 Drinking water

Drinking water is the most basic component of livelihood needs. By drinking water, we refer to water used for drinking by humans and livestock as well as water used for other domestic purposes. In principle, we should be looking at these three uses separately as they have different degrees of constraints on the quality of water that is needed. While quality requirements are the most stringent for drinking water meant for humans, they are less stringent for water meant for other purposes, which gives rise to some indirect effects.

The study of Kerr *et al.* (2000) is one of the important investigations covering a wide spectrum of intervention modes, several agencies and over 70 project villages and control villages. Instead of a small number of case studies concentrating on the more promising projects, the Kerr *et al.* study concentrates on drawing as wide a sample as possible for assessment and cross comparison. Their findings are significant and unexpected, and the picture of watershed development activity that emerges is not very flattering. They merit serious consideration as a counter-balance to the case studies of the more promising projects. To sum it up briefly, while the latter case studies bring out the potential of water development programmes, the Kerr study brings out how little that potential has been realised in reality.

In respect of drinking water needs, the study finds that: “All projects that promote water harvesting through small tanks and dams directly or indirectly try to increase the level of water in wells for drinking water. In Maharashtra, this includes every project except NWDPRA projects. Excluding villages with additional drinking water schemes, the AGY/ IGWDP projects had the largest increase in the percentage of villages with adequate drinking water. Control villages had higher improvements than either NGO or Jal Sandharan (Water Conservation) villages” (Kerr *et al.*, 2000).

The present review also shows a mixed trend in terms of the impact on drinking water. Most of the case studies indicate that watershed development has made a difference in mitigating the distress, though the degrees may vary. However, the review also indicates that this holds true only during “normal” rainfall years. If the rainfall is below the average for that area, then most of these villages have to depend on external sources such as water tankers.

This was corroborated by our field visits to Ambewadi and Vaiju Babhulgav villages (under IGWDP), Dornali (under AFARM), Bhavthan (under Manavlok) and other villages. In Adgaon, the situation is even worse though they also get exogenous water. It was reported that during the 1995-96 summer, drinking water had to be provided to this village by tankers, a situation similar to the one that existed before the programme. In the case of Chale village (Kolwan Valley Project under DPAP - Common Guidelines), the drinking water issue is completely de-linked from the watershed development efforts as the village is supplied

with water from the Mulshi Pradeshik Water Supply Scheme. This has become an issue in several drinking water and sanitation schemes, where drinking water schemes are not integrated with the watershed development programmes, and cases like Chale are not an exception. The study by Reddy *et al.* (2001) shows that the use of drinking water has increased in all the villages after the advent of watershed development. In three out of the four study villages, the time spent on fetching water is much less than earlier, and in one of the villages, the time saved is of the order of 82% as compared to earlier situation (Reddy *et al.*, 2001).

### 4.1.1 Irrigation at the cost of endangering drinking water supplies?

The review shows clearly that watershed development has led to a significant increase in the use of water for agricultural purposes. Unfortunately, in many places, this has been at the expense of drinking water. The review shows that many of the watersheds experience drinking water shortage during the summer months. This is reflected by the fact that most villages experience a dire need for water tankers in the summer months to fulfil their domestic water needs, especially during years when the rainfall is less than normal.

Of late, there have been conflicts over the prioritisation of water use - drinking water versus irrigation water. For example, in one of the villages covered during our field visits in Maharashtra, acknowledgement of improvement in the drinking water situation after watershed development was followed by a rider: "This year, because of drought, we had to get water tankers in the months of April and May". This was a typical response from most watersheds that we visited, especially in Maharashtra. However, in striking contrast, we also could see standing sugarcane crop in the same watersheds. Thus, a situation emerges where drinking water shortage runs parallel with sugarcane cultivation in the watersheds during drier years. It illustrates the fact that most watershed development programmes have overlooked the issue of prioritisation of water use and access, especially during drought years when there is overall shortage of water in the watershed.

According to Sharma (2002), who takes a macro picture of the situation, the continuing drinking water problem in many states indicates that the existing watershed development interventions have not succeeded in drought-proofing. There are several examples and situations where projects have not made even minimum provision for drinking water (Sharma, 2002). In a recent article by Sunita Narain on World Environment Day 2003, it was noted: "Despite efforts by the government, the number of "problem villages" – a euphemism used to describe villages with drinking water shortages – does not seem to be reducing." Quoting official figures, she goes on to say: "In our mathematics, 2,00,000 problem villages minus 2,00,000 problem villages is still 2,00,000 problem villages" (Narain, 2003).

This is corroborated by Kakade *et al.* (2001) who studied seven BIRD-K watershed interventions, covering about 7,000 ha and about 2,500 households, to understand the impact of watershed development programmes on drinking water. According to the study, the problem is complicated because in many places, people draw water for both drinking and agriculture from the same aquifer. Since the water is used for the first two crops (kharif and rabi), generally there is no water left in the summer months for drinking or domestic purposes. According to this study, in villages like Rajkot, which experienced two years of continuous drought, the drinking water problem continues even after watershed project implementation.

Two of the important recommendations of the study are: (i) water supply, sanitation and watershed development should be linked together to solve the problems of drinking water supply, sanitation and irrigation; and (ii) controlled utilisation of water for irrigation needs to be incorporated in projects to avoid potential conflicts between drinking water needs and irrigation needs (Kakade *et al.*, 2001).

There are also some indications that water quality has been deteriorating, especially in the drought-prone regions. The increasing problem of fluorosis is only a part of the problem. Watershed development, in the absence of any control on ground water extraction, does not seem to have helped in decreasing the intensity of this problem (see footnote 11 in Chapter 5).

One of the main objectives of watershed development programmes, especially in drought-

prone regions, is to mitigate the distress with regard to water for drinking and domestic purposes (including water for cattle). Almost all watershed development guidelines factor in the extent of drinking water shortage as one of the criteria for selection for watershed development. In fact, an assured source of potable water should be the minimum benchmark to judge the success of a watershed programme. However, the ground reality is quite diverse and not as encouraging as it should have been.

## 4.2 Fodder and fuel needs

### 4.2.1 Fodder

The study of Kerr *et al.* (2000) assesses the average performance of watershed projects in terms of availability of fodder, especially from common lands. The results are quite varied across the different types of projects studied.

It is important to note that fodder needs have changed along with the increase/decrease in the herd size and the herd composition. One of the noticeable trends, especially in villages where the ban on grazing has been enforced strictly (Adgaon, for example), is that the number of smaller ruminants like goats is decreasing. As discussed earlier, dairying seems to have picked up in many watersheds. This also shows that there is a shift towards bigger milch animals. Their number seems to be rising, especially that of cross-bred cows. Similar trends have been reported from irrigated areas. In some watersheds, grazing restrictions have led to both a change in herd composition and a shift from open grazing to stall-feeding. For example, in Sukhomajri, there has been a shift from goats to stall-fed buffaloes and improved cows (Kerr, 2002a).

The study of Karanth and Abbi (2001) notes a general decline in the number of livestock in the watershed area. But this is more due to the decline in the number of goats. "The main reasons for farmers not rearing goats is because common lands were either encroached or brought under cultivation, and under such circumstances, they moved with other preferences (such as migrating to cities). It is also related to the emerging land use pattern, which is under pressure for cultivation, rather than vegetative cover, which is conducive for animal husbandry. Customary practices concerning open grazing of animals during non-crop seasons are conflicting with the emerging cropping and land use patterns. In this respect, PIDOW has not provided a good balance between agriculture development and animal husbandry interests. Though efforts were made to develop community grazing lands, these efforts do not seem to have met with any long term success. One group of people (Lambanis), who were prominently associated with animal husbandry by adopting a pattern of seasonal migration ideally suited to it, have been switching to employment-oriented urban-ward migration" (Karanth and Abbi, 2001).

There are also isolated cases like that of Khudawadi village in Osmanabad district where women took private wasteland for development on a long-term lease and, with collective effort, carried out soil and water conservation works, re-vegetation and protection. Within a year of such measures, there was a significant increase in fodder output. This emboldened them to go for a group IRDP scheme for goat rearing.

However, the study of Reddy *et al.* (2001) shows a slightly different trend. They base their study on the assumption that environmental degradation results in a shift towards small ruminants. On the other hand, availability of irrigation often leads to decline in the importance of livestock (for example, grazing lands are converted to crop lands). It means that while marginal improvements in resource conditions strengthen livestock economy, substantial improvements in access to resources like water might lead to declining livestock economy.

Their study shows that the size of livestock holding of big cattle (cows, bullocks, etc.) has declined over the last five years. Thus, the advent of watershed development seems to have brought about a shift in the composition of livestock favouring smaller ruminants. This indicates that watershed development has not significantly checked the degradation of land, whether common or private. The study also indicates that the distribution of livestock in absolute terms has become skewed in favour of the rich and medium farmers.

Finally, the study shows that the share of fodder from commons has increased in all villages. Earlier, the contribution of CPRs to fodder consumption was zero. Now, it has

increased to about 3 to 12% for beneficiary households. Poor households are the main beneficiaries of the CPR conditions as their dependence on CPRs is greater. The overall assessment implies that though the impact of watershed development on the availability of fodder is positive, the results are not very emphatic (Reddy *et al.*, 2001). This leads to the conclusion that the trends shown in this study may not be representative of an average case, as the researchers have chosen better managed watersheds primarily to demonstrate the potential and not the average performance.

In our field visits, we found that fodder availability has generally improved after watershed development programmes. In some of the cases, the duration of its availability has increased, as observed in Dornali village (AFARM). In this case, prior to the watershed development programme, fodder was available only till December-January. After the watershed development programme, it is reported that fodder is available throughout the year. Prior to the project, the villagers had, at times, to depend on fodder from outside the village area. Now, this situation has changed with measures taken such as planting of trees, protection of common lands and ban on open grazing. As a result, the time and labour involved in collecting fodder has reduced. Similar changes were reported in other villages like Bhavthan (Manavlok), Adgaon, etc. In Ambewadi village (IGWDP), fodder availability has increased two-fold as a result of the watershed development programme. However, in Chale village (Kolwan Valley Project), even after the watershed programme that commenced in 2001, people still have to buy fodder from places as far as 10 km away.

### 4.2.2 Fuel

Trends in availability of fuel follow very closely those of fodder. The review indicates that the availability of fuel in most well-managed cases has increased, although the average performance seems to be poor.

In some villages like Ralegaon Siddhi and Mittemari traditional fuel is also being supplemented by the introduction of biogas. In Mittemari, there are reportedly about 10 biogas plants. Ralegaon Siddhi has a community biogas plant for the landless and dalits in the village.

However, there are also reports that the burden (in terms of time spent) of collecting fuel-wood has increased, especially during the implementation phase of the project. This seems to be mainly because of the blanket closure of commons that some projects impose in order to protect the re-vegetation in the common lands. In their study, Reddy *et al.* (2001) have shown that the time spent on fetching fuel-wood has increased in three out of four villages studied. This seems to indicate that the advent of watershed development has not improved access to fuel-wood in these villages. This is also reflected in the shares of different sources in fuel-wood consumption. CPRs play an important role in meeting fuel-wood needs (followed by purchase from the market) and their share varies from 34% to 72% in the four villages under study. The dependence on CPRs is greater in the case of small and marginal farmers in most situations.

Similarly, there are also studies that show that fuel consumption patterns tend to undergo a change as a result of watershed development programmes. A study of Khariya Nala watershed in Jhansi (Hazra, 1999) shows that prior to the watershed programme, 87% of the total energy needs of the households were met from cow-dung cakes and firewood and crop residue contributed only about 7% and 6% respectively. But in the post-project phase, the fuel consumption pattern changed and consumption of firewood and crop residues went up to 55% and 20% respectively, thus drastically reducing the consumption of cow-dung cake. The cow-dung thus saved was later used as manure for their crops. Elsewhere, it is reported that with watershed development, the average consumption of fuel-wood (in terms of household energy consumption for cooking and allied activities) tends to increase, which is sometimes taken as a proxy economic indicator (Reddy *et al.*, 2001).

In our field visits, we found that the re-vegetation programme (on bunds, non-crop lands and commons) along with some social regulations like ban on cutting trees and, instead, allowing people to collect only the fallen/dry branches, has helped improve fuel-wood availability. Villages like Dornali (AFARM), Bhavthan (Manavlok), Adgaon, Vaiju Babhulgaon (IGWDP), Hivre Bazar, Ralegaon Siddhi, Adihalli-Myllanhalli (BIRD-K), and others report increases in availability of fuel-wood. In some cases like Mittemari, apart from collecting fuel-wood from their own land, farmers collect fuel-wood from

the common land, which has been developed as part of the watershed programme. They also get a lot of agricultural residue (from crops like mulberry, sunflower, tur, coconut, maize, etc.) both from rain-fed and irrigated crops.

**Box 4-1: Impact on availability of green manure, fodder and firewood**

Afforestation programmes, both on community and private lands, along with other vegetative methods of soil and water conservation implemented as part of the watershed programme, seem to have improved the biomass availability in some villages. For example, the afforestation programmes in Kalmandargi village on the hill and near Wadigera (PIDOW-Gulbarga) partially meet the biomass needs of the community. However, the study by Karanth and Abbi (2001) also shows that more than 60 percent of the respondents (out of a sample of 160 farmers) are of the opinion that the availability of green manure and fodder has considerably declined during these years. This can be attributed to changes in land use pattern resulting from common land encroachments on steeper slopes and forest area on the hilltop. Non-crop private land, earlier under brushwood, has been brought under cultivation. There also seems to be a decline in the availability of firewood and timber for agricultural implements.

*Source:* Based on (Karanth and Abbi, 2001)

## 4.3 Food and agricultural crops

### 4.3.1 Improved productivity of crops

Improved productivity of crops, especially rain-fed crops, and its contribution to the livelihoods of the people is taken to be an important operational indicator of the performance of watershed development projects. It is also an important indirect indicator of the contribution of watershed projects to the enhancement of ecosystem potential. The review shows that there is a definite increase in crop productivity and total production of agricultural crops. As discussed earlier, soil and water conservation treatments, coupled with specific productivity enhancement measures, have definitely increased productivity or at least helped to stabilise the kharif crops (and, in some places, allowed rabi crops), especially under normal rainfall conditions.

Erappa (1998) found that there has been an increase in the productivity of almost all crops as a result of watershed development programmes across all landholding sizes. However, the study also reports that there has been a drop in yields of a few crops like ragi and maize. Study of PIDOW-Gulbarga shows that there has been an increase in the productivity of crops like tur (from 1.5 bags to 3 bags per acre), hybrid jowar (from 4 bags to 6 bags per acre) and bajra (from 6 bags to 7 bags per acre). During our field visit to PIDOW-Gulbarga area during the rabi season in 2002 (rainfall in this area was below normal), we could observe a clear difference in the condition of the standing crops (Sun Flower, Tur, etc.) in the treated and untreated areas. Similarly, the study by MANAGE in the Manchal watershed (Rangareddy district, Andhra Pradesh) with a small sample size of 80 farmers shows that the productivity of crops like castor, sorghum, tomato and pearl millet increased by 50, 44, 65 and 50 percent respectively as a result of watershed treatment. The high increase in the productivity of tomato is partly due to land treatment and partly due to additional application of organic manure (MANAGE, n.d.). However, larger studies such as those by Kerr *et al.* (2000) indicate that there is great variation in productivity and the trend is not as uniform as it would seem from the case studies of the more promising ones.

Among the field sites we visited, Hivre Bazar (AGY), Ralegaon Siddhi, Dornali (AFARM), Bhavthan (Manavlok), Vaiju Babulgaon (IGWDP), Adihalli-Myllanhalli (BIRD-K) and PIDOW-Gulbarga have all reported an increase in food production. In some cases, the villages have been able to fully meet their food requirements. In certain cases like Vaiju Babulgaon, they have been able to meet a substantial portion of their requirements (70 to 80%) locally. There are two caveats: one, these do not represent the average cases as they are the more promising ones; and, two, the increase is mostly during good or normal rainfall years (and not drought years).

There is also an increasing trend to go for more remunerative crops, especially in those watersheds where the interventions have made a visible difference in water availability. However, there is no uniform pattern to this shift. Different types of crops have been chosen at different places, depending on local conditions and the market. In Maharashtra, the trend is mostly to choose sugarcane, since it

fetches an assured price. Of late, there has also been an increase in the area under horticulture and vegetable crops. In Karnataka, apart from shifting to horticulture (especially in the case of new land that is brought under crops), vegetable cultivation and sometimes sericulture, people also shift from one food crop to another, mainly depending on the cost of cultivation and the prevailing market prices. Thus, there are examples of ragi giving way to maize in many places.

#### 4.3.2 Applied water making the greatest difference

Amongst various factors like soil and water conservation treatments, specific productivity enhancement measures, bringing new area under crop production, and so on, applied water seems to be making the greatest difference in productivity enhancement. Various studies bring out very clearly that productivity gains are much more substantial in irrigated holdings and wherever there has been a substantial increase in irrigation as a result of watershed development, the productivity increases have been more stable (Shah, 1998). In the case of rain-fed farming, however, the increases have only been marginal. Farmers invariably say that in good years, everything works out well, but the productivity increases are not sustained during bad years. Such examples illustrate the rainfall threshold for the efficacy of measures taken under watershed programmes.

In Sukhomajri, the increase in irrigated area led to an increase in crop production. It is reported that the yield of maize and wheat doubled in 10 years. It also resulted in diversification of cropping patterns (Kerr, 2002a). Because of this, the more visible increase in productivity and production has been largely limited to those sections that could take advantage of or got access to the increased water resources. The study by Reddy *et al.* (2001) shows that the increase in the irrigated area is more in the case of rich and medium farmers in all villages studied. However, the irrigation benefits are not limited to beneficiary or participating households due to the externality effect. Both quantitative and qualitative changes, along with the duration and reliability of availability of water, are important factors. This aspect is reflected in land values, cropping pattern and land productivity (Reddy *et al.*, 2001).

#### 4.3.3 Drop in the initial productivity gains

In many cases, the initial high productivity gains could not be sustained, especially in the post-project phase. During our field visits, we found that current yields were quite low, though the people generally sounded positive about the impact of watershed development on productivity of crops. When asked about the fall in productivity, they sought to explain it away by saying, “This year, the productivity was bad because it was a drought year”.

Very often, the productivity gains could not be sustained, especially after the withdrawal of the PIA. For example, the mid-term appraisal of the IX plan programme by the Planning Commission, GoI (2001) shows that in watersheds surveyed in Maharashtra and Andhra Pradesh, the productivity gains did not last more than two years (Soussan and Reddy, 2003). Similar were the outcomes in some of the model watersheds taken up by ICAR. Productivity and production went up during the implementation phase and fell immediately after the completion of the project, some of which had even bagged national productivity awards. The experience of Mittemari further reinforces this view.

### 4.4 Income and benefit

#### 4.4.1 Income and benefit patterns

In most of the evaluation studies, increase in income (read cash income) is taken as a success indicator. The review shows that by and large, there has been an increase in the income levels of people through various means and options like increased productivity, shift towards more economically profitable crops, increased availability of employment, development of allied sectors like dairy and non-land based activities. Many villages like Dornali, Adgaon, Hivre Bazar, Ralegaon Siddhi produce marketable surplus (especially fruits, vegetables and other food and non-food crops). In most of the villages, a spin-off effect of watershed development has been the growth of dairy activity as a supplementary source of income. A good example of this is Adgaon, where the dairy economy is flourishing. This was partially made possible by an abundant and free supply of fodder. Earlier, with a livestock dominated by goats (which did not yield enough milk for mass marketing), only about 100 litres of milk per day was available in the entire village. The programme promoted high-yielding

Jersey cows in a big way. As part of the programme, the farmers were taken for an exposure visit. Immediately after the exposure visit, a group of 10 farmers spent Rs.5,000 each to purchase 10 cows. This event triggered a chain reaction in the village with the number of Jersey cows increasing to 100 in a brief time span. The village now has two milk cooperatives with a total of 156 members, including nine women, and collects about 2,000 litres of milk per day. The average annual income of the village from milk rose to an estimated Rs.43 lakhs (Anonymous, n.d.-a). Cases like this, as noted earlier, do not represent an average scenario but stand out as examples of the inherent potential of the programme.

The study by Reddy *et al.* (2001) in Andhra Pradesh indicates that in the study villages, household income has gone up (except in one village out of the four) though the relative share of incomes from different sectors remain more or less the same even after watershed development. The study also reports that the average food consumption per household has also gone up. However, in none of the four villages does food constitute the largest item and the share of food in total household expenditure has gone down over the last five years. Though it is generally seen that with increase in income, the expenditure on basic food items tend to reduce, one needs to probe whether this is at the expense of nutrition (in terms of caloric intakes).

D'Souza (2001) tried to examine the impact of watershed development programmes on the nutritional status of children – the linkage between increased production and improved nutrition. The sample for the study consisted of 1,532 children in the 0-5 age group from 27 villages where watershed projects were in different stages of implementation (out of the 129 projects under implementation). It was found that an increase in crop production and income is not automatically reflected in the improved nutrition of children (D'Souza, 2001).

In terms of expenditure, people tend to spend more on water-related works like borewells, pump-motors or on other items like tractors, ploughing implements, livestock, all of which have a productivity enhancing function. Another impact is that the land value seems to have gone up after the watershed development programmes (Reddy *et al.*, 2001), although this cannot be attributed to the intervention effects alone. The DNRM study (Ramakrishnan *et al.*, 2002) reports that watershed development efforts in Madhya Pradesh have resulted in increased crop yield, land values and ownership of livestock and other assets in the project villages. The gains have been more for the medium and large farmers because of the size of their land holding and their capacity to invest in water extraction technologies. In an assessment of European-aided watershed Development Projects in India, Ninan also reaches more or less the same conclusion (Ninan, 1998). In a study of Sukhomajri, it is reported that incomes rose by an average of 50% between 1979 and 1984 with all the households gaining (Kerr, 2002a).

However, increase in yield does not mean an increase in real terms or in net income. Many studies have shown that the increase in productivity has been achieved with higher costs. It is also reported that as a result of watershed development, the composition of inputs changes, and there is more dependence on modern inputs like improved/hybrid seeds, chemical fertilisers and pesticides, etc. This has resulted in higher cost of cultivation in watershed projects as compared to non-watershed areas (Erappa, 1998). Hence, net returns would be a better indicator to assess whether the incomes have increased or not.[42]

[42] There are many studies, which have tried to estimate the net returns and also the internal rate of returns from watershed investments. In the study by Reddy *et al.* (2001) of four watersheds in Andhra Pradesh, only 3 watersheds reported incremental net returns in the case of Paddy and only two in the case of Groundnut. The incremental net returns varied from Rs.534/acre to Rs.1,105/acre (Reddy *et al.*, 2001). Chopra (1999) has used a multivariate analysis over a large sample size of 13 projects cutting across different states and agro-climatic zones to do an economic valuation of the watershed projects. The study shows that there is a wide range of Benefit-Cost ratios ranging from 1.25 to 3.8, and the internal rate of return varied from 12.33% to 41%. There is also quite a bit of literature on the methodologies to be used for both economic and non-economic valuation of watershed development benefits, such as Chopra (1999), Kerr (2001), Landell-Mills (1999), Lélé and Venkatachalam (2004). Shah *et al.*(1998) have taken the position that valuation has to be done in the overall framework of "ecological economics". For details of the principles and methodology, see the chapter "Towards a New Theoretical Synthesis: The Interface of Ecology and Economics" in Shah *et al.* (1998).

### 4.4.2 Limitations of economic quantification

A word of caution would be in place here, especially in the context of the growing tendency to quantify everything in economic terms (and putting numbers to everything) and evaluate a project in income terms. Often, there is a tendency to equate increase in income with cash income, or use it as a proxy for increased welfare or a better livelihood scenario. Livelihood includes income, but also much more. Women, for example, have a great deal to contribute to livelihood, though they may contribute little to income, especially cash income, within the established meaning of the term. There are also situations in which the income may show a rise without necessarily increasing fulfilment of livelihood needs. Dairy farming, vegetable and fruit cultivation are a few examples where the income from the milk, vegetable or fruit so produced may even mean a corresponding fall in their availability to the local community. The situation gets all the more accentuated because men, in a patriarchal society, have full access and control over cash income, which is generated through market-oriented production.

Another example discussed earlier is the tendency towards increased use of improved or hybrid varieties of seeds as a means of productivity improvement. This can lead to farmers losing their self-reliance and becoming dependent on both national and transnational seed companies. In one of the watershed villages in Tiptur area (BIRD-K), we saw a few farmers cultivating a vegetable called gherkin, which is primarily exported. Our enquiries showed that a particular company controls all aspects of the cultivation of gherkin. The agents of the company supply the seeds and other inputs and also the technology (package of practices). The company also has a buy-back arrangement with the farmers, which means the farmers do not have the freedom to sell their stock of gherkin to whomsoever they want. The farmers who cultivate this crop told us that the company also decides the price and generally the smaller sized gherkins fetch a better price. There are many such examples, which show that the wider and global processes operating in the different sectors of the economy, especially in the agrarian context, also operate in the watershed context. These situations may not be assessed by simple economic valuations or using income as an indicator of livelihood enhancement.

## 4.5 Employment and migration

Some of the issues related to migration and labour availability in the context of watershed development are discussed in the chapter on equity since they are crucial to the pattern of income generation among regions and sections. Generally, it is assumed that watershed development helps to decrease the extent of migration. Changes in the pattern of migration are generally taken as indicators of changes in employment opportunities, agricultural productivity and overall quality of life (Kerr *et al.*, 2000). The review of available literature and our own field visits and interactions show that watershed development does have the potential to bring down migration temporarily, especially in the initial phase of the programme when the emphasis is on physical works. However, in the post-project phase, one does not find a uniform trend. In fact, there are some instances where availability of work, especially seasonal agricultural work, has been reduced because of watershed development.

The study by Kerr *et al.* (2000) shows that "with the exception of AGY and IGWDP villages, seasonal migration rose in every project category. The AGY and IGWDP villages had a net reduction in overall migration and the possible reasons for this may be improvements in infrastructure and access to services. However, the average figures mask the fact that more AGY and IGWDP villages experienced net out-migration than net in-migration" (Kerr *et al.*, 2000).

There are also other cases where migration has increased after watershed development, which is seen as an externality (Reddy *et al.*, 2001). This may be due to the fact that during the implementation of watershed development

projects, labour participation would have increased consequent to the demand for watershed works within the villages and drawn people away from the larger labour market, while it is then being re-released to the market after completion of the works (Deshpande and Reddy, 1991).

The review shows that crop intensity *per se* does not increase wage labour opportunities; instead, it depends on the types of cropping changes that take place as a result of watershed development. Another fact that emerges out of the study is that villages with higher water availability (either because of the water locally generated or because of the water brought from outside as in the case of Adgaon and Ralegaon Siddhi) combined with certain basic access to all (as in the case of Pani Panchayat in Pune district) have a greater potential to offer full employment to the people. Also, there is evidence that employment opportunities have increased during the rabi and summer season because of availability of water and people shifting more towards horticulture and vegetable cultivation (Reddy *et al.*, 2001).

In our field visit to the Adihalli-Myllanhalli watershed (BIRD-K), we found that migration of small and marginal farmers had come down. Most of them have started cultivating their own lands. It is also reported that some of the landless and marginal farmers have leased land from big farmers. According to the BIRD-K staff, one of the positive impacts of the watershed programme has been that the Bovi community in the watershed area has stopped migrating and has, instead, taken to agriculture. There are a total of about 55 households (around 300 people) of Bovi community in Onkalhatti village. Discussions with some of the members of this community show that around 15 people have coconut plantations today, of which three are older plantations while all other coconut gardens are created with the help of the project. Though migration has come down by about 25 percent as compared to the pre-watershed situation, some of the members of these households do migrate for work. Since many of the families have taken to agriculture (including coconut, horticulture and trees), at least one member in the household is forced to stay back in the village.

In the case of Dornali village (AFARM), we found that migration had stopped for some time when the watershed development work started in 1998 as work was available within the village. But this availability of work was not permanent. When the watershed treatments got over, migration started again, though the extent seems to be less in the post-watershed scenario mainly because of the increased irrigated area. In the case of Adgaon, about 100 outside labourers migrate to this village, as local labour cannot meet the requirements because of intensification of agriculture. In the case of PIDOW-Gulbarga, the overall rate of migration seems to have decreased. But this decrease is more in terms of number of persons migrating from a single family than a decrease in the total number of families from where there is migration.

Lack of employment or work is not the only reason for which people migrate. People also migrate for other reasons such as to escape caste and other discriminations,[43] better wages (as compared to the wages they can get in the villages) and more assured labour opportunities. Hence, using decrease in migration as an indicator of the success of watershed development needs to be judiciously contextualised.

Often, the emphasis is also on completely stopping migration and success is measured in terms of the degree to which migration has been stopped. However, there is a need to understand the nature of migration itself. In other words, one needs to see whether the migration is out of compulsion (to meet livelihood needs) or out of (family) labour surplus or as an opportunity to increase one's assets, opportunities and horizons. What is important is to see whether the nature of migration has changed due to watershed development programmes. Unfortunately, this has not been explored properly. In a study of natural regeneration programme in Udaipur region, it was found that irrespective of the fact that there was substantial improvement in the resource

[43] Dr. Ambedkar had given a call to the dalits to leave the villages and move and concentrate in the cities, as they would never be able to fight oppression and discrimination in the villages where they are scattered.

base, the extent of migration did not show any significant decrease. While probing more on this, the people responded saying that "Earlier, we used to migrate out of compulsion; now, there is no compulsion to migrate to meet basic needs; people migrate out of choice to improve upon the gains of the NRM programme" (Paranjape *et al.*, 1997). This indicates that though the figures may be the same, the nature of migration and the reasons for migration have changed significantly.

## 4.6 Livelihood assurance

The overall picture that emerges from the review is that generally, watershed development has resulted in some improvement in livelihood opportunities for watershed communities. The degree of improvement varies from the spectacular, like in Ralegaon Siddhi and Adgaon, to the "once good but now not very good" as in Mittemari. The internal distribution of benefits has not always been even, with the better-off farmers in the valley portion benefiting the most and the landless and farmers in the upper reaches benefiting the least. There are also reversals like those in Sukhomajri. But in all cases, some of the livelihood improvements are carried over into the post-project phase. With such a perspective, which implicitly looks at watershed development programmes as providing some degree of livelihood support for watershed communities, the overall performance of the programme would rank as below average. But there would be a great number of cases in which the overall performance has been more than satisfactory.

**Box 4-2: The need to supplement watershed programme to fully address the issue of livelihoods**

Fr. Crispino Lobo and Mr. Abraham Samuel of IGWDP strongly feel that other programmes should be integrated with the watershed programme for the benefits to reach resource poor sections. To quote from our discussions with them:

"The realisation has come that watershed development, as conceived by IGWDP, can bring about only the development of infrastructure of the watershed. It cannot lead to an increase in productivity, unless supported by other components like availability of credit to the beneficiaries. This is becoming more apparent as the programme is expanding to other states like Rajasthan, Andhra and Gujarat. In Maharashtra, the villages with high number of landless households were not selected in the programme; the criterion was that there should not be too much internal disparity within the village. However, in other states where the programme has started, the number of landless in the villages is generally high compared to Maharashtra. This being so, there is a greater need for other supportive components. The supportive components that are introduced there are: skill development of artisans, SHGs, small enterprises like shops and a loan facility by WOTR itself. It is observed that only those small enterprises that are relevant to the local economy would be viable. For example, activities like making pickles would not be viable, as it cannot compete with the actors in the larger market. Another supportive measure is training the educated unemployed youth in the agricultural education institutions, or training them in skills like motor-winding or bakery."

### 4.6.1 The issue is dependability

This evaluation is good so far as it applies to evaluating watershed development as an essentially soil and water conservation activity, treating improvement in livelihood opportunities and fulfilment of livelihood needs as an associated effect. However, watershed development programmes today are expected to do much more than this. They are seen as being at the core of the process of rural development and are today often supposed to be the lynchpin around which all government-run developmental activity should converge. It is increasingly being claimed that watershed development will ensure fulfilment of livelihood needs, obviating the need for dams and canal irrigation.

The crucial question then is to what extent the watershed development programme could deal with drought. Existing studies do not shed much light on this question. Barring certain exceptions like Ralegaon Siddhi, some of the IGWDP projects, and to some extent the PIDOW-MYRADA project in Gulbarga and BIRD-K intervention in Tiptur area, the feedback from the field indicates that, by and large, the watershed

programmes seem to be successful under normal rainfall conditions of a particular area. This question of whether watershed development programmes can really offset the impact of reduction in rainfall, and if yes, to what degree, needs to be further researched. The popular perception is that watershed development helps people in good years, but fails them in bad years, when they need the help the most.

There is a related lacuna in watershed planning: lack of consideration of the issue of dependability. Very often, watershed planning is done on the basis of average or mean rainfall figures, which is very close to 50% dependability. This means that the watershed planning would work for 50% of the years. In other words, the planning would fail once in every two years. Hence, people's perception is that they do not get the desired benefits, if there is a drop in rainfall. Of course, there is evidence to suggest that the situation in a village or watershed where watershed development has been carried out would be better than that in villages and watersheds where watershed development has not taken place. Since people's livelihood is tied to the programme, it is imperative that the programme be planned at a much higher dependability, say 80% or more. At 80% dependability, the rainfall quantum would be smaller than that at 50%, but at 80% dependability, four out of five years, one is sure to get that much rainfall. This adds stability to the programme, which would succeed 80% of the years. To put it differently, the programme can achieve planned targets in four out of every five years. If there is one bad year in five, it is easier for people to build up surpluses during the four better years (of which one or two will be quite good) to tide over the one bad year.

**Box 4-3: Estimating in situ use, local water and exogenous water: An illustrative exercise**

Based on livelihood needs in mildly and severely drought prone area, let us take for comparison two watersheds A and B, respectively in a mildly drought prone area and a severely drought prone area, where, except for rainfall all other factors are identical.

Assumptions:

1.Total watershed area 1500 ha

| | Watershed A | Watershed B |
|---|---|---|
| a) Unproductive area (settlement, roads, wells, stones, etc.) | 100 ha | 150 ha |
| b) Non-agriculture area (wastelands, commons, etc.) – 40% utilisation of rainfall | 275 ha | 550 ha |
| c) Agriculture area - 60% of rainfall utilised | 1125 ha | 800 ha |

2. Annual rainfall -

Watershed A: Average rainfall 657 mm; 80% dependability rainfall - 500 mm

Watershed B: Average rainfall 500 mm; 80% dependable rainfall - 380 mm

3. Population (and standard no. of families)

Watershed A - 4000 (800 standard families)

Watershed B - 3000 (600 standard families)

4. Working out potential local water use (reference period is one year):

| | Item | Watershed A: Mildly drought prone region | Watershed B: Severely drought prone region |
|---|---|---|---|
| a) | In-situ utilised rainfall on non-agriculture land at 80% probability rainfall | = 40% x 275 ha x 500 mm = 550,000 $m^3$ | = 40% x 550 ha x 380 mm = 836,000 $m^3$ |
| b) | In-situ utilised rainfall on agriculture area at 80% probability rainfall | = 60% x 1125 ha x 500 mm= 3,375,000 $m^3$ | = 60% x 1125 ha x 380 mm = 1,824,000 $m^3$ |

| | | | |
|---|---|---|---|
| c) | Local water available for application and use (assumed as 15% of rainfall) at 80% probability rainfall | = 15% x 1500 ha x 500 mm = 1,125,000 $m^3$ | = 15% x 1500 ha x 380 mm = 855,000 $m^3$ |
| d) | Water for domestic use (200 $m^3$/family) and cattle use (200 $m^3$/ family) | = 400 $m^3$/family x 800 families = 320,000 $m^3$ | = 400 $m^3$/family x 600 families = 240,000 $m^3$ |
| e) | Local applied water available for biomass production | = 1,125,000 $m^3$ – 320,000 $m^3$ = 805,000 $m^3$ | = 855,000 $m^3$ – 240,000 $m^3$= 615,000 $m^3$ |
| f) | In-field water use at 70% efficiency | = 70% x 805,000 $m^3$= 563,500 $m^3$ | = 70% x 615,000 $m^3$= 430,500 $m^3$ |
| g) | Total potential water use for biomass production from local (in-situ use and applied) water | = 550,000 $m^3$ + 3,375,000 $m^3$ + 563,500 $m^3$ = 4,488,500 $m^3$ | = 836,000 $m^3$ + 1,824,000 $m^3$ + 430,500 $m^3$ = 3,090,500 $m^3$ |
| h) | Total water required to produce 18 t of biomass per family for 800 families in the village at a productivity of 30 kg/ ha-mm or 3 kg/$m^3$ | = 18000 kg/family x 800 families / 3 kg/$m^3$ = 4,800,000 $m^3$ | = 18000 kg/family x 600 families / 3 kg/$m^3$ = 3,600,000 $m^3$ |
| i) | Exogenous (from external source) basic service required at 80% probability | = 4,800,000 $m^3$ – 4,488,500 $m^3$ = 311,500 $m^3$ | = 3,600,000 $m^3$ – 3,090,500 $m^3$ = 509,500 $m^3$ |
| j) | Exogenous water required at 70% application efficiency | = 311,500/0.7 $m^3$ = 445,000 $m^3$ | = 509,500/0.7 $m^3$ = 727,800 $m^3$ |
| k) | Total water utilised for biomass production | = 550,000 + 3,375,000 + 1,125,000 + 445,000 = 5,495,000 $m^3$ | = 430,5000 + 1,824,000 + 615,000 + 727,800 = 3,818,400 $m^3$ |
| l) | Exogenous water required as percentage of total water use | = 445,000/5,495,000 = 8.8% | = 727,800/3,818,400 = 19% |
| m) | Exogenous water requirement per family | about 600 $m^3$/family | About 1,213 $m^3$/family |

*Source:* Adapted from the illustration given in Paranjape et al. (1998)

In this respect, the remark that we heard in almost every field visit we made for this review, whether in Karnataka or in Maharashtra, is illuminating and extremely pertinent. Time and again, we were told that watershed development measures worked well in good years; in good years, they did succeed in fulfilling their livelihood needs. But whenever there was a "bad" year, whenever the rainfall was below average or the rainfall pattern was not suitable, they faced acute shortage. This is also borne out by our experience in other semi-arid zones in Gujarat and Rajasthan. In all those places too, we heard the same refrain.

It is interesting to compare in this context, Ralegaon Siddhi and Adgaon, two projects which have generally formed a contrast. Here, we shall look at some of the similarities which exist between them, despite their apparent divergence in many respects. In both places, and this is significant, water from a major source has been brought to the village – from the Kukdi canal in Ralegaon and from the Sukna project in Adgaon. Norms which have been evolved for the watershed area in Ralegaon (the ban on sugarcane for example) do not apply in the Kukdi canal area in the village. If we do not consider, for the time being, the drinking water problem in Adgaon, we have near full employment in both villages, though Ralegaon Siddhi has a much more equitable distribution of benefits. It may be said that in both villages, watershed development supplemented by exogenous water has led to livelihood assurance. However, this has been achieved in a more harmonious and equitable manner in Ralegaon, and in a trickle-down manner in Adgaon; in a socially regulated and environmentally regenerative manner in Ralegaon, but in an unregulated and environmentally unsound manner in Adgaon.

We would not advocate the absence of norms for Kukdi water in Ralegaon, nor is sugarcane the only route to stability, but the role that exogenous water has played in both situations needs to be recognised. It is perhaps important to recognise here that in many of the semi-arid regions of India, livelihood assurance for watershed communities may require a small but significant supplement of exogenous water.

### 4.6.2 The need for integration of local and exogenous water

One of the conclusions of a more in-depth study of a sub-basin in Udaipur region in Rajasthan corroborates this finding with a more detailed analysis of the potential of watershed development for the sub-basin. SOPPECOM carried out a study of the Udaipur region (Paranjape *et al.*, 2001) in order to estimate the potential of local water harvesting and small water harvesting structures to fulfil livelihood needs of the local community. It made fairly conservative assumptions about livelihood requirements in that it assumed that part of the livelihood requirements were met from non-farm activity and concentrated only on the remaining need. It estimated that with optimal water use and an efficiency of 70% between source and field delivery, the requirement of water availability per household would be about 600 $m^3$ for domestic purposes (drinking water, water for the cattle and for other domestic use) and 1800 $m^3$ for production purposes (food, fodder, and high value trees and intensive small plot cultivation for cash needs).

As against this, they estimated the water availability at source for about 12 years under two assumptions; first, that they would be able to intercept 80% and recharge 50%, and second, that they would be able to intercept 80% and 75% of the run-off and ground water recharge, respectively. These values are presented below.

**Table 4-1: Estimated total water availability per household (m3/hh) in Udaipur region**

| Year* | Interception: 80% runoff and 50% recharge | Interception: 80% runoff and 75% recharge |
|---|---|---|
| 1990 | 6,210 | 7,948 |
| 1989 | 5,459 | 6,602 |
| 1994 | 5,150 | 6,452 |
| 1996 | 3,434 | 4,093 |
| 1988 | 2,870 | 3,512 |
| 1991 | 2,759 | 3,445 |
| 1993 | 1,744 | 2,100 |
| 1998 | 1,316 | 1,699 |
| 1997 | 978 | 1,194 |
| 1995 | 184 | 184 |
| 1986 | 117 | 117 |
| 1987 | 0 | 0 |

*The years have been rearranged in order of resource availability

*Source:* Based on (Paranjape *et al.*, 2001)

The conclusions of the SOPPECOM study are striking. Even under such conservative assumptions, for three out of the 12 years, it would be difficult to ensure even domestic water requirements; for another three out of the 12 years, it would be possible to ensure domestic water requirements, but livelihood requirements would not be met; and only in six out of 12 years would livelihood requirements be met. In other words, if we have to ensure livelihoods for this rural population at a higher degree of dependability, a small but significant supplement of exogenous water is certainly required.

A critical analysis of canal irrigation would also argue for a restructuring of the water sector so as to modify the role of large systems from being independent, autonomous entities to a role of supporting and supplementing smaller systems based on micro-watersheds and clusters of micro-watersheds. The three Ozar Water Users Associations (WUAs) in Nashik district of Maharashtra, to some extent, illustrate the potential of such integration. Unlike in the conventional practice of command management, the three WUAs built check dams on the nallahs crossing the command area of the WUAs and used these structures to harvest local rainwater and also to store part of the water that they received from the dam. This recharged the wells in the command area and also added stability to the water regime. As a result, the people have much more control over water delivery and now are in a position to farm diverse crops. The area under irrigation has increased tremendously, as has the productivity. One interesting institutional innovation is that the wells have been brought under the purview of the WUAs and the farmers are charged for using the well water.[44]

If we do require livelihood assurance for all, then we also need to define what place watershed development occupies in the process of achieving that objective. From the review, it is clear that at least in places where watershed development has made a difference, a process of development of water resources and productivity enhancement has gone hand-in-hand and continued beyond the project period. Many other elements have also contributed to the phenomenon and have their own importance for specific aspects. But this, we feel, is the critical element in all those places where watershed development has led to livelihood assurance for a substantial section of the watershed community. This points to the need to treat watershed development as a first step in the process of providing livelihood assurance for all.

[44] For details on the Ozar experience and the issues related to co-management of local and exogenous water and also surface and ground water, see the study by Paranjape and Joy (2003).

# CHAPTER 5

# IMPACT OF WATERSHED DEVELOPMENT ON SUSTAINABILITY

## 5.1 Indicators of ecosystem impact

The central concern of early watershed development activity has always been soil and water conservation. Even now, it forms the core of watershed activity. We may see this objective as part of a larger environmental objective, to arrest ecosystem deterioration and assist ecosystem regeneration. Quite a few studies are available which have looked at the impact of watershed development programmes in India. However, most of them are performance studies and evaluations, and the indicators used by most of the researchers are those generally used to study agricultural development programmes. For example, researchers have looked at the impact of watershed development programme in terms of variables like increase in cropped area, irrigated area, crop intensity, input use, productivity and production, cost of cultivation, water availability (and rise in ground water levels), number of wells, changes in cropping pattern, moisture status of the soil, and net returns (Deshpande and Reddy, 1994; Erappa, 1998; Karanth and Abbi, 2001; Chopra, 1999). An increase in all these variables and parameters is taken as a measure of success.

A few studies go beyond these conventional indicators and, to some extent, try to incorporate impact of watershed programmes on the ecosystem in their performance criteria. One such study is by Kerr and Chung (2001) who worked out a detailed list of ideal and operational indicators (Table 5-1).

**Table 5-1: Ideal and operational indicators of performance**

| Sl.No. | Performance criteria | Ideal indicator | Operational indicators used in Kerr and Chung study |
|---|---|---|---|
| 1. | Soil erosion | Measurement of erosion and associated yield loss | • Visual assessment of rill and gully erosion (current only) |
| 2. | Measure taken to arrest erosion | Inventory, adoption and effectiveness of Soil and Water Conservation (SWC) practices | • Visual assessment of SWC investment and apparent effectiveness (current only)<br>• Adoption of conservation-oriented agronomic practices<br>• Expenditure on SWC investments |
| 3. | Ground water recharge | Measurement of ground water levels, controlling for aquifer characteristics, climate variation and pumping volume | • Approximate change in number of wells<br>• Approximate change in number of wells recharged or defunct<br>• Change in irrigated area<br>• Change in number of seasons irrigated for a sample of plots<br>• Change in village-level drinking water adequacy |
| 4. | Soil moisture retention | Times series, intra-year and inter-year variations in soil moisture, controlling for climate variation | • Change in cropping patterns<br>• Change in cropping intensity on rain-fed plots<br>• Relative change in yields (higher, same or lower) |
| 5. | Agricultural profits | Net returns at the plot level | • Net returns at the plot level, current year only |
| 6. | Productivity of non-arable lands | Change in production from revenue and forest lands (actual quantities) | • Relative change in production from revenue and forest lands (more, same or less than pre-project) |
| | | Wildlife habitat | • Extent of erosion and SWC on non-arable lands<br>• Change in wildlife and migratory bird populations |

*Source:* Based on (Kerr and Chung, 2001)

The indicators listed by Kerr and Chung indicate the status or condition of the ecosystem and deserve more attention than they have received. To some extent they also illustrate the dual role that ecosystem resources and processes play. Many of the indicators have a dual relevance: they are related both to the state of the ecosystem and the fulfilment of livelihood needs. Hence, though we confine ourselves in this chapter to aspects that relate to ecosystem status or sustainability, some overlap with livelihood aspects that have been dealt with specifically in the previous chapter is unavoidable.

The operational indicators mentioned above were evolved because the ideal ones cannot be easily used in the field for various reasons and they may not entirely cover the phenomenon they aim to measure. For example, one of the operational indicators used in the study to measure erosion, namely, "visual assessment of rill and gully erosion" (current only) may not capture other types of erosions like sheet erosion where the thin layer of topsoil is gradually but uniformly removed from less sloping lands. Perhaps the degree of turbidity in the water flowing out of the patch of land could be a better, or at least an additional, supplementary indicator of the status of soil erosion.

However, it should be noted that hardly any of the studies base themselves on a list like the one Kerr and Chung provide. There is, thus, very little quantifiable or hard data available in respect of ecosystem status and environmental sustainability. Consequently, one is forced to rely, in spite of their limitations, on qualitative narratives and judgements. In the following section of the chapter, we look at biophysical impacts on the ecosystem in three critical areas, namely, (i) impact on soil erosion; (ii) impact on crops, pastures, common lands; and (iii) impact on water storage and availability.

## 5.2 Impact on soil erosion

Almost all evaluation studies say that watershed development interventions have had a positive impact on controlling soil erosion. This is also the feedback we received during the field visits. However, few studies have undertaken actual measurement of related indicators like silt load and hence it is difficult to say accurately what control of soil erosion means. Generally, the necessary data required to assess ecosystem impact have not been generated as part of watershed development programmes because they are not designed that way.

Besides the operational indicators mentioned by Kerr and Chung (2001), we may additionally use turbidity of flow as another indicator to assess the broad impact on soil erosion in terms of how clear is the flow in the streams and what are the people's perceptions of it. The lesser the turbidity, the greater is the control of soil erosion. Improvement in the moisture holding capacity of soil, increase in the duration of dry spells tolerated indicating soil amelioration, increase in productivity of plots, and finally, the cut-off daily rainfall value at which run-off occurs are some of the other indirect indicators.

### 5.2.1 Definite reduction in soil erosion is generally indicated

The general review of Kerr *et al.* (2000) throws up some very interesting findings about the erosion of crop and non-crop land. It suggests that irrigated plots are generally well maintained and show the least erosion. Dry croplands, on the other hand, are prone to erosion because generally, they are not as well maintained as irrigated lands. The study also indicates that in this respect, control villages performed only marginally worse than watershed development areas. However, for uncultivated land, they find – somewhat against expectation – that many of the watershed development areas performed marginally worse than the control villages.

Though most of the other studies do not have data on soil erosion indicators, some reduction in soil erosion is generally reported as part of popular perception. In our field visits, farmers were able to provide some information about the turbidity of flow based on their perceptions. There was a near consensus across different watershed experiences that after watershed development interventions were made, the stream flow had become clearer and the silt load had decreased.

In case of PIDOW-Gulbarga, the evaluation studies show that the gully checks and other structures have considerably reduced the run-off in the watersheds, which is a driving force for erosion. Certain landscape changes indicate, in

terms of ecological conditions, the situation in the past and the situation now. Landscape processes like erosion, sediment accumulation in the downstream, gully formation and formation of ravines are not common in PIDOW watershed villages. This can be seen in comparison with other villages where watershed development programme has not been taken up (Karanth and Abbi, 2001). In the case of Vaiju Babhulgav (IGWDP), people's perception is that the silt load has reduced by about 60%, which is a significant improvement.

The review also shows that treated watersheds could tolerate longer dry spells compared to untreated watersheds. This is mainly because the soil moisture status and water holding capacity of the soil has improved with the treatments. This is reflected in people saying that the productivity of the plots has improved after watershed treatment.

### 5.2.2 Repair and maintenance of soil conservation work

Soil and water conservation works need regular repair and maintenance for them to remain effective. When assessing the social sustainability of soil erosion measures, one finds that there is a distinct difference between older and newer projects.

Most of the older projects like the older ICAR model watersheds in Mittemari and Golhalli in Karnataka have not been properly maintained. Most soil and water conservation structures in these projects have been destroyed, either due to natural processes or human intervention. There are no indications of any efforts in repairing these structures. During the field visit to Mittemari, we could not see a single big structure that was intact and fully operational. Apparently, about 10 check dams and nallah bunds, along with many boulder checks and gully plugs, had been built. We were informed that people were removing stones from these structures for their personal use. Some of the structures had breached within three years of construction because of low quality of work and faulty design that did not take into account actual storm water flows at the site.

These situations can be directly attributed to lack of social arrangements needed for repairing and maintaining the structures. In Maharashtra too, in the early phase of soil conservation works implemented through the soil conservation department, the focus was primarily on constructing conservation structures without any understanding or fixing responsibility with regard to their maintenance. As a result, most of these structures became dysfunctional.

In contrast, in projects implemented by NGOs and the newer projects undertaken under the Common Guidelines, or in the KAWAD projects, there is a significant focus on social responsibilities concerning sustainability of conservation measures. Institutional mechanisms – both organisational and financial – have been put in place to ensure maintenance of the structures.

Reflecting on the IGWDP experience, Abraham Samuel and Crispino Lobo of the IGWDP feel that "maintenance of the treatments is in general quite satisfactory. During the implementation phase, individuals from the village are appointed as Panlot Sevaks (watershed volunteers) to look after the implementation. They continue to function afterwards as maintenance staff. A small remuneration is given to them from the maintenance fund."[45]

However, we should not draw a hasty conclusion on this count. First, much of the data on newer projects is in the form of case studies that often comprises the more promising cases, whereas the negative results come from studies that cover a large sample, including the not-so-promising and the failed projects as well. Secondly, the older projects have been in existence for a longer time for arrangements to run their course and it is by no means certain that the newer projects will not go the same way when they age. All that one can say is that since the newer projects have taken note of the problems and have evolved some measures addressing these specific problems, there is a greater likelihood that they will show better performance for longer periods.

[45] From discussions with Abraham Samuel and Crispino Lobo during the field visit.

### 5.2.3 Soil mining as part of watershed development activity!

Even though soil and water conservation measures are at the heart of watershed development programmes, one also comes across certain other practices that indicate that the concern for soil as an ecosystem resource does not run very deep. One such example is the presence of brick kilns in the watersheds. Brick kilns in an ecosystem where deep clays are abundant, fuel is readily available and soil erosion is not a problem, is one thing. But it is another matter to find them in degraded ecosystems where soil erosion has been identified as a major problem and as the *raison d'etre* of one's activity. It demonstrates lack of sufficient concern or application of mind.

We came across two such incidents during our field visits. One was in the Adihalli-Myllanhalli watershed (BIRD-K) in Tiptur. Apparently, there are about five to six brick kilns that operate seasonally. Since BIRD-K is otherwise quite alive to such issues, we may take it as an oversight. However, in one of the micro-watersheds of KAWAD, Khana Hosahalli village in Bellary district, there is a brick-making unit, which has been set up as a non-land based activity by the project itself! On the one hand, efforts are made to conserve soil through different interventions. On the other hand, fertile soil is turned into bricks and sold. As soil mining, this is one of the most unsustainable of practices.

### 5.2.4 Land levelling

Another practice, which can have a negative impact, is the over-emphasis on land levelling using heavy earth moving machinery. The practice is most widely prevalent in KAWAD. The topsoil is used to form the bunds and this also causes a lot of earth disturbances. Dr. Pandurangaiah of the University of Agricultural Sciences, Bangalore feels that a very large proportion of the topsoil will be displaced when levelling is done extensively. Generally, these sloping lands are located in the upper reaches of the watershed where slopes are steeper and topsoil is shallow. Soil in these patches of land is highly prone to erosion. Seasonal and annual tilling and planting of shallow rooted crops can accelerate soil erosion, even though they may bring in gains in the short term.

## 5.3 Impact on biomass production

Seasonal and annual biomass production estimates are good indicators of the variability of the ecosystem resources in time and space. They provide a visual and quantitative verification of the effectiveness of land and water management practices and reflect changes in an ecosystem after interventions have been made. In this section, we deal with the impact of watershed development programmes on biomass cover and biomass production in common and private lands (and non-crop and crop lands).

### 5.3.1 Biomass from common non-crop land

Concern for common lands was one of the important reasons for the wide support received by watershed development activity. Some watershed programmes have even confined themselves to common properties and do not take up activity on private lands. This, then, was the area in which watershed development programmes were expected to contribute the most. Unfortunately, the general performance in this respect falls far short of the high expectations. While there has been some improvement in some places, the performance in most places has been poor.

According to Kerr *et al.* (2000) "grass fodder, tree fodder and fuel were the only products from common lands found in enough villages that warranted analysis." Their findings show that most project villages have fared better than control villages as the proportion of control villages reporting increase in the availability of grass fodder, tree fodder and fuel is lower compared to the average values of all villages. But they also point out that generally, the availability of these products declined in villages under all project categories, though there were variations across different types of projects. It is important to stress that even for the best performers, no project category reported an overall net increase in availability of any of these products from the commons. To sum up the findings of the study, it can be said that the areas where watershed development has taken place have done better in this respect than other areas because they have been able to slow down the rate of degradation. But they have, unfortunately, not been able to arrest the continuing degradation of the commons.

***Low survival rates; low species diversity***

Increase in perennial cover, density of plantation, survival rate of saplings and species diversity are some of the indicators that we may use in assessing the impact of watershed development programmes on common lands. With regard to pastures, forests and commons, the main change is that in most of the programmes, they have been brought under some degree of plantation. However, the general experience is that the survival rate is quite low (even lower than 50%) and that the plantations could not achieve significant growth rates.

Canopy coverage has been reported to be poor in comparison with the cover expected by the extent and density of planting, though it may be better than what it was earlier. Hence, one of the major purposes for planting trees in the commons – namely, to arrest soil degradation and improve the water regime by providing some canopy cover over the exposed landscape – has been only partially fulfilled. In most of the plantations, the reported canopy cover is less than 50% by the end of the project.

Like soil and water conservation works, plantations also show a lack of effective management after the project period is over. During our field visits, many cases of people cutting trees were reported, especially in those areas where the project period is over and the PIA has withdrawn. Many of the older projects showed a rapid degradation after the projects were completed, though there are also a few examples where the cover has been maintained. In terms of the impact on biodiversity, our field visits in Karnataka show that most plantations are dominated by a few species like Acacia, Casuarina and Eucalyptus.

***No clear rules to prevent felling or over-extraction***

There is no quantitative monitoring of either the biomass growth or the biomass extraction rates. Hence, it is difficult to arrive at estimates of sustainability of extraction; in other words, whether it is within the annual incremental biomass generation. In the absence of such information, we may look at the kind of rules and practices that govern the extraction from the commons as an indirect indicator of the extent of exploitation of this resource.

In most of the projects, there is a ban on open grazing and on felling and cutting of trees. People are allowed to take deadwood or lop branches. Similarly, they are also allowed to cut the grass and take it away to stall-feed their cattle. In some cases, fines are imposed for violating these rules. In some others, the grass from the common land is auctioned on a yearly basis. These rules seem to be the only measures aimed at regeneration of the commons (especially the plantations) and reduction in the extraction rates. We did not come across any other rules which could control extraction rates. Examples of such rules are the restriction of extraction through mode of carrying (allowing only head loads and banning bullock cart and mechanised modes of transport) and restriction on selling (ban on selling of produce gathered from the commons), which have been devised in some villages in Rajasthan. These allow, but regulate, the extraction of biomass from the commons.

Our field visits showed that, except in a few cases, even these rules are often not observed. In Golhalli (part of the Chitravati watershed), planting was carried out on all the common land and hilly areas during the project period. There are no social arrangements or rules about grazing and, by and large, free grazing is practised in the area. The trees planted then are now being cut by the people and used as fuel wood. The predominant tree species planted were Acacia and Casuarina, which together covered more than 80 percent of the planted area. The other tree species are Jamun, Karanj and Ficus. Most of the saplings have been cut. But fortunately, Acacia and Casuarina are good coppicers and grow back every time they are cut.

In Dornali (AFARM), where the survival rate is only 50%, we also observed that the plants have not grown much and the canopy is not dense either. A ban on grazing was in place but not fully observed. Those who did not have any other means (for fodder) did not follow the ban on grazing because their cattle do not have lands for grazing. In Adgaon, the ban on grazing was even extended to a ban on goats. The villagers were forced to get rid of their goats to protect the plantation on the common lands.

FES in Papagani in Kolar district (Karnataka) operates within the framework of Joint Forest Planning and Management (JFPM) in terms of access, sharing of produce and management

responsibilities. We could clearly see the difference this has made in terms of increased regeneration in FES sites compared to areas where there has been no intervention.

There is also a perception amongst implementing agencies that regenerating common lands with perennial trees is problematic because of the longer gestation period of such trees. Since the project period is very short and forestry species take a lot more time to yield harvestable produce, the harvesting or extraction can start only after the project is over. So it is thought to be difficult to motivate people.[46]

### 5.3.2 Biomass from non-crop private land

Non-crop private land was primarily used for grazing prior to the implementation of watershed programmes. Though the ownership of such land was private, often people other than the owner also had access to this land to graze their cattle. As a result of the watershed development programme, such land is increasingly being brought under private plantation of trees, seasonal crops or horticulture.

Plantations on these lands, whether horticulture or silvi-culture, have generally led to an improvement of perennial cover on these lands. However, a substantial portion of this land has been converted to cropland, mostly through levelling, though a certain amount of terracing is also seen.[47] As mentioned earlier, this is particularly noticeable in projects like KAWAD where land levelling has become one of the important components of the programme.

There are two more issues related to ecosystem impact that need discussion here. We have already discussed the general point related to soil erosion in the earlier section and also indicated the type of options that may be available and are capable of proving profitable for farmers, even in the short run, without going for such extensive land levelling. In this respect, we concur with agencies like NABARD that do not encourage this activity.

There is also evidence to show that even from the productivity point of view, it is probably better to go for other land use systems like silvi-pastural-horticulture (grass, shrubs, trees and horticulture) which is a multi-rooted, multi-canopy system. Dr. Pandurangaiah of UAS, Bangalore advocates alternate land use systems over extensive levelling. There are also other means of gradually forming more level strips or graded terraces with minimal displacement of the fertile topsoil.

Another possibility of exploring good yields with limited water assurance on sloping land is the one popularised by the late Prof. Dabholkar of Prayog Parivar. It tries to create favourable soil regimes on such lands by concentrating the thin topsoil into pits or heaps using locally available soil and biomass. The system works well for horticulture, or for creepers like grapes, and becomes very profitable when combined with pitcher irrigation or fertigation methods that deliver water and soil nutrients locally to the root zone of the plants.[48] These measures can sustainably enhance the productivity potential of degraded lands without extensive land levelling activity, which would disturb the earth and contribute to soil erosion.

### 5.3.3 Biomass from crop land

Crop land is a component of the ecosystem that is closely tied up with the livelihood component. It is difficult to separate the discussion of ecosystem impacts from livelihood and equity impacts. But we shall attempt to restrict our discussion to those aspects of crop production and cropland that are relatively more closely related to ecosystem impact in terms of aggregate productivity and changes in crop pattern, though some discussion of the latter concerns is inevitable.

#### *Crop area as part of land use pattern: increase in cropped area*

Increase in cropped area is one of the operational indicators used to evaluate the

[46] From the discussions with Yasmin Master and Vidya Ramchandran of MYRADA.

[47] Most of the evaluation studies have reported an increase in the crop land by converting private non-crop land into crop land through leveling, terracing, etc. For some of such studies see MANAGE (n.d.); Lakshmikanthamma (1997); Iyengar *et al.* (2001); Erappa (1998); Karanth and Abbi (2001); Reddy *et al.* (2001).

[48] For an illustration of fertigation methods, see the section on Shriram Fertigation method in Paranjape (1998).

performance of water development projects. "The larger the increase, the better the performance" is the conventional wisdom. Most of the evaluation studies reviewed show that there is a significant increase in the cropped area after watershed interventions. As discussed earlier, the increase has been mainly at the expense of privately owned non-crop area. This new crop land is earmarked for seasonal crops and horticulture, with seasonal crops occupying the major fraction.

As discussed above, most of this increase in cropped area comes from land levelling and hence, is somewhat of a mixed blessing. The point is that increase in cropped area is not always positively correlated with ecosystem improvement. We see here the possibility of a potential conflict between livelihood and economic goals *vis-a-vis* ecosystem improvement goals. However, as indicated earlier, there are ways in which both these goals – namely productivity enhancement for increased livelihood support and ecosystem conservation and improvement – can be jointly addressed. What is needed is a strong commitment to find ways of integrating them rather than considering them to be conflicting goals, which makes it imperative to trade off one against the other.

### *Increase in irrigated area*

Increase in the net and gross irrigated areas is another operational indicator used to evaluate watershed development projects. There is an increase in irrigated area in almost all projects. Interestingly, the extensive study by Kerr *et al.* (2000) finds that the increase in irrigation has been greater in control villages than in watershed villages. On the face of it, the observation appears surprising. But a closer examination reveals that this is so because watershed villages are invariably situated in more difficult terrain – which, one may add – is the reason for the selection of the particular area for watershed development in the first place. The study explains this phenomenon by saying that, "they began the study period with low percent-irrigated area, but favourable agro-climatic and infrastructure conditions could have helped stimulate investment." Importantly, the study also finds a trend towards an increase in irrigation in all villages, though in certain cases, the increase is only marginal.

Almost all the evaluation studies within the frame of this review show that watersheds have witnessed increase in the irrigated area, though there is a great variation in the extent of increase. Mostly, this has been made possible due to the increased number of wells and borewells that came up in the wake of the watershed projects. In such areas, increase in cropping intensities could be another indicator of improvement where water availability extends beyond the Kharif season (usually the only season farmers are able to take irrigated crop), allowing more than one crop in a year. Continued availability of water for supplementary irrigation indicates the effectiveness of watershed interventions during dry season and the system's increased drought-proofing capability. However, this needs to be seen in the context of the overall water balance of the area. The review also shows that very often, the increase in irrigated area is quite disproportionate to the potential annual flows. This means that the water has been drawn mainly from the stock (deep aquifer) and raises issues of sustainability (Paranjape *et al.*, 1998; Batchelor *et al.*, 2000a; Batchelor *et al.*, 2002).

Applied water, as a rule, increases the productive potential of an ecosystem. Provision for a longer period of moisture holding and evapo-transpiration increases biomass production. However, it also usually corresponds to higher rates of extraction of biomass. It is quite possible that most of the biomass increase goes out of the system and the amount of biomass that is recycled within the ecosystem falls rather than rises. If that is indeed the case, then the higher ecosystem productivity depends crucially on applied water supplements. If such supplements were to be removed, the ecosystem productivity would fall to values that are lower than the initial values without the supplement. This is already evident in some places where reversals have taken place in the post-watershed period. Some of the model watersheds like Mittemari, which had won national productivity awards earlier, show some of these impacts.

### *Changes in cropping pattern*

Almost all the evaluation studies indicate that one of the major impacts of watershed development is a shift in the cropping pattern.

PIDOW-Gulbarga is a fairly typical example. Prior to the PIDOW-Gulbarga intervention, millets and cereals were the major crops, followed by pulses, oil seeds, and cereals in the project area. The main millets were jowar, bajra, samey and kore. Among the pulses, tur, green gram, black gram, Bengal gram and horse gram were grown – in that order of importance. The oilseeds included groundnut, til, kusbe, agase and pundi. Paddy and wheat were also grown but in a minor way.

One of the impacts of the PIDOW project was that people took to intensification of agriculture for higher (cash) returns. Some of the minor crops like kore and horse gram got wiped out. The area under groundnut also decreased mainly because the yields declined. Today, the situation is such that most of the farmers prefer to buy groundnut in the market (Karanth and Abbi, 2001). It is reported that a staple crop like ragi in some parts of Karnataka is undergoing a reduction in area. It is reported that in some villages of the Chitravati watershed area in Karnataka, there has been a shift from food crops to commercial crops. For example, the percentage of area under ragi crop in these villages was reduced by about 30 percent (Erappa, 1998). A similar trend is also seen in the study of Manchal watershed in Andhra Pradesh (MANAGE, n.d.). The study consisting of a sample size of 80 respondents showed that the area under tomato and other cash crops increased by about 12% over the project period (1995 to 2001) and the main losers were sorghum, castor and pearl millet. The main trend observed is the tendency to shift to economically more remunerative crops.

This shift is also confirmed by our field visits to a wide variety of projects. Many examples could be cited to illustrate this point. In Manjanahalli watershed (under NWDPRA-ORP), the present trend seems to be growing potato, followed by ragi or maize. Potato seems to be a new crop introduced here. Earlier, the main crops were pulses and ragi. After the start of the project, maize is being popularised in the area. Today, it occupies about 30 to 40 ha of the treated area (around 25% of the cultivated area), which is a significant change over a short span of time. Another newly introduced crop is watermelon, which is grown after the potato harvest in August to November and covers an area of about 10 ha. In Dornali village (AFARM), there is a tendency to go for water intensive crops like sugarcane and more than 10 ha is already under sugarcane. In Bhavthan village, (Manavlok), watershed treatments have made it possible to grow rabi crops like cotton and wheat. In addition, some farmers have started planting sugarcane as the availability of water has increased since watershed development.

In the case of Adgaon, the available data indicate that there have been significant changes in the cropping pattern and cropping intensities after watershed development. The pre-project and post-project data show that kharif area increased from 274 ha to 475 ha, rabi area increased from 217 ha to 484 ha, and horticulture increased from a few ha to more than 200 ha. Crop diversity seems to have increased too. The main crops prior to watershed development were jowar, bajra, tur and harbhara (gram). Now, new crops like groundnut, wheat, sunflower, chillies, chickpea, hybrid cotton and vegetables and also horticultural crops like sweet lime (orange) are also grown (Anonymous, n.d.-b). Similarly, in Vaiju Babhulgaon (IGWDP) village also, horticulture crops like pomegranate, oranges, sweet lime, chiku, and amla, have been newly planted on 60 ha. Cultivation of onion and vegetables was also started after the project.

### *Changes in crop practices*

One of the important indicators of the impact of increased productivity of crops on the ecosystem is the nature of the crop practices that have led to this rise in productivity. Productivity associated crop practices, including those actively propagated and supported by the watershed development programmes, are something of a mixed bag, with little consistency. It is an eclectic mixture of productivity concerns and practices that are part of the dominant, mainstream paradigm of high-input agriculture, along with a sprinkling of some environment friendly practices in terms of agronomic practices and inputs used. For example, activities like vermi-composting and use of integrated nutrient management (INM) and integrated pest management (IPM) are being encouraged as part of some watershed programmes, along with conventional chemical fertiliser use.

Most studies also indicate that, for the most part, crop technology and cultivation practices

follow the mainstream, high-input based agriculture framework. Moreover, most of the evaluation studies also share such a framework (see, e.g., Erappa, 1998; Karanth and Abbi, 2001; Shah, 1998; Shah and Memon, 1999). Increase in cropped area, the area under irrigated crops, the area under improved/hybrid seeds, the area under more remunerative crops, inputs like fertilisers and pesticides, cropping intensity and crop productivity (mostly in terms of per unit area and not in terms of per unit of input used – for example, water) are directly seen as indicators of performance. Since initial input use in most of the watershed areas is quite low, higher input levels to achieve higher yields may not be negatively correlated with ecosystem improvement. Yet, it is necessary to identify crop practices that have environmental consequences. For example, an appreciable rise in fertiliser use within the Low External Input Sustainable Agriculture (LEISA)[49] paradigm may represent an equal productivity increase with little environmental damage, while achieving the same productivity gains from high-input strategies may lead to significant pesticide and fertiliser residues and other environmentally harmful impacts. Nevertheless, the indicators used would show the latter as indicating better performance.

In our field visits, we found that in the case of the newer projects, there are some concerted efforts to encourage environment friendly practices. One example is KAWAD, wherein the programme ropes in Agriculture, Man Ecology (AME) as a support organisation in Bellary to provide specialised inputs in the area of sustainable agriculture. (See Box 5-1 for AME's contribution to sustainable agriculture development in the context of watershed development). Also, composting and vermi-composting are encouraged as part of the project with financial allocation for this component. AFARM in Dornali village has promoted organic farming through awareness camps and also organised demonstration of NADEP compost method. A few farmers have shown their willingness to follow natural pest control methods and also use organic manure.

In some of the ORP initiatives, people were encouraged to take up preparation of compost using agriculture wastes and were given training in different methods of application of green manure and integrated nutrient management (INM). Certain integrated pest management (IPM) practices like putting poles in the fields to attract birds to pick the insects and pests have also been tried out. Also, it has been reported that since the training was provided to farmers on fertiliser application methods, they have been able to bring in more efficiency in fertiliser application by adopting split application of fertiliser doses.

**Box 5-1 AME's initiative in promoting sustainable agricultural practices**

Agriculture, Man, Ecology (AME) is an organisation committed to Low External Input Sustainable Agriculture (LEISA). Presently working in the three states of Karnataka, Andhra Pradesh and Tamil Nadu, AME is associated with the KAWAD watershed initiative since April 2002 in Upparahalla and Chinnahagiri watersheds. Its role as a technical support agency is to introduce and sustain improved agronomical practices and strengthen integrated farming systems in watersheds. AME aims at technology transfer through participatory technology development (PTD) through farmers" field schools (FFS). In the beginning of their involvement with the KAWAD watershed programme, AME worked with NGOs, but now works directly with the people - from facilitation to implementation.

It has initiated 12 FFS in Upparahalla and 9 in Chinnahagari watersheds. One FFS generally consists of 20 farmers in the selected village. FFS is not a formal body, but an informal education system and a seasonal group. AME expects that at least 3 persons from each "school" would continue to be functional after training. These farmers are chosen in such a way that they represent the upper, middle and lower areas of the watershed and also represent small, medium, large and women farmers. Till today, they have trained 420 farmers in Chinnahagari and Upparahalla. AME also trains trainers and master trainers.

The objectives of FFS are: (i) to strengthen people's capacity for decision making and overall management of crops; (ii) to reduce cost of cultivation; and (iii) to promote and popularise eco-friendly and local inputs. Also, they have been trying to find alternative crops to groundnut, which occupies nearly 70% of the area (red soil).

[49] See Reijntes *et al.* (1992) for a good exposition of LEISA.

A school begins by identifying plots and observing them at weekly meetings of farmers in the school. Classes are held every fortnight. Small experiments are carried out and the results discussed by farmers. Every meeting has a special topic and a group discussion. The school is seasonal and does not function in summer since there are no crops being harvested. Various experiments as well as local need-based experiments are taken up. There is a tie-up with the university. It is expected that by the end of the school, a few of the members will be in a position to train other farmers.

AME believes that soil and water conservation and crop production should go together and that in the Watershed Plus phase, the emphasis could be more on production. Organic matter in soil is important; so there is a need to enrich biomass production, and in turn to follow an integrated farming system. Apart from KAWAD, AME also functions as a support organisation for the ISPWDK and the DANIDA supported watershed projects.

*Source:* Discussions with Shri Kandagal, Coordinator, and other staff of AME (Bellary) and AME documents. For more details about AME's integrated farming system approach, PTD, and its use of LEISA techniques, see Lanting (1995), Walsum et al. (1998) and AME (2003).

ISPWDK believes that the watershed development programme should be known as the productivity enhancement project, though not much attention was paid to this aspect earlier. This concern for sustainable productivity enhancement is reflected in the design of watershed projects supported by ISPWDK, where the emphasis is on sustainable productivity enhancement of rain-fed crops. The programme components include: IPM, Integrated Farming System, INM controlled experiments on some of the staple crops like Tur and Jowar, building linkages with organic farming networks, farmers" field schools in different villages of the project area (with AME inputs), seed bank concept in each village, not burning Tur stubbles, but composting them and integrating into soil, other methods of increasing organic matter throughput into the soil, vermi-composting and other composting techniques, and contour ploughing. As a result of these measures, the farmers feel that the cost of cultivation has come down and there has been a noticeable increase in yields. For example, Jowar yield has increased by about 30 to 40%. Production of Tur and Bajra has also increased. They have developed audio-visual material on different methods of sustainable productivity enhancement, which is used extensively as training material for the farmers. According to Shri Jangal, Coordinator, Programme Support and Management Unit of ISPWDK projects, 70 to 80 percent of the measures listed above are being adopted by the farmers.[50]

Though there has been an increasing awareness and sensitivity towards the eco-friendly nutrient and pest management practices, many evaluation studies show that use of chemical fertilisers and pesticides have been on the increase in areas where watershed development programmes have been taken up, especially where irrigation water is available. In the case of PIDOW-Gulbarga, farmers began adopting risk minimising and productivity enhancing strategies by way of using chemical fertilisers and pesticides after watershed development measures. MYRADA also promoted the use of fertilisers and pesticides as part of its "agricultural package" (Karanth and Abbi, 2001). AFARM's own evaluation of its watershed development projects says that "the most serious negative impact of the watershed intervention, particularly in the sphere of agriculture, is the increased use of chemical inputs like fertilisers and pesticides and also the use of hybrid seeds" (AFARM, 1998). This is an indication that the agricultural component of the watershed programme, by and large, still operates within the mainstream, high input based agricultural paradigm.

### *Shift away from non-crop area and food staples*

One important indicator of the changing nature of the ecosystem is the change in cropping pattern and land use pattern. Productivity and production changes mainly indicate how the productive potential of an ecosystem is changing, but certain other changes have gone largely unnoticed; for example, the loss of non-crop area to crop area

[50] From the discussions with Shri Jangal in his office.

and – within crop area – the substitution of staple food crops to more remunerative cash crops.

Since the canopy cover on most non-crop land, whether private or public, continues to remain poor even after the watershed development programme, this amounts to a shrinking of perennial cover. Since effective perennial cover in the country has decreased to as low as 15%, an effort to increase perennial cover, without necessarily sacrificing production possibilities and incomes, is urgently needed. We have already discussed how this could be possible. If limited but assured quantities of water become available to a substantial number of farmers in the watershed, perennial cover can certainly be improved. If a prior consensus is reached on increase in perennial cover, water itself becomes an instrument that makes this possible. In the absence of such an agreement, water becomes an instrument for an impact in exactly the opposite direction.

**Box 5-2: Impact of NWDPRA in Maharashtra**

The study by Deshpande and Reddy (1991) has tried to capture the impact of NWDPRA in three different zones or regions, namely, the scarcity zone, the moderate rainfall region, and assured rainfall zone. In the scarcity zone, the study notes that "the watershed treatment led to higher diversification and risk spreading. The only point of concern was the presence of Sugarcane in the water scarce economy. The yield levels do not show any persistent increment across crops and size classes of operational holdings but there is enough evidence to indicate an increased stability in yield levels. It was quite clear from the analysis that the scarcity zone would need a longer gestation period as compared to the other regions - mainly due to the level of degradation." In the case of the moderate rainfall region, the study indicates that "the proportion of fallows and uncultivated lands and the cropping intensity were higher in the watershed region, indicating thereby higher resources intensity. The cropping pattern in the project region is well diversified as compared to non-project area, indicating risk spread.... Except in the case of Jowar and Paddy, the watershed area has a distinct edge over the control region even though the latter had slightly higher irrigated area. This region has a good promise for watershed technology and it is essential to arrest the speed of degradation in this area." Finally, in the case of the assured rainfall zone (generally this zone has lower rainfall and may be very close to scarcity zone in terms of rainfall quantum but there is less uncertainty in the level of rainfall), the study notes that the initial work of the watershed goes in recouping the damage caused earlier because of higher level of degradation of the ecosystem. The cropping pattern in the project area is more commercialised, though diversified. Resources are not only concentrated on better quality of lands by releasing marginal lands out of cultivation but also on highly remunerative crops like Sugarcane, Wheat and Cotton to the detriment of others. The watershed region here also has better cost efficiency, ensuring that the net income per hectare in this area is higher than that in the control region. The most interesting aspect of income generation is the inverse size-productivity relationship in the project region as against a direct relationship in the control area. The assured rainfall region watersheds are likely to yield better results in short run compared to those from scarcity zone.

*Source:* Based on Deshpande and Reddy (1991)

## 5.4 Changes in watershed hydrology

Water is the most critical resource in the context of sustainability, equity and livelihood assurance. Because of certain inherent characteristics of water like uni-directionality of flow, there is also the possibility of externalities often leading to conflicts. Hence, it is very important to understand what is happening to this resource through watershed development intervention. In this chapter, we restrict our discussion only to the ecosystem or sustainability impacts. As in the case of soil erosion, there is a virtual absence of measurements and data on changes in the water scenario after watershed measures. Therefore, one has to depend on the perceptions of the people or of the implementing agencies.

### 5.4.1 Increase in duration of stream flow

An increase in the duration of stream flow is an indirect indicator of a more balanced water regime and an increase in the base flow component. The review shows that there has been a change in the duration of flow in the stream after watershed development programmes were implemented. The increase in the duration is between two to three months. In Dornali village (AFARM), the flow was reported only till November prior to the watershed programme, but now there is water in the stream till the month of March or later, even under normal rainfall conditions. Similar is the case with villages like Bhavthan of Manavlok. Increase in the duration of the flow here is a couple of months. In Adgaon, where water used to run off by the month of August, i.e., immediately after the rains, it now stays for another two months.

### 5.4.2 Decrease in run-off

Run-off suppression is at the heart of soil and water conservation practices. Hence, it is hardly surprising that reduction of run-off is one of the most commonly reported results of watershed development. This phenomenon may be explained by the fact that it is re-routed as base flow resulting in increased levels and durations of base flow. However, most of this reporting is by way of visual observation and local perception rather than systematic, scientific studies. There is a need to take up scientific studies to empirically support this claim as well as to understand and keep track of the changes that are taking place in hydrology as a result of watershed interventions.

One of the few cases where monitoring was carried out as part of the project itself was the PIDOW project in Gulbarga. Their results indicate that there has been an average reduction of 30% in the run-off over a decade for similar rainfall conditions. The surface run-off for similar conditions of rainfall (quantity and intensity) has reduced as a result of change in the land use, which in turn is a direct result of the watershed management project (Karanth and Abbi, 2001).

The study of Kakade *et al.* (1997) in the Adihalli-Myllanhalli watershed of BIRD-K calculates run-off based on observed values of soil parameters before and after the watershed treatment. It shows that prior to the watershed development programme, at a peak rainfall intensity of 60 mm/hr, the volume of water flowing from a 100 ha area in one hour was about 18,000 $m^3$ whereas it is as low as 1,600 $m^3$ in the post-intervention period. This indicates a staggering 90 percent reduction in runoff at the peak intensity of rainfall at a recurrence interval of 10 years. It also indicates that if the intensity of rainfall is less than 54 mm/hr, run-off is practically zero.

**Box 5-3: Dispersal of settlement: An unintended consequence of watershed development**

An interesting change in the spatial arrangement of the village has occurred in Vaiju Babhulgav village (under IGWDP) due to the watershed development project. The extent of cropping here increased due to the increase in water levels in the wells. The villagers dug more wells and started building houses in the farms. They shifted their residence from the *gavthan* (main village settlement), where all villagers lived in a cluster, to their own farms. More water was available for farming as well as drinking from already existing or new wells in their own farms. As their residences are now spaced out, there is a tendency to have one's own well complete with an electric motor, resulting in tremendous increase in the number of wells and motors.

*Source:* IGWDP reports

### 5.4.3 Unintended and unanticipated hydrological changes

As a result of interventions made in the watershed, watershed hydrology changes, often in entirely unintended or unanticipated ways. Very little attention is paid to the type of hydrological changes that are taking place and their implications – both from the point of view of watershed functions and services and the impact these changes have on the different end users. The review shows that the PIAs implementing the watershed programmes have not paid much attention to these aspects. Barring a few exceptions (e.g., Batchelor *et al.*, 2002) studies of watershed development projects have also paid little attention to these aspects.

Batchelor and others make two important points by analysing the impact of watershed

development (often unintended) on the water regime of the region. One, water harvesting in semi-arid areas, if used inappropriately, can lead to inequitable access to water resources and unreliable drinking water supplies. Two, water balance studies in AP and Karnataka have shown that water harvesting programmes impact significantly on patterns of water use and can result in distinct winners and losers (Batchelor *et al.*, 2002).

### 5.4.4 Shift to deeper aquifers, drying ponds and springs

Studies by Batchelor *et al.* (2002) also show that along with the increase in the number of wells, there has also been a shift from open wells to deep borewells and increasing use of submersible pumps. Hence, there has been a shift from ground water that exploited the shallow aquifers, such as the crystalline basement regolith aquifer in Anantpur, to extraction from deeper aquifers, which have lower recuperation rates. Falling ground water levels resulting from increased rates of ground water extraction have contributed to changes in surface hydrology, leading to springs and seepage zones drying up and flow or saturated zones occurring only after exceptionally wet periods.

In the KAWAD projects, water harvesting by creating extra water storages along drainage lines has also contributed to changes in surface hydrology. Flow in ephemeral streams now occurs less frequently, is reduced in magnitude and/or is less prolonged after large rainfall events. The average run off as a percentage of rainfall is around 6% and 2% for the Doddahalla and Chinnahagari rivers (KAWAD projects area) indicating that further check dams or storages may not help much since the amount of additional surface water that can be harvested is very limited (Batchelor *et al.*, 2002).

In another example, Kakade *et al.* (2001) find that in one of the study villages, Rajkot, ground water has been over-exploited through the use of a large number of bore and dug wells meant for irrigation purposes. The exploitation rate is more than potential recharge rates for the region. This is true of most of the watersheds – the extraction is much higher than the annual recharge or replenishment, and comes from the stock.

### 5.4.5 Decreasing downstream flows

In the case of Gundlur Tank in Chinnahagari watershed, which was taken up under the World Bank-supported Karnataka Community Based Tank Management Project, the study by Batchelor *et al.* (2002) shows that the flows into the tank has reduced by about 40%. This is mainly because of increased water harvesting in the upstream and increased ground water extraction in most places. Reduction of inflows into the tank downstream is much greater during low rainfall years.

The study shows that though irrigation benefits in the command have more or less remained the same, the mode of irrigation has changed from surface to ground water. This also means that, in all likelihood, the users have also changed. This change has affected other uses that depended on the tank, like watering for the cattle, pisciculture, washing and bathing. The study concludes that harvesting should be encouraged but within an integrated or adaptive water resource management framework, using procedures that weigh the benefits and tradeoffs associated with altered patterns of water use.

We have observed a similar situation in Maharashtra as well. There are many cases where existing minor, medium and major projects do not seem to get the flow required (or the flow as per the original design) because of the upstream developments that have taken place subsequently (Rajagopal *et al.*, 2002).

Demands have been raised to convert existing irrigation tanks to percolation tanks and then use the water as ground water, with water markets as the main medium for those without wells to get access to water (Reddy *et al.*, 1994). This is being suggested and lobbied for under the pretext that ground water irrigation is more efficient than surface water irrigation. Surface water is still considered, to a great extent, a common property resource.[51] In the absence of any social regulation about the extraction and use of ground water, converting existing (surface) irrigation tanks into percolation tanks is like

[51] Presently, the fraction of irrigated land which is irrigated by ground water (60%) has increased two-fold in the last 2 decades and is more than the fraction irrigated by surface water sources (40%).

converting a common resource into private property. Are there any efforts to socially regulate ground water extraction? What are the institutional and policy implications of this? It is very clear that unless this issue of regulating ground water use is addressed, no amount of watershed development will make a difference to the overall water situation in the drought-prone regions of the country.

### 5.4.6 Little consensus on water use prioritisation

The review clearly brings out the fact that there is very little common understanding or consensus about the use of water or prioritisation of water use. In most cases, the implementing agencies (including some NGOs) either do not consider this issue as part of the watershed programme (as the emphasis is on development of the resource) or think that it is too complicated to handle. The end result is a free-for-all in water use.

We came across only a few cases like Ralegaon Siddhi, Babhulgaon of IGWDP, and Hivre Bazar of Adarsh Gaon Yojana, with an explicit agreement that water intensive crops like sugarcane and banana would not be taken up with the water generated through watershed development efforts. However, in many cases, people are prohibited from taking water directly from the check dams or surface storages. Another example of self-regulation of ground water extraction is reported from Kurburahalli village (Kalyandurga Mandal in Anantpur district) where Rural Development Trust (RDT) has been involved in watershed development work. In this village, the people themselves have devised a norm regarding water extraction. As per this norm, the people use water for irrigation purposes only up to a depth of 100 feet. If the depth falls to more than 100 feet, water from the well is not used for irrigation and is reserved only for drinking.[52]

### 5.4.7 Impact on ground water

Though there has been an increase in the water table, especially in the wells close to various structures like check dams, this has been more than offset by the tremendous increase in the number of wells. In almost all cases that we visited, and those for which some data are available (and this is also confirmed by various other studies), the number of borewells and dug wells have gone up immensely. Now, the dominant trend is to construct borewells and tap water from the deeper aquifer.

Let us take some field situations to illustrate this. In Adihalli-Myllanhalli area (BIRD-K), apparently the water table has risen by 3.7 m. However, the number of borewells has increased from 50 to about 110 and 20 more new open wells have been dug for irrigation. The area irrigated has increased from 44 ha to 173 ha. Coconut, traditionally a rain-fed crop, now survives on borewells.[53]

In Golhalli village, a few years back, borewells were dug up to a depth of 300 to 400 feet. Now people have to dig more than 500-600 feet. There are about 30 borewells in the village, of which only about six work all around the year. The others work only if the rainfall is good. About 10 years back, there were only six borewells in the village. Though the people cannot estimate exactly how many borewells get recharged by the water stored behind the structures, they feel that if the rains are good and the tanks get filled, most of the borewells provide water for most of the year. There are 13 to 15 open wells in the village. But only four of them are working, and only if the rainfall is good.

In Mittemari, presently there are about 20 open wells. Apparently, almost all the wells are dry. People say that during the project period, about three to five open wells got recharged. Very often, the farmers who have open wells also have borewells and they depend more on the borewells than the open wells. Before the start of the project, there were 20 borewells. Today, there are 60. Almost all borewells have water if the two tanks in the village fill up. Otherwise, water is available in them only from July to January. The depth of borewells in the area has increased from 200 to 500 feet in the last 10 years.

[52] From the discussions with Dr. A.K. Singh of the Central Soil and Water Conservation Research and Training Institute (CSWCRTI), Bellary.

[53] Based on the reports and documents made available by BIRD-K and also the discussions with Dr. Reddy and Shri. Doraiswamy.

### 5.4.8 Fluorosis and the issue of the quality of water

Watershed development seems to have acted as an additional impetus for investments in wells and pumping devices, leading to a virtual pumping race. There are also cases of ground water pollution and water going saline because of the excessive withdrawal of ground water. Excessive ground water withdrawal seems to have aggravated the already existing fluoride problem in Kalyandurga of Anantpur district of Andhra Pradesh and in many parts of Karnataka (like Kolar district). This has caused havoc with the health of the people.[54]

In most of these areas, shallow aquifers are not as contaminated by fluorides as the deeper ones. But watershed development has prioritised water for irrigation in such a manner that all the better and shallower sources have been utilised for irrigation. Especially in summer, the deeper sources are the only ones left for drinking and other domestic purposes. This shows the need to pay proper attention for prioritisation of water use, different components of water resources and their suitability for different purposes.

### 5.4.9 Absence of water balance studies

The review brings out clearly that there has not been any attempt to carry out water balance studies to understand what is happening to the different components of water as a result of watershed intervention. Without such studies, it is difficult to say whether we are using water in a sustainable manner or not, in other words, whether we are using the annual flows or digging into the stock.

One of the few attempts at some kind of water balance study, though *post facto*, is the water audit in the three watersheds under the KAWAD programme. The study is revealing in many respects. But unfortunately, because of its *post facto* nature, the study and its findings have had no bearing on the actual implementation of the project either in terms of the structures built or in terms of laying down conditions for water use. As a result, far from controlling ground water extraction, people are going for deeper and deeper borewells (Batchelor *et al.*, 2000b).

Dodahalla watershed in Bijapur district has been already declared a dark zone. The study by Batchelor *et al.* (2000a) finds that the extraction rate of ground water in some villages in the Dodahalla watershed is two to five times higher than the average recharge values. This situation can only be sustainable if water flows into these villages from neighbouring areas. If the project promotes activities that reduce these flows, there will be clear winners and losers and not necessarily an improvement in overall productivity or equity at the watershed scale (Batchelor *et al.*, 2000b). The higher extraction compared to the annual recharge can also mean, as mentioned earlier, that water is being extracted from the deeper aquifer, and thus is being withdrawn from stock. This is also correlated with the necessity for deeper borewells (instead of shallow, dug wells).

[54] According to a study conducted by the Zilla Panchayat engineering division (of Chitradurga district) last year, fluroide levels in water available in about 135 to 140 villages in the district is higher than the permissible limit. People of these villages are caught between the devil and the deep sea. On the one hand, they do not have sufficient water to drink due to the drought and on the other hand, whatever water is available is not fit for drinking. The available water has high levels of nitrates and fluorides. Consumption of high fluoride water over a long period of time can result in flurosis that causes mottled teeth and deformity of bones. As the district does not have adequate surface water resources such as rivers, people depend on ground water from open wells and borewells. But even the ground water levels are decreasing day by day. At some places, water can be found only at depths below 400 feet. So people have been drinking water that has high fluoride content, which has resulted in several people slowly developing fluorosis. The problem is severe in Maradihalli and surrounding regions in Hiriyur taluk and Thopuramalige, Kallahalli, Kasavanahalli, Kasavarahatti, Inchingere, Tamatkal villages in Chitradurga taluk. In Thopuramalige village, which is about 10 km from Chitradurga, at least one person in each of the 130-150 households suffers from bone diseases. About 10 persons, aged between 40 and 70, are permanently bedridden. Some are unable to work as their legs and hands have become deformed. Ramachandra Reddy (60), who has to be assisted by his wife for everything, recalls: “About 20 years ago, water was abundantly available in all the open wells. The water was good and we had no problems. But once the wells dried up, borewells were dug. Water in the borewell had high levels of fluoride and was not fit for drinking. Since there was no other water available, we started consuming the borewell water. After 10 to 15 years, several people in the village complained of joint pain. Doctors blamed it on the water.” (*Source: Deccan Herald*, April 2, 2003). Also see Jamal (2003)).

The same study also reports that in Upparahalla watershed in Bellary district, there is a higher concentration of pumps (submersibles) with more than 5 HP rating in the upper reaches of the watershed. Consequently, the villagers in the upper reaches can extract water more rapidly than would have been the case had they had smaller pumps. This enables these villagers to utilise water that might otherwise have reached villages further downstream (Batchelor *et al.*, 2000b). Though this strategy might help the farmers in the upper reaches in getting a share of the increased water resources (as against the general trend of farmers in the valley portion getting most of the benefits), it would be counter-productive and unsustainable in the long run.

What is required is a water balance study and monitoring of water resources as an ongoing activity. The KAWAD study is an elaborate study and cannot be easily replicated in all areas. What we need is simple and robust models that can give us useful first approximations that can then be progressively refined through observation and "ground truthing".Geographic Information System (GIS) and other computer-based tools and techniques have an important role to play here, but in a manner that avoids over-dependence or turning them into bottlenecks. The need of the hour is methods that are simple enough to yield good approximations without GIS support, which can then be improved and refined in subsequent phases through such support.

## 5.5 Addressing sustainability: emerging issues

### 5.5.1 The need for sustainable productivity enhancement measures

Productivity enhancement measures can take two paths. One is the present-day mainstream, high external input based agriculture, popularly known as the "green revolution". The second is sustainable and alternative agricultural practices, which also include a wide spectrum of practices ranging from a complete ban on use of chemical inputs demanded by votaries of the pure organic agriculture school to those who argue for a combination of different types of inputs, with the caveat that the use of these inputs must enhance natural processes. An example of the latter is Low External Input Sustainable Agriculture (LEISA).

The overall impression one gets from the review is that the agronomy component of the watershed development programme still operates in the high input agriculture framework. This is manifested in the tendency towards increased use of chemical fertilisers and pesticides. In fact, if one looks at the different variables and indicators that have been used to assess the success of the watershed programme, most impact studies on watershed development have used the mainstream, green revolution framework. However, there are also isolated examples which suggest that conscious efforts are being made to educate people, and also promote the use of environment friendly nutrient and pest/disease management practices. Farmers are also increasingly responding to such organic agricultural practices.

One important point that emerges from the review is that as a result of watershed development efforts, more and more non-crop private lands are being brought under cultivation. This is primarily done through extensive land levelling. But it has proved to be a double-edged sword. The main rationale for land levelling is the visible and immediate impact that it has on productivity even though it may, in the long run, result in excessive soil erosion and gradual reduction of productivity. Also, increased productivity is confined to the part of the levelled strip with deeper soil cover. The difficulty is that sustainable options must offer comparable benefits and comparable visibility.

From the ecological sustainability point of view, each landform or class has a particular function to play in a watershed. One of the cardinal principles of watershed development, at least theoretically, is that different types of lands have to be put to use as per their capabilities. In fact, watershed intervention aims to improve the functions performed by each of these classes. Bringing sloping (with shallow soil depths) non-crop areas under seasonal and annual tillage could increase soil erosion. Also, it can cause negative externalities in different ways. In traditional land-use systems, there used to be an organic link between the cropped area and non-cropped areas (forest, pastures, and wasteland). By bringing in more and more non-crop land

under shallow-rooted, seasonal agriculture, this organic link is broken. By converting more non-crop land to crop land, we are encouraging mono-cultural tendencies which can decrease local biodiversity. Non-crop land has different types of grasses, bushes, trees, creepers and other types of vegetation including medicinal plants. It is a repository of a great variety of rootstock. It also supports a variety of micro- and macro-organisms, all of which have a role to play in the ecosystem.

However, it is also true that from the point of view of livelihoods, it is important to ensure certain quantities of different types of biomass (food, fodder, fuel, timber) and also income. So the issue is whether we can ensure these livelihood requirements without radically altering the land use pattern through extensive levelling, or bringing sloping land under seasonal crops and tilling. The question is: what are the other options available for this? One option is to adopt methods popularised by Dabholkar's Prayog Parivar network like creating "nursery soil conditions" near the root zone of the plants which does not call for disturbing the soil extensively (Dabholkar, 1997).[55] A second option is to bring such non-crop lands or areas taken up for land levelling under perennial biomass cover (grass, shrubs, trees) with different uses and economic values, along with appropriate institutional and financial back up. The argument against such an approach is that it takes longer for people to get any tangible benefits. Here, the issue of species selection becomes important. A judicious mix of short and long duration plants can take care of this problem. Also, because of biotechnology and other technological advancement in nursery raising, the time taken for maturing has been greatly reduced. Tamarind is a good example of this. The increased fodder availability because of protection can also strengthen the pastoral and livestock component of the livelihood basket.

Another possible approach could be to try to meet the food requirements from a reduced area. It has been observed that there is a tendency amongst the people to bring in more and more land unsuitable for shallow-rooted crop production under crop production during drought and scarcity conditions (Joy and Rao, 1993). Experience and various experiments show that it is possible to meet food needs from a smaller area through sustainable productivity enhancement methods. One such example is the experiments with small plot intensive cultivation by many groups in Maharashtra that have been able to achieve very high levels of productivity with local inputs.[56] Another example that is talked about currently is the Madgascar Rice Intensification System, which is now spread over a very large area in different countries. It has been reported that it has been able to achieve an average productivity of something in the vicinity of 10 t/ha (Uphoff *et al.*, 2000). Yet another way is to ensure a certain quantity of water to the people as part of the watershed programme. Experience shows that in drought prone regions, critical (or protective) irrigation can make all the difference between a total crop failure and a good crop. This minimum water assurance combined with some of the emerging LEISA techniques can build up productivity in a very short time span and meet the food requirements from a much smaller area. The saved area can then be devoted to a diversified biomass production system without significantly disturbing the different types of land use classes. Of course, this calls for a restructuring of the present-day watershed programme in terms of fund allocation, institutional arrangements and phasing of the programme. These issues are discussed further in the concluding chapter.

### 5.5.2 Regulating biomass extraction rate

From the point of sustainability, an important area that needs to be looked into is the extraction of biomass to meet fuel and fodder requirements. With regard to fuel needs, we may have to address the issue in a larger canvass. Of course, fuel-wood availability would increase if we bring existing non-crop area under a diversified biomass production system, as we discussed above. Another strategy is to consider options like widespread distribution of kerosene to rural households and saving the corresponding amount of fossil fuel energy in other sectors (like reducing chemical fertiliser use in

[55] Also many of his Marathi booklets like *Vipulache Srushti, Tuze Ahe Tuj Pashi,Pan Tu Jaga Chuklai,* etc.

[56] Shri Balkrishana Renke and his group have been doing this for the last five years or so. He has kept a very good record of all inputs and outputs. For details see Kulkarni (2000) and YUVA (2001).

agriculture by shifting to LEISA techniques or reducing the use of fossil materials in infrastructure). In short there could be methods and strategies in which this could be balanced out.

Another area of saving biomass (and consequently reducing extraction rates) is to attempt herd rationalisation. Of course, this is an area that is highly contentious. Still, one could explore how we can bring down the number of cattle, say bullocks, by making social arrangements for sharing them during agricultural operations. This would also help bring down the use of biomass. All the saved biomass (both in terms of fuel and fodder) can go back to the ecosystem as throughput and contribute substantially towards sustainable productivity enhancement.

### 5.5.3 Ridge to valley versus other approaches

Till recently, the ridge-to-valley approach to watershed planning and implementation was a dogma that did not allow much flexibility. The early generation watershed projects in the country and the present GoI-funded projects under the Common Guidelines (including the revised guidelines) still insist on this approach. NABARD-funded projects also follow this approach very rigidly. The same is the case with most of the projects operated by the NGOs. However, there seems to be a shift in this approach lately – especially in some projects supported by bilateral agencies. The KAWAD watershed programme, supported by DfID, is an example of this. The main argument for this shift in the approach is that the ridge to valley approach does not encourage people's participation – either because the people know that their land would get treated automatically or because the farmers do not show any interest or do not want to contribute – and also causes considerable delay in the implementation of the project. They basically go by people's willingness to contribute financially towards the work. The lands of only those willing to contribute get treated. Willingness to contribute – and not the basic biophysical characteristics of the watershed or the plots – becomes the sole criterion for taking up water and soil conservation works in privately owned land.

Here, questions like "what is different about watersheds?" or "what distinguishes watershed approach from other agricultural development strategies?" become important. The basic difference is that the watershed approach is based on inter-connection of different types of resources, uses and users and the assumption that intervention on a particular plot or type of land can have an impact on other plots or lands too (and also other uses and users). Cashing in on this interconnectedness of the ecosystem is the actual strength of the watershed programme. This is what binds watershed development together. Watershed development is concerned not only with individual resources but also with the interaction amongst them (Farrington *et al.*, 1999). Also, the micro-watershed concept aims to establish an enabling environment for the integrated use, regulation and treatment of water and other resources of a watershed-based ecosystem to accomplish resource conservation and biomass production objectives (Jensen *et al.*, 1996; cited in Farrington *et al.*, 1999). Other agricultural development programmes treat things in an isolated (and mostly individual plot, crop-or technique-based) manner.

Treating a watershed as a collective resource unit is also important from the point of view of property rights and collective action. Diverse individuals and groups have an interest in how movements of water, soil and nutrients between different parts of the watershed are managed. They connect people who are distant from each other. In economic terms, watersheds are filled with production and consumption externalities. They include a variety of resources like grazing lands, agricultural land, residential areas, forests, wetlands, common waterways and water storage structures, each of which may be used by a variety of users for a variety of purposes. Treating watersheds collectively also means developing institutions, which can help in coordinating the different uses and users, and develop appropriate property rights systems/ institutions. If we lose sight of this, then it becomes an individual-based enterprise. Individual farmers most easily recognise and internalise the effects of land use change on their own plots and farms. Beyond the farm scale, they need to consider how to coordinate their activities with upstream and downstream farmers, communities and other users of land and water (Swallow *et al.*, 2001). Watershed management approach is also needed to use the

scarce resources in a productive and sustainable manner. The treatment of the land has to be contiguous; an untreated patch in the neighbourhood would do more damage to the treated area (Singh *et al.*, 1991).

Farrington *et al.* (1999) stress the need to first rehabilitate the lands on the upper slopes for the following reasons. One, the landless and low-income farmers who depend most on the upper slopes benefit first. Two, ground water recharge commences as early as possible. Three, by the time the lower catchment is treated, any debris and erosion running down from the upper catchment is minimised. Though one would generally agree with this, the emphasis on increasing ground water recharge right at the outset without any social arrangements regarding its extraction, use and access can aggravate problems later. This has been one of the serious flaws in watershed development so far.

While most experts stress the need for a broad ridge to valley approach, there is also the viewpoint that one needs to shed the "fundamentalism" that has crept into watershed development approaches. It is important to understand the spirit behind this principle and work accordingly, making sure that the principle does not acquire the form of rigid orthodoxy. Rigid insistence on the ridge to valley sequence often alienates communities unwilling to work so far from their fields and wells. It may be better to identify significant water harvesting sites within the selected watershed in a participatory manner and then plan their construction, as also the treatment of their catchments in a more or less co-terminus manner (Shah *et al.*, 1998). Another way of handling this issue is to prepare an integrated plan of the watershed, keeping in mind the three distinct zones within the watershed (upper reaches, the transitional zone and the valley portion) and then phase out the programme over the next four or five years in such a manner that the interventions follow the pace and sequence of the institutional development and social arrangements.

### 5.5.4 Run-off suppression: the need to be aware of the balance

The review brings out very clearly that many people see watershed development as a process (or means) of run-off suppression – the more run-off is suppressed, the more efficient the measure. This is not always true and serves as an example of the need to be aware of the water balance.

Run-off suppression involves measures like continuous trenches or bunds. We have to take note of two phenomena here. Apart from the obvious effect of run-off suppression, water also gets accumulated in the trenches behind them. A saturation zone and shallow accumulations are formed. Evaporation from these shallow pond-like bodies and saturated soil surface may lead to evaporative loss of water, which can be substantial. For example, if the area of such surfaces or accumulations in the watershed is of the order of 10 ha and the period for which the soil surface remain saturated after a heavy spell of rains is of the order of 10 days (and there are usually five such spells during a season), then the total evaporation loss is equivalent to the evaporation from a water body covering 10 ha for a period of 50 days. At a moderate pan evaporation rate of 8 mm/day, this represents 4,000 ha-mm (40,000 $m^3$ and equivalent to about 120 tonnes of dry biomass with a productivity of 30 kg/ha-mm) of evaporation. While doing the watershed planning, we must plan in such a way that it minimises this loss also. This may involve deliberate breaks in the trenches to guide run-off and not let it accumulate. It may involve planting trees in the saturated zones, especially trees which use water rapidly and productively. The point is that consideration of water balance gives us a way of improving our watershed development measures on the lines of productivity oriented hydrological planning (Paranjape *et al.*, 1998).

The other point is: what happens to the run-off so suppressed? Run-off from the upper slopes (which are generally wasteland or forest) to lower lying areas (which are generally crop land) is an important source of water and nutrients for the crop land. In fact, this was more pronounced in the traditional systems of agriculture where agricultural land used to be surrounded by forests. Now, it is the other way around! It is possible that in our enthusiasm to suppress run-off, we cut off the lifeline of the crop area substantially. Thus, it may be better to adopt a strategy of run-off guidance. This means that we guide the run-off in such a way as to control soil erosion in higher run-off areas and collect it for

crop or productive use in infiltration areas through soil improvement measures (Paranjape *et al.*, 1998).

### 5.5.5 Need to study and monitor unintended hydrological effects

One more point is the way we look at the relation between ground water and surface run-off. There is no doubt about the general view that we should strive to convert as much run-off into ground water as is possible. Having said this, we also have to pay attention to other considerations. We have already discussed the need for run-off to the crop area and productive use areas. There are also other considerations too.

Take for example a case where the conversion to ground water makes water unavailable to people (or users) within that watershed. In fact, the whole business of ground water recharge measures and their effects on particular places is a poorly understood phenomenon in the watershed development context. There are situations where the ground water regime is such that the recharge to ground water appears a few kilometres away in another watershed. We have to remember that our attempt should be to maximise the amount of water available for use in the watershed. To put it simply, ground water has to be recharged to the point where it becomes a reserve to be tapped in bad years. Every additional recharge measure must deal with how to make as much of it available for use.

Another consideration in this context relates to property regimes in water. As we know, surface water is still considered, to a great extent, as belonging to the common property regime, whereas ground water is accessed and used more as private property. In this background, we must remember that by converting all water into ground water, we are also converting a resource which is in the common property regime into private property. As discussed earlier, there are even demands to convert already existing irrigation tanks into percolation tanks (Reddy *et al.*, 1994). Though one might say that ground water irrigation may be more efficient compared to surface water irrigation, from the point of view of equity and sustainable use of the resource, this could be a dangerous move as there are no safeguards in place to control and regulate, both socially and legally, the use and access of ground water in our country.

### 5.5.6 Need for regulation of ground water extraction

There is increasing evidence of the fact that ground water extraction has seen a significant increase during the last ten years or so. There has been an overall increase in the number of wells. The increase in the number of deep tube wells, in particular, has been phenomenal. Most of these areas are hard rock areas where deep percolation and recharge may be quite low. Watershed development seems to have acted as an additional impetus for investments in wells and pumping devices and there is a virtual pumping race. As discussed earlier, excessive withdrawal has led to ground water pollution. The areas that are going from white to grey and grey to dark (as per the ground water development classification) are also increasing. In years of drought, ground water used to act as a buffer to meet drinking water and other essential needs. Now, there are predictions that meteorological drought would be accompanied by ground water drought. What are the sustainability implications of this? It has grave equity implications too as one's locational advantage in the watershed (if one's land is close to the check dams, stream course, or in the valley portion), combined with one's financial resources to invest in wells and lifting devices, tend to determine who gets access to how much water. Unless we can address this issue of regulating ground water use, no amount of watershed development would make a difference.[57]

The effects of drought and water problems are widely publicised and have led to an imperative to do something, but the underlying causes are less widely discussed and some issues (especially the effects of unsustainable ground water use for irrigation) seem to be consciously avoided. In fact, sustainability and equity in water resource management continue to be daunting problems in the

[57] Shah *et al.* (1998) also argue for sustainable use of ground water as part of the watershed project design so that ground water does not remain either under-utilised or over-exploited.

absence of policy initiatives in this direction (Soussan and Reddy, 2003).

### 5.5.7 Need for integrated planning, prioritisation of water use and social regulation

In Karnataka, the watershed development programme and the tank renovation, rehabilitation and management programme (under the Jala Samvardhane Yojana Sangha) go parallel and there is no effort to integrate them. In Maharashtra also, drinking water schemes are separate from watershed development efforts. Our review shows that in many places, there are either existing tanks that have been silted up and not under use or tanks that are functioning, but are not integrated in the watershed planning. By integration, one can probably overcome some of the problems related to upstream versus downstream as well as ground water versus surface water conflicts and also, to some extent, take care of the limitations of both if they function as exclusive systems (Datye *et al.*, n.d.; Paranjape and Joy, 1995).[58] Ralegaon Siddhi is an example of such integration.

### 5.5.8 The need to make applied water part of project design

This is not to say that water is not being used for irrigation purposes in watershed development areas. The farmers themselves have, however, paid full attention to the possibilities. One of the very visible impacts of watershed development is that water resource availability improves and the number of wells goes up rapidly. As a result, there is an increase in the irrigated area in a short span of time. The point, however, is that applied water, as a means of protective irrigation to stabilise even one crop, is not made part of the *project design*. Alternatively, applied water is equated with irrigation and seen as falling outside the purview of watershed development. There have been cases where watershed project proposals have been rejected because they contained a component of equitable water distribution system cost as part of the watershed project.

Whether watershed policy makers and implementing agencies see the two as separate or not, the farmers certainly do not see it as separate! They always try and join watershed development with an applied water system, which they see as appropriate. The review clearly shows that for the most part, the conventional approach of separating applied water (or irrigation) sharply from watershed development has already taken its toll, both from the social and sustainability angles.

Still, there have been isolated cases where the implementing agencies have taken certain measures or at least shown some sensitivity to this issue. The three areas where such initiatives exist are: a) water source mostly in terms of certain surface storages or encouraging to go for collective wells; b) water efficient technologies like drip (including certain low-cost drips); and c) promotion of less water intensive crops. There are other examples where water has been brought from outside the watershed (and from major and medium irrigation projects) to supplement the water requirements over and above the watershed development efforts. Examples like Ralegaon Siddhi and Adgaon fall under this. In the case of Adgaon, water is brought from the Sukna dam, which is about 10 km away, through pipelines and is used to irrigate primarily the orange/sweet lime gardens. Similarly, in Ralegaon Siddhi, water is lifted from the Kukadi canal (Kukadi is a major irrigation project) which is flowing from the side of the Ralegaon Siddhi village. This water is used to irrigate about 200 to 300 ha in the village.

[58] It illustrates how integration of local water with exogenous water can be done in the context of the Sardar Sarovar project. Narmada water through SSP is used as supplementary water to strengthen and stabilise the local water systems.

# CHAPTER 6
# EQUITY: CLASS, CASTE, AND GENDER

Equity, as a normative goal, is another extremely important issue in watershed development programmes. For a long time, however, it did not enter the discourse on watershed development. The focus of watershed development, and of earlier soil and water conservation programmes like bunding, was on resource conservation (and to some extent on resource augmentation). Equitable distribution of the increased resource was not on the agenda at all. As a result, most of the studies at that time did not look at distributive equity as an important factor in project assessment.

Things have, however, changed over the years. More and more people are now talking about equity and the term, in general, has acquired some acceptability amongst practitioners, researchers, policy makers, and donors. Studies on natural resource management in general, and watershed development in particular, have, therefore, also focused more on equity as a developmental outcome.

Our review of the watershed experience (and the broader literature on equity also) illustrates, however, that there is a wide range of understandings of what is meant by equity and how it manifests itself in particular watershed contexts. Addressing equity concerns in the watershed context, therefore, requires problematising equity itself and explicitly highlighting what is meant by equity.

Examining equity must, moreover, keep in mind the fact that watershed development, by its own logic, often promotes inequitable outcomes. This is so because the nature of benefits is based on one's spatial location within the watershed and on pre-existing inequalities of class, caste and gender. In areas where it is being promoted, it has to cope with this context of inequitable resource endowments.

This chapter examines how questions of equity are being addressed within watershed development programmes. We first look at what is revealed in the scant literature on watersheds and equity. The bulk of the chapter focuses on the spatial and socio-economic inequalities that exist within watersheds, the manner in which watershed programmes have attempted to address these inequalities, and the success or failure of such initiatives. It concludes with a discussion of gender and Dalit concerns.

## 6.1 Equity as assessed by the Gini coefficient

During the review, we came across two studies that have attempted to address the relationship between watershed development and inequality. Reddy *et al.* (2001) have undertaken a study of some of the successful watershed development projects in Andhra Pradesh implemented under the 1994 Common Guidelines and their impact on rural livelihoods. In dealing with equity, their main focus has been to see whether inequality has increased or decreased as a result of watershed interventions, by using the Gini coefficient for income levels of the beneficiary as well as non-beneficiary households before and after the watershed interventions.

Household income was measured in terms of two components – agricultural income and total income, which included agriculture and other activities like livestock, petty business, migration, etc. For beneficiary households, the Gini ratio for agricultural income and total income changed from 0.84 (before watershed) to 0.64 (after watershed) and 0.64 (before watershed) to 0.30 (after watershed) respectively. Similarly, for non-beneficiary households, the Gini ratio for agricultural income and total income changed from 0.86 (before watershed) to 0.70 (after watershed) and 0.70 (before watershed) to 0.33 (after watershed) respectively. These estimates indicate a substantial decline in inequalities across all sections, including non-beneficiaries. This is true of both agricultural and total income, though the inequalities are less with regard to total income due to a greater dependence on non-agricultural incomes/activities. This would indicate that the poor seem to have benefited more from employment outside their own farm, while the rich benefited more from their own agricultural development. The imbalance between

agricultural and non-agricultural income indicates that benefit flows from non-agricultural sources are more equitable. According to the study, the over-all indication is that inequalities have declined after the advent of watershed development (Reddy *et al.*, 2001).

However, this rather optimistic picture cannot be generalised because, as the researchers themselves have said in the study, the sample does not represent all types of projects in terms of their performance. In fact, the purpose of the study was mainly to demonstrate the potential of watershed programmes, if implemented properly. A study of the Kandi Watershed Development Programme in fact argues that, in the case of families engaged in cultivation, the income inequality has widened, that is, the Gini concentration ratio for household income increased from 0.32 in 1979-80 to 0.42 in 1986-87 (Singh *et al.*, 1993).

These differing conclusions emphasise the need to examine the watershed-equity question more carefully. Why is it that in one case, inequalities seem to have lessened, while in another, they have increased? In order to answer this question, we examine what some of the *a priori* reasons might be for increasing inequalities and then see what types of efforts have been made to address inequity.

## 6.2 Watershed development: existing inequalities

The increased awareness about equity issues in watershed development is an acceptance, at one level, of the fact that watershed development *per se* does not promote equity. While watershed programmes are supposed to address rural poverty, the fact that watersheds are a land-based technology suggests that the landed will be the primary beneficiaries as benefits will mostly follow the contours of existing inequalities and property rights. Because there are significant inequalities in terms of access to productive assets and resources, watershed development could potentially reinforce existing inequalities.

Moreover, spatial inequalities also exist. Primarily because of the biophysical characteristics of the watershed (like slope, depth and structure of soil, underlying geology and a host of other factors), benefits accrue unevenly across the different parts of the watershed. Those in the valley portion are likely to benefit much more, especially in terms of water resources, as compared to the upper or transitional zones within the watershed. This is because no matter what measures are taken in the upper reaches of the watershed, the effects of percolation accumulate more in the valley portion, which is the lower part of the watershed. Watershed development is asymmetrical also because the people in the upper reaches have no real control over this process. In the case of irrigation command areas, the asymmetry works in the reverse. The head reach farmers can control the flow going to the tail-end portion of the command and the tail-enders do not have any control over this process. The reverse is true for watershed because the watershed hydrology changes as a result of the watershed interventions. The emphasis on converting all the water into ground water results in people in the valley portion getting most of the benefits.

Most of the water-holding structures like check dams, storage tanks and larger nallah bunds are also generally located in the valley portion of the watershed area. Plots closer and downstream to these structures and water sources get much more water as compared to those plots that are placed farther away and upstream from the structures. One of the important physical attributes of water, which causes negative externalities, is the uni-directionality of gravitational water flow.

Also, since watershed interventions are carried out mostly in the upper reaches of the watershed, this can impose greater costs on families in the upper reaches. The upper reaches of watersheds contain a larger proportion of uncultivated common land that is often denuded. Protecting such land against erosion requires vegetating the landscape, which, in turn, means placing restrictions on grazing and firewood collection. This imposes costs on the poor. The landless and women, who make use of the commons the most, are likely to be most affected. Moreover, the benefits of water harvesting are mostly downstream where wealthy farmers invariably have more of the land. Inhabitants of the upper reaches, therefore, are providing an unpaid environmental service to the lower reaches

(Kerr, 2002b). Generally, resource-poor farmers like Dalits and small and marginal farmers tend to have inferior quality land mostly in the upper reaches of the watershed while rich farmers are concentrated in the valley portion.

Another possible conflict is between farmers within the watershed and pastoralists. Kerr *et al.* (2000) highlights the conflict of interests between herders and agriculturists in Maharashtra. In some cases, the closing of the commons for regeneration has denied herders their traditional rights. Herders, in fact, complained that even where regeneration had already taken place, the commons have remained closed to them. This threatens their livelihood interests (Kerr *et al.*, 2000).

All these examples highlight the close inter-linkages between socio-economic and spatial inequalities.

## 6.3 Addressing inequalities

The Eswaran Committee, which looked into the question of training and capacity building in the context of watershed development, especially after the 1994 Common Guidelines, has been quite forthright in expressing its concern for equity as one of the goals of watershed development programmes. To quote from the Executive Summary of the report: "There is a need for undertaking activities for the benefit of the rural poor, namely landless and other weaker sections. It should be clearly provided that the landless and other weaker sections of the Watershed Community have equal rights of access and use of resources available in the form of agricultural products, namely, fruits, fuel and fodder, etc., in the village common lands. Whenever community assets are created in the form of community water resources, fishponds, etc., a mechanism of sharing them with the rural poor, namely the landless and other weaker sections, should be worked out along with sharing of usufructs from village common lands. Some of the benefits, which would accrue from watershed development programme, would be in the form of greater and equitable rights like generation of employment, higher agriculture production and availability of greater biomass, especially fuel wood and fodder. This could help in better opportunities for non-farm employment for the rural poor and an increase in the general wage level due to increase in opportunities" (GoI, 1997).

To what extent the concerns of the Eswaran Committee have been addressed needs to be examined in detail. In order to examine the impact of watershed interventions in terms of equity, however, it is necessary first to understand the structure or composition of the watershed community and the ways in which different social sections depend on watershed (ecosystem) resources for their livelihoods. Potential beneficiaries include: agricultural labourers (including the landless), poor and marginal farmers who also hire out labour substantially, middle peasants, rich/large farmers, women, Dalits and shepherds (especially those who still continue with their traditional migratory practices and who depend on seasonal migration). Since the question of how different social sections meet their livelihoods is related to the question of equity and access to resources, it is very important to keep track of the changes the watershed development interventions make in the way different social groups earn their livelihoods and to see whether or not land concentration, caste hierarchy and patriarchy are at all touched by such interventions. Only then can there be discussion of the success/failure of watershed development interventions.

Kerr (2002b) has worked out a detailed typology of approaches used by different projects in India to address the issue of equity. They include: a) working in particularly poor areas; b) employing poor people to construct watershed works; c) counting on trickle down benefits to reach poor people; d) being sensitive to poor people's needs during implementation; e) undertaking non-land-based activities that support poor people's livelihoods; f) giving poor people decision making power; g) using subsidies selectively; and h) guaranteeing poor people usufruct rights to the resources, whose productivity the project enhances (Kerr, 2002b). However, it should be noted here that this typology does not explicitly talk about equitable access to water or equitable sharing of the increased water resources.

These varying emphases have different degrees of potential to address inequities within the watershed. However, not only might they aggravate inequities as we illustrate below, but often, the intended benefits of distribution may not materialise. In what follows, we consider specific interventions and how they have addressed questions of equity.

**Box 6-1: Villages with higher incidence of landlessness not eligible for watershed programme**

Generally, it is taken for granted that the watershed programme is supposed to address the issue of rural poverty. Incidence of landlessness is considered one of the indicators to assess the extent of rural poverty. Resource degradation and poverty are some of the criteria for selection of watersheds under different programmes. However, there are instances where higher incidence of landlessness can make a village ineligible for the programme. For example, the Indo-German Watershed Development Programme gives preference to villages with less landless people. MYRADA also has a similar criterion. More than anything else, it is a frank admission by the implementing agencies of the limitations of the watershed programme to address the livelihood issues of the resource-poor sections, especially in situations where the proportion of the landless is very high.

*Source:* Discussions with the officials of the organisations and reports and documents; for MYRADA Fernandez (1994).

### 6.3.1 Land-based activities

In watershed development, most of the components are land-based activities. Thus, it would seem quite possible that the benefits mostly accrue to the landed sections and within the landed sections, the rich and large farmers in particular. The bias towards the landed also gets reflected in the pattern of expenditure on different activities in watershed programmes. An analysis of the expenditure pattern shows that more than 70 percent of the funds are used for land and water management interventions that predominantly benefit larger farmers. Only 7.5 percent are being used to support the livelihoods of poor and landless families (Soussan and Reddy, 2003).

The ridge-to-valley approach, which has been adopted in many watershed programmes, is an attempt to address this imbalance. This approach gives preference to small and marginal farmers who are located on the degraded slopes of the higher reaches of the watershed. This is commonly known as equity in coverage (Soussan and Reddy, 2003). In the Adihalli-Myllanhalli watershed, BIRD-K consciously decided to spend as much money as possible in the upper reaches of the watershed so that the poorer farmers who have land in the upper reaches benefit. A conscious decision was taken to spread the expenditure evenly across the watershed.

ISPWDK has adopted other land-based strategies to address issues of inequality. This programme has attempted to regenerate the fallow lands at the foothills or close to the ridge on a priority basis as these lands belong to the poor. These lands are of poor quality and very difficult to reclaim. Out-migration of people from this area makes the problem more acute. Another strategy has been to bring the non-cultivated, inferior quality land of the poor under cultivation.

Such attempts to address inequities within the watershed through land-based activities have, however, had many shortcomings. First of all, while the ridge-to-valley approach helps spread expenditure more equitably across the watershed, it does not guarantee the resource-poor any share in the improved resources like water, which is generally appropriated by farmers who are located in the valley portion. Second, it is usually those with some amount of land who benefit from such strategies as the benefits are often in terms of irrigation. Third, there are short-term costs in terms of interventions in the upper reaches. Protecting common lands, for example, means that the landless cannot graze their cattle. In Manjanahalli, where the landless were given land, many leased out their lands for amounts ranging from Rs.2,000 to 10,000. The main reason the landless did not cultivate the land was that they did not have bullocks and could not afford to hire bullocks or tractors. The PIA has not taken any initiative to make sure that people get access to the necessary inputs for cultivation. Very often, it is not enough to give land to the landless. They also have to be provided with the necessary inputs and support as they are first time cultivators. Though there are government schemes to benefit the resource poor,[59] people are not aware of them. The implementing agency has also not helped them utilize such schemes.

[59] An example is the Ganga Kalyan scheme, wherein people from the Dalit community can get a well dug with electric connection free of cost.

**Box 6-2: AFARM disillusioned with present day watershed development: Adopts targeted approach to address the problems of small and marginal farmers**

AFARM, which has been at the forefront of the watershed programme in Maharashtra, is having second thoughts about the efficacy of watershed programmes in addressing issues of equity and, hence, has decided to adopt a more targeted approach. After many years of work, AFARM has come to the conclusion that the farmers who have lands in the valley portion are the ones who siphon off the benefits of watershed development. AFARM has already initiated a programme in Sugirpada village, Nandurbar district, (Maharashtra) covering about 60 marginal households with an area of 100 acres. Though the programme does not use a full-fledged watershed approach (for example, they do not follow the ridge-to-valley approach here), they do contour and soil surveys, and use several soil and water conservation measures as well as dry land agricultural techniques such as furrow and ridge method, contour ploughing, and inter-culturing (loosening soil). Crop based training in dry land agriculture is also part of the programme. AFARM has also started a grain bank and an implement bank. The implement bank, together with sharing of work, helps in timely agricultural operations. Attempts have also been made to initiate different types of composting (like NADEP) so that more organic matter goes into the soil. Farm ponds for protective irrigation have been initiated. Similar programmes have now been started in a couple of villages (like Budhehal and Chopdi) in Sangola taluka and Kini village in Akhalkot taluka – both in Solapur district of Maharashtra.

*Source:* Discussions with Dr. Ghare and Shri Tamboli of AFARM

### 6.3.2 Common lands

The development of the commons offers the best bet for the resource-poor, especially landless, to get any tangible benefits from the watershed programme. At the least, the rejuvenation of the commons improves availability of fodder and fuel and to the extent the poor benefit more from this, inequity will be addressed. However, a general improvement in the status of CPRs does not automatically guarantee the resource poor sections access to the improved resources.

Although most watershed projects aim at regenerating the commons through soil and water conservation measures, planting and protection, we find that by and large, the performance has not been good, except in some of the successful early generation projects like Sukhomajri and Ralegaon Siddhi. There are two reasons for this. As mentioned above, certain interventions hurt the poor in the short run. Second, there are implementation problems. Grazing bans are a case in point. In many villages of Maharashtra where watershed development has taken place, Dalits and agricultural labourers who have small ruminants have been affected by grazing bans (Kerr *et al.*, 1998). The case of Adgaon offers a glaring example. People here were forced to get rid of their goats and this affected their livelihoods. Nearly a hundred women from the village were taken to the Mahatma Phule Agricultural University at Rahuri to be "educated" on the environmental hazards of keeping goats. Despite this "education", the local people were angry when nearly 5,000 of their goats were taken away. The *Asthayi Samiti* (ad-hoc committee) from Adgaon had to bear the brunt of their rage.

The general feeling, however, remains that not enough is being done to treat the commons within watershed projects. The Mid Term Evaluation (MTE) report on the KAWAD project points out that while the KAWAD project documents highlight the importance of CPRs, in practice little attention is paid to CPR-based interventions. The evaluation reveals that CPRs do not surface during discussions in the MWSDCs and that this has serious implications in terms of employment generation (Iyengar *et al.*, 2001).

ISPWDK is of the opinion that if the resource-poor (the landless for instance ) are given the right to harvest the grasses and fuel from the regenerated common land on a priority basis, then it can partly meet the livelihood needs of the poor. Other opportunities exist in terms of planting high value medicinal plants on common lands as a JFPM activity, and harvesting and processing them into medicinal products that

have a huge market today. In Golhalli village, the main gain for the resource-poor has been fuel-wood from the common land. Since the planted tree species are very good coppicers, the vegetative regeneration is rapid even though the trees are cut regularly.

In the case of the KAWAD project, the MTE called for a reappraisal of the projected benefits from CPRs (estimated to be as high as Rs.1,750 million) because they found that the assumptions on which the estimated benefits were based, like the availability and productivity potential of CPRs, were very optimistic (Iyengar *et al.*, 2001). This suggests that there might be limits to a commons-based strategy in certain situations.

### 6.3.3 Water

Water, in one sense, is the most critical component for increased productivity and livelihoods. Hence, development of water resources through watershed development has serious equity implications. Experiences as well as different studies show that in comparison to other measures, applied water makes the most vital difference to productivity enhancement in the context of watershed development (Shah, 1998). Unfortunately, this is one of the most overlooked aspects of watershed development.

In respect of equity, water is a troublesome issue. In most cases, water is treated as private property. Watershed programmes rarely aim to guarantee a certain minimum access to water for irrigation and productive purposes. This is one of the weak links in the watershed programme. By and large, there is neither prioritisation in water use nor any norms for water distribution. Since water rights are tied to land rights, both the location as well as the size of one's holding generally determines who gets how much water. People who have land in the valley portion and close to the water harvesting structures get the most water. Equitable water distribution is rarely part of the mainstream watershed agenda.

The other problematic issue in the context of equity is that of water markets. There is significant evidence to suggest that water markets have emerged in many areas. For example, during our field visits in Karnataka, we were told that the borewell owners sell water to those who do not have access to other sources and, in return, get 25 percent of the produce. Similar practices known as *ek chouthai* (giving one-fourth of the produce) exist in parts of Maharashtra. Such phenomena suggest that watershed development efforts, in the absence of any social control over ground water and equitable distribution, will only further skew the already skewed access to water and even lead to "water-lordism". While the discourse on water markets suggests that this need not necessarily be so, in the watershed context, it certainly seems to have enhanced inequalities. The extreme case is where the investment for the creation of water comes from public funds, but the water is ultimately used for private profit making.

There are, however, examples where equity is addressed in a much more redistributive manner. Some of the oft-cited examples in this regard are Sukhomajri, Ralegaon Siddhi and Pani Panchyat. As mentioned earlier, in Sukhomajri, the money collected from water charges was equally distributed amongst all the households (Kerr, 2002a). In Ralegaon Siddhi, collective wells were promoted and informal groups of farmers were organised to manage these wells (Paranjape *et al.*, 1998). In the case of Pani Panchayats (Box 6-3) in Pune district, per capita water distribution norms were adopted (Paranjape *et al.*, 1998; Pangare, 1996). The same principle was applied in the case of Bali Raja Dam (a small weir with a capacity of about 20 Mcft of water) in Sangli district of Maharashtra.

**Box 6-3: Principles of Pani Panchayat**

The Pani Panchayat movement put the question of equitable distribution of water on the socio-political agenda of Maharashtra in the early 80s and tried to link water with the livelihood needs of the people. The Pani Panchayat movement is based on the understanding that water is a natural resource and so all the villagers should have a right to use it on a proportionate basis. The basic principles around which the Pani Panchayats operate are given below:

Only group schemes are undertaken and schemes for individual farmers are discouraged. This fosters community spirit.

Access to water is on the basis of the number of persons in a family and not in proportion to the size of the land holding of the family. The norm is that water is made available for half an acre of irrigation per

person (per capita water distribution), with a maximum of 2.5 acres per family. The land in excess of 2.5 acres remains under rain-fed conditions.

Water rights do not go with the land but remain with the individual beneficiaries.

Beneficiaries should share 20 percent of the cost of the scheme in proportion to their water share. The remaining 80 percent is given by the Gram Gourav Pratishtan Trust as an interest-free loan to be repaid in five years.

The beneficiaries should take up the responsibility for management, operation and maintenance of the scheme.

Water-intensive crops like sugarcane are not to be grown in the service area of the scheme. This will allow for more seasonal crops under protective irrigation.

The landless also have water rights.

*Source:* (Pangare, 1996; Paranjape et al., 1998)

There have also been interesting experiments in the recent past with regard to water distribution in watershed programmes. In Adihalli-Myllanhalli (BIRD-K), farm ponds were constructed for farmers near the ridgeline. Each farmer had a pond constructed on his/her plot. It was also decided that neighbouring farmers could manually take water to water their trees and horticulture plants. The NGO, Manavlok, provided financial assistance to villagers in Bhavthan village who were willing to go for collective wells. However, this experiment does not seem to have sustained itself.

In Manjanahalli watershed, all the people were allowed to take water manually from the ponds. Apparently, only about 15 farmers could provide protective irrigation manually from the ponds for horticulture and forestry plants. This was one form of sharing practised by the farmers. The owner of the pond was allowed to pump the water. This water sharing arrangement was decided upon in one of the meetings by the Sangha (group of farmers in the watershed).

However, from the point of view of equity, things do not seem to have gone the way they were originally intended to, especially in the case of intervention by BIRD-K. Not all farmers have ponds. Moreover, though the ponds were constructed as storage ponds, they ultimately became recharge and percolation ponds. As a result, the ponds in the upper reaches did not hold water and the people could not use them as a source of applied water. Eventually, farmers who had land in the valley portion (especially coconut farmers) benefited much more from the ponds. Farmers in the upper reaches who cultivated horticulture crops did not get water when they needed it.

It might have been better, therefore, if some of these ponds had been strategically used as (buffer) storage tanks with appropriate linings. These tanks could then be refilled as per requirements with recharged water from the valley portion (open wells, borewells or other surface water bodies behind the check dams) and used for equitable water distribution. Also, the hurried construction of ponds did not allow for institutional arrangements for proper management of these ponds to emerge. If BIRD-K had phased out the construction of the ponds using an observation-based approach (in terms of location, role, refilling and sharing), then probably some of the technical flaws could have been avoided. Such an approach would have also helped the people observe the impact of these ponds.

### 6.3.4 Non-land based activities

Promotion of non-land based activities (NLBAs) as part of watershed development programmes is increasingly being taken up in many projects to address the livelihood issue of resource-poor sections (like the landless, small and marginal farmers, women, and craft persons). Activities such as food processing (ragi malt making, pickles, processing of pulses into dals, etc.), ragi and finger millet cleaning, small flour milling, tailoring, carpentry, pottery, selling dry fish, and loudspeaker hiring are being taken up as part of NLBAs in many watersheds like Adihalli-Myllanhalli of BIRD-K, Vaiju Babhulgaon of IGWDP, and in some of the NWDPRA projects like Manjanahalli.

It is worthwhile to look at a few examples of such activities. In the Manjanahalli watershed, the PIA has just set up an agro-processing unit whose chief components are a ragi cleaning machine and a flourmill. Generally, two people are employed in each unit. Cleaned ragi fetches 50 paise more per kilogram than un-cleaned ragi. Powdered ragi fetches a good price in urban areas. The

expectation is that income from such activities will be comparatively higher than that obtained from agricultural labour.

KAWAD channels its NLBAs through SHGs. Also, KAWAD projects set aside approximately Rs.1400 per person to promote such activities. Specialised agencies like RUDSETTI and SUTRA have been contracted into the project to explore different options for NLBAs and train people in different skills. SUTRA has initiated a couple of small Pongamia oil extraction units in the KAWAD watershed area; these employ a few people each.

Most of these activities are similar to the ones promoted in various other rural development programmes and have usually not been very income enhancing. The Mid Term Evaluation Report (2001) echoes the same view – the NLBAs are mostly conventional ones. These include trading, such as bangle vending and vegetable selling, traditional skill-based activities, such as pottery and carpentry, as well as contemporary skills, such as motor winding and crane repairing.

Another important question is that of sustainability. For example, the extraction units of Pongemia seeds set up by SUTRA are experiencing problems because their products are not in demand and do not have a proper market.[60] Sustainability questions here, therefore, pertain to incomes of the poor. There is no mechanism within MWSDCs or SHGs that support target groups on a preferential basis (Iyengar *et al.*, 2001).

A bigger problem is that these non-farm activities have very little direct linkage to watershed management. The strict division between land-based and non-land based activities and the tendency to push the resource-poor towards NLBAs could result in a situation in which the resource-poor sections may not have a stake in the management of natural resources. Consequently, they may not have any motivation to participate in the programme. This can affect not only equity but also sustainability (Pender and Kerr, 1998). Finally, attempts to provide *only* non-land based activities to the poor might actually alienate them further from any claims on the resources generated through watershed development programmes.

### 6.3.5 Attempts at risk proofing/pooling and sharing arrangements

We came across some other experiments aimed at addressing the needs of the marginalised. In a couple of places, like Ralegaon Siddhi and Dornali, grain banks have been started. The grain bank in Ralegaon Siddhi has been functioning for quite some time now. In Dornali, the grain bank started in 2001. Anyone in need of grain can become a member in the grain bank. The bank distributes grain to the members in summer months or during drought. In Khudawadi, the women's group took private wasteland on a long-term produce sharing arrangement and started plantation on it. In Chikamatti village in Chinnahagari watershed of Chitradurga district (KAWAD project), an effort has been made to bring revenue land (10 acres) under plantation with a produce sharing arrangement between the MSWDC and the village Panchayat. MYRADA, the IA, has taken the lead in this. People have themselves come forward and are doing the maintenance work. Whether such efforts are sustained and whether they make a perceptible difference in terms of equity needs to be explored in greater detail. Nonetheless, these seem to be creative interventions.

### 6.3.6 Wage employment

Employment generation is one of the stated objectives of many of the watershed programmes (GoI, 2001). The logic is that watershed development generates additional employment and in that sense has a trickle down effect on the resource poor. There are studies, which show that a watershed development approach has been more successful than poverty alleviation and employment generation schemes such as JRY, NREP, etc. Unlike JRY, NREP or other employment generation programmes, watershed development programmes are designed to create both employment and assets for local people, taking advantage of the natural capacity for regeneration inherent in a biomass-based system (Chopra and Kadekodi, 1993).

[60] Information provided by Yasmin Master and Vidya Ramchandran of MYRADA (which is the Implementing Agency of KAWAD project in Chinnahagari watershed in Chitradurga district).

Shah and others argue in favour of an employment-based growth strategy for India and are of the opinion that watershed development, if done properly, offers the best bet. According to them, "even spending about 1% of the national income on watershed development programmes can lead to both employment guarantee and food security in rural India – in a manner both non-inflationary and sustainable. It results not merely in "revolving" but truly long-term "sedimented" employment, a phrase made famous by Joan Robinson and K. N. Raj in 1956" (Shah *et al.*, 1998).[61]

Our enquiry suggests that watershed development programmes have been able to generate considerable employment opportunities for agricultural labourers and other resource-poor people. Most third party evaluation studies and reports by concerned implementation agencies and NGOs not only buttress the point, but also go a step further and assert that employment generation is the major gain for the poor from watershed projects. In places such as Adgaon, full employment was created. The demand for wage labour trebled. New institutions emerged for mutual exchange of labour among farmers to overcome shortage of labour.

Giving work on contract to a group of workers is another current practice, in particular for harvesting work. Normally, wages are paid in kind for harvesting work. Working in teams of seven or eight, each of these groups harvests a minimum of seven and a maximum of 15 quintals a day. On an average, each worker grosses seven to eight kilos of grain per day. Over the years, wages have increased though the difference between the wages of men and women remains. However, the increase in the availability of labour cannot be fully attributed to watershed development alone. Moreover, migration continues to be an important phenomenon in watershed areas, especially in drought-prone areas such as Bijapur, suggesting that watershed interventions have a limited impact in terms of overall livelihood enhancement.

A more disaggregated examination in terms of the implementation and post-implementation phase is also important here. Since the emphasis in the implementation phase is on physical works (various soil and water conservation measures that account for nearly 70 percent of expenditure and which has been discussed in Chapter 3), employment opportunities are significant. Of late, however, such employment opportunities have been reduced somewhat because of the use of earthmoving machinery for earth works like bunding, levelling, etc. In KAWAD watersheds, machinery is extensively used for most of the physical treatments like bunding, land levelling and land reclamation through boulder clearance. Extensive use of heavy machinery for earth work takes away even this opportunity from the rural poor.

The post-watershed phase is different. Conventional wisdom suggests that watershed development leads to intensification of agriculture (because more land is brought into crop production, increased water availability makes it possible to go in for more than one crop, and so on) and, consequently, increased availability of agricultural employment. However, the veracity of this statement depends upon the nature of agricultural production and the type of change watershed development brings with it. For example, if the emphasis is on perennials like horticultural crops, then the labour absorption is limited.

While employment generation has been targeted mostly at the marginalised within watershed programmes, the outcomes have not always been as intended. In Dornali village, agricultural labourers got employment, especially in the initial phase of the programme. In some of the villages of IGWDP and ISPWDK, the landless are given priority in labour work and "fair" wages are provided. However, very often, the rich and large farmers in the area are against paying higher wages to the labourers on watershed work sites as this would raise the general wage rate in the area, especially for agricultural work. As a result, organisations like MYRADA always follow the prevailing local wage rates, as they do not want to "disturb" the village structure. In PIDOW-MYRADA, labourers generally work in agricultural fields during kharif and rabi seasons and in watersheds during summer.

[61] According to Joan Robinson and K. N. Raj, "the employment associated directly with the investment process may be called revolving employment. The other type of employment, which is connected with the sediment of productive capital left by the investments, may be referred to as sedimented employment" (Raj K. N., 1990, p. 179) as cited in Shah *et al.* (1998).

Another area of variation between different organisations and their approaches is with regard to the use of machinery for soil works. In most cases, the use of machinery is not generally encouraged as it cuts into employment opportunities for the labourers. For example, in the case of ISPWDK projects, the use of machinery is not encouraged for land-based activities. In the case of PIDOW, machinery was used only in one phase (out of four phases) of the entire project period because the work had to be completed within the deadline. Sometimes, machinery was also used for heavy work, which could not be carried out by human labour. In some of the bigger villages in the KAWAD watershed area, there are about 8-10 bulldozers owned by the rich farmers. Thus, a fair share of the investments in the watershed programme, instead of accruing to the local, resource-poor people as wage, goes to resource-rich sections within the village as rent and to the manufacturing companies and their agents as profits. The conflict between technology and employment is, therefore, an important issue to be considered while planning future watershed programmes.

### 6.3.7 Pricing out the poor

Over the years, there has been an increasing emphasis on contribution from beneficiaries, especially for taking up work in private lands. There is great variation in the proportion of cost sharing as also the mode of payment across different agencies and also states. Generally, the contribution ranges from 10 to 30 percent of the cost. In most of the projects under the Common Guidelines, there is flexibility in terms of the mode of payment – cash or labour. In Karnataka, KAWAD is one project in which the contribution is considered to be very high; for certain components of the programme, it comes to 40 to 50 percent of the cost. KAWAD also insists that the contribution be made in cash upfront. In the Kollegal project of MYRADA, the contribution for individual works is very close to 100 percent (Kolavalli and Kerr, 2002a).

Though the ostensible logic behind high levels of contribution is to enhance people's participation and sense of ownership, we suggest (this has also been brought out by the MTE report) that it has become an instrument of exclusion. Many small and marginal farmers cannot take up any land-based activity because they are unable to afford it. This concept of high individual contribution as a pre-condition for taking up land based activities also maps on to KAWAD's decision to do away with the ridge-to-valley approach.

Cost sharing often impacts the poor more. Costs are largely borne by farmers in the upper reaches as much of the work is undertaken there. If watershed development is to address the interests of the poor, institutional arrangements have to be put in place to tackle the issue of sharing of benefits and costs (Kolavalli and Kerr, 2002b).

## 6.4 Dalits, livelihoods, and watersheds

Thus far, we have talked mostly about disparities in terms of class or resource endowment and spatial location - for example, on the differential impacts on farmers with different sizes of landholdings and agriculture labourers or farmers situated in different reaches. There are, however, also important gender and caste issues, which, to some extent, overlap with the class question. We turn to some of these issues here.

There is no systematic literature which looks very closely at the impact of watershed development on Dalits. It only reflects the reality on the ground that Dalits and other historically (and socially) disadvantaged sections have been in the periphery of watershed efforts. In fact, class and caste converge to produce a situation in which the Dalits and other socially disadvantaged sections are invariably the ones who do not have access to resources, especially land. Even in the case of those who have some access, their lands are generally degraded and located in the upper catchments. Thus class and caste also map on to locational advantages and disadvantages in the context of watersheds. Since watershed development is primarily a land-based programme, unless special institutional and social arrangements are made to go beyond the constraints imposed by property and caste relations, there is nothing intrinsic in the programme to address the concerns (and also participation) of Dalits. In fact, there are certain preconditions like complete ban on grazing and closure of commons, which can directly go against the interests of the Dalits. A classic example is Adgaon where the Dalits and agricultural labourers lost an important source of

their livelihood as they had to sell off their goats because of the ban on goats. Because of this, the Dalits became very hostile to the watershed development programme in the village. In the mainstream watershed development programme, increased wage labour opportunities and SHG activities are the only two avenues open for Dalits to improve their livelihoods. By and large, the experience has been that the core of watershed development programme bypasses the Dalits.

Also, certain initiatives of the State (and not necessarily related to watershed development programmes *per se*) could affect Dalit interests even further. For example, it has been reported that in Nalgonda district (Andhra Pradesh), there has been a recent Government Order (GO) which would, in effect, reverse assigned usufruct rights. This would be disastrous for Dalits as most of their land holdings are government assigned lands. In Medak, the common lands developed by the Dalit women are now being assigned to non-Dalits (WASSAN, 2001). As Dalits are often agricultural labourers or marginal farmers, the concerns raised earlier with regard to the more marginalised groups are valid in the case of Dalits too.

However, we should also take note of some of the new initiatives (though very, very few) that are trying to address the concerns of Dalits. For example, WASSAN, an NGO, organised a meeting in January 2001 to identify Dalit concerns in watershed programmes. The three major concerns that emerged were: a) the need to pay greater attention to private lands belonging to Dalits; b) the need to focus more concretely on common lands; and c) the need to address non-farm employment concerns.

In addition to these tangible concerns, the forum also highlighted the need to address the issue of Dalit participation in watershed management. Reference was made to the need to have some sort of proportional representation for Dalits within watershed committees and even to have "Dalit" watersheds, an issue that suggests that addressing Dalit concerns in mainstream watershed programmes is perceived to be difficult. This concern for Dalit "autonomy" was also expressed in terms of SHGs, that is, SHGs for Dalits (WASSAN, 2001).[62]

## 6.5 Gender issues

Gender issues have two dimensions: namely, the manner in which women are involved in the watershed development process, and how watershed programmes address the concerns of women specifically. The discussion on gender here is restricted to the latter issue; the former is discussed in the chapter on participation.[63]

The impact of watershed development on women has assumed some importance over the last ten years or so. The Common Guidelines (1994) stated that it was necessary to give "special emphasis to improve the economic and social conditions of the resource-poor and the disadvantaged sections of the watershed community such as those without assets and women" (GoI, 1994). Beyond such statements, however, there does not seem to have been much emphasis on women's needs. Determining the extent to which women's needs have been addressed in the course of watershed management requires more careful scrutiny.

Although literature on the subject is somewhat scant, a number of points can be

[62] The meeting organised by WASSAN was the first of its kind in the watershed development context exclusively to address the issues of Dalits (and also other disadvantaged sections like women and landless). The report of the meeting clearly reflects that the issue of livelihoods of Dalits and watershed development needs to be contextualised within the wider questions of social discrimination (like untouchability) and oppression. The document also explores and comes up with certain firm suggestions with regard to a) The components of the Dalit Agenda; b) Rural livelihood options for Dalits; c) Institutional Issues; and d) Programmatic Issues. For details see WASSAN (2001).

[63] For a good exposition on the issue of gender and watersheds, see Seeley *et al.* (2000). The section titled "Strengthening the Participation of Women in Watershed Management" in Farrington *et al.* (1999) discusses some of the issues related to women's participation and also some of the positive experiences of organisations like Deccan Development Society in Andhra Pradesh and also of Indo-German Watershed Development Programme in Maharashtra. It also outlines the type of policy initiatives needed to strengthen women's participation in watershed programmes and also to see that the programmes reflect women's needs, concerns and viewpoints.

made. In theory, improvements due to watershed development should benefit women as well. If, for example, the availability of water is enhanced within the watershed, this would have positive implications for women as their task of fetching water becomes easier. Further, treatment of the upper reaches of the watershed could result in lesser effort by women in procuring fuel wood, fodder, and so on.

D'Souza (1997) also highlights a number of other tangible benefits: a) increased employment because of the physical treatments of the watershed and also because of the extension of agricultural period (sometimes this is also seen as a negative impact on women because it increases the workload); b) income and skill development through nursery raising and allied activities; c) income generation through dairy, stall-fed goat rearing and poultry keeping; d) improvement in the health and lifestyle of women; and e) increased access to credit and, as a consequence, improved status both within the household and in the village (D'Souza, 1997).

However, there are potential negative impacts as well, especially in the short-run. First of all, watershed activities can have a restrictive impact (in the short-run) on households within the upper reaches – especially due to restrictions on the commons. This is likely to have a negative impact on women. For example, the complete closure of the village commons in Adgaon meant that women had to travel even longer distances to meet fuel-wood and fodder needs as a result of watershed interventions. Sarin has computed that women spent three to four times more time to collect fuel-wood. Also, women had to shift to Lantana (difficult to collect), steal from others" forest (and pay hefty fines), buy firewood, or use very low quality fuel like leaves, dung, and thorny bushes. (Agarwal, 2001). Since women's role has been very often restricted to SHG type of activities, they have been kept out of the core of watershed activities – conservation and development of land, water and biomass – and denied access to these resources in their own right as women. Women have tended to be marginalised in watershed development projects because of the focus on land development, which makes it male-focused, given the control of land in most parts of India (Seeley *et al.*, 2000).

Another indirect benefit women seem to have got from the watershed programmes is the easy access to drinking and domestic water, fodder and fuel. Generally, these are chores where women's labour is primarily involved (as a result of patriarchy and the gender division of labour). Thus, enhanced resources like water, fodder and fuel have helped women in decreasing their drudgery (both in terms of a decrease in labour as well as time). Many of the evaluation studies of watershed development use indicators like reduction in the time spent in fetching drinking water, fodder and fuel to assess the programme from a gender point of view. It is very seldom explored as to what happens to the time thus saved. Do women really have control over the time saved? The answer is generally no. This has happened in the case of drinking water projects, which are aimed at providing water at the doorstep and reducing women's labour. However, time freed from fetching and storing water becomes extra time available for patriarchy. As a consequence, even though women do save labour and drudgery on one task, there may not be an overall reduction in their drudgery. Also, the old adage that housework expands as per the availability of time comes true. Since women now have more time, they are expected to do many more things – both within the house and in the field – things, which they normally would not have done earlier. So, while the drudgery of the particular task of fetching water is reduced, it does not mean a consequent reduction in the overall burden that they shoulder.

In the watershed context, women's burden is also related to intensification of agriculture, an indicator many researchers use to measure the success of watershed programmes. Intensification of agriculture takes its toll on women in terms of increased work as cheap (and often unpaid) labour. Countering this increase in drudgery involves an overall empowerment of women within the household and outside (Joy and Paranjape, 2002).

However, the wider question of empowerment of women cannot be addressed if one takes only an instrumentalist viewpoint on gender (women for watershed development or watershed development for women is the question). This has been very obvious in the context of women and drinking water/sanitation programmes. Women are often seen as an instrument to achieve goals set with respect to water. In the process, women's own needs and perspectives

tend to be sidelined. As Sara Ahmed (drawing from different authors like C. Green, S. Joekes and M. Leach; C. Van Wijk-Sijbesma and Vandana Shiva) points out, "In rural areas, women are almost exclusively responsible for collecting water for domestic purposes and for health and hygiene at the household and community level. Water scarcity has a direct impact on the time that women (and girls) spend in water collection and hence, the time available for other work as well as on their access to water within the household. Recognising women's multiple roles as providers of domestic water, as guardians of family health and as managers of water at the community level, water resource planners have increasingly sought to integrate women in water development initiatives. However, despite the allocation of resources and the growing multiplicity of well-intentioned statements, the rhetoric of women's participation overlooks the divergent needs and interests that rural women have in relation to water which are mediated by social relations of power at the household and community levels. In addition, bureaucratic organisations, which are responsible for water management, are largely insensitive to the gender-differentiated needs and interests of water users or their capabilities as community water managers" (Ahmed, 2000).

There is a dual kind of awareness that is needed if women's needs are to be addressed, even as water needs are met, and women are not to become a medium – an additional and somewhat more effective pressure group in bringing about an improvement in the water (especially drinking and domestic water) sector.

Unfortunately, the growing NGO-isation of developmental activity has also brought in its wake a fragmentation of issues, of tasks and activities that can fit in with a "project mode" approach. While such project mode activity is a necessary overall step, gender concern is often an external attachment. A gender viewpoint is included only at the insistence of the funding agency. At its best, it is subservient to fulfilment of fragmented objectives and at its worst, entirely unconnected with the main current of NGO activity which is often gender-blind (Joy and Paranjape, 2002). This is, however, not to deny the sensitivity of the few NGOs who have done good work, but they remain honourable exceptions.

Women's participation in watershed development has, however, resulted in more attention being given to women's concerns. This participation has come mostly in the form of Self Help Groups (SHGs). At one level, this is a problem because women have not really been consulted with regard to mainstream watershed activities. But there are examples where women's participation has been more broad-based. In the case of Khudawadi (Osmanabad district, Maharashtra), the implementing agency negotiated with the water users" society and got a share of water for the women in the village. Also, the landless women's group took about 10 ha of private wasteland on a produce sharing arrangement. The women's group took up soil and water conservation works in this land and also brought it under plantation. The water they got from the WUA was partly used during the establishment phase of the plantation. The women's group also set up an IRDP scheme of collective goat rearing as fodder availability increased due to the protection and development of wasteland (Kulkarni, 2001; Joy and Paranjape, 2002).

In order to mainstream women's participation, WOTR (Indo-German Watershed Programme) has developed Gender-oriented Participatory Operational Pedagogy for capacity building. It has resulted in small but appreciable improvements in women's understanding and capabilities. The women have formed more than 350 SHGs in the IGWDP project areas in Maharashtra. There is also an increased participation by women in land use planning and more women are volunteering to supervise the work on watershed sites. Their vocal participation in the Gram Sabhas and village watershed committee meetings is notable, though there is a long way to go (Lobo and D'Souza, 1999).

Deccan Development Society (DDS) has been involved in watershed development activity for quite some time through the Rayalseema Watershed Development Programme. The project explicitly tries to strengthen women's position in society by planning and implementing a gender sensitive programme. DDS works through other NGOs like Krushi, Jana Jaagriti, and Praja Abhydaya Samstha. All these initiatives bring out different aspects of women's participation as well as control over natural resources in the watershed context. For example, Jana Jaagriti's initiative revolves around establishing women's

rights over common property resources. Praja Abhydaya Samstha's initiative is with regard to establishing women's rights on private property resources.[64]

These examples, though small in number, are a pointer to what is possible. They also help draw certain insights, which would help in, to use a fashionable expression, mainstreaming gender in watershed development. It is important, however, that the emphasis on women's participation and women's needs do not end up putting women in a box and bracketing their responsibilities in stereotyped ways.

**Box 6-4: Assessment of Adgaon watershed development from a gender perspective**

Several actors have made the watershed development in Adgaon possible. These include farmers with diverse caste, class and ethnic background, organisers of Marathwada Sheti Sahayak Mandal (MSSM), technical experts and researchers, the Ministry of Agriculture, and SDC. The actors brought with them diverse perspectives and strategies. It is in the context of the interplay in pluralism that one needs to capture gender processes in Adgaon.

It would be simplistic to define women in Adgaon as a homogeneous category. Caste, tribe, class, ethnicity, age, and their involvement in farm work determine their experience and life situation. Analysis of the impact of watershed development reveals divergent processes on men and women. It is in this context that one must place the trajectory of development of backward castes, in particular the Bhils, Chamars, and women in these castes. In comparison to other castes, members of these castes continue to remain underprivileged.

A review of institutional processes reveals that while there were efforts to integrate different social categories in collective efforts, women seldom figured as a separate category. The assumption that women and children were, in any case, integral to the institution of family and farmers, was uniformly adopted by each of the partners in the watershed development. Allocation of funds for women was minimal, the project was viewed only in the technical context by the funders; women were not included in the Asthayi Samiti.

What emerges is a sexual division of labour, where men's role involves a great deal of coordination, planning, implementation and monitoring of farm activities. Women's domain of work is more in areas which are preparatory in nature and supportive of the work that men perform. What is striking is the strategic location of the entire range of technological aids to improve the work of men in fields. In stark contrast, little change has taken place in the nature of women's work. Technology and modernisation have left their work untouched. Strange as it may sound, the only work implements that women continue to use are the traditional hand sickle, dibbling tool and baskets.

The entry of milch animals and increased farm productivity has had a multiplier effect on women's work in the household. For women in Adgaon, cattle care implies cutting, collection and transportation of fodder, an additional chore in their lives. Also, preparation of cattle feed, feeding, watering and cleaning of cattle sheds are done by women. Men milk and transport the milk to collection centres of milk co-operatives and collect payments, disbursed once every ten days.

*Source:* Research study made available by MSSM. Unfortunately, the copy did not have any details, including title, author/s, or year.

## 6.6 Positive discrimination

The literature on watersheds illustrates that there is increasing awareness about the need for measures that fall under what could be broadly called positive discrimination. This can take different forms and some of the groups have tried to address this issue by making certain special provisions within the programme itself. Some possible measures of positive discrimination include giving fishing rights in the water bodies, priority access to usufructs from the commons, earmarking nursery raising and leasing out both Gram Panchayat and private wastelands on produce sharing arrangements. Kolavalli and Kerr (2002) also report some interesting cases of such positive

[64] For details on these initiatives see Rao (1999)

discrimination from Orissa. The NGO, Parivarthan, succeeded in persuading a landowner to give land for construction of a pond where the landless could rear fish. In another case, the landless, who participated in the digging of a pond, were given the right to cultivate vegetables on the embankment in projects jointly implemented by DANIDA in Orissa (Kolavalli and Kerr, 2002a).

Questions of positive discrimination are also being addressed in terms of cost sharing. For example, KAWAD has now begun to recognise that high contributions could have a negative effect on the poor. In KAWAD watersheds, certain steps have been initiated to bring down the contribution of poorer sections. The contribution of farmers with less than 1 ha has been brought down to 25 percent of the usual rate; SCs and STs are given a concession of 25 percent. In fact, in most of the projects, a graded contribution system is emerging. In the case of projects that operate under the Common Guidelines (revised), the contribution for individual works is 10 percent of the cost. However, in the case of persons from SC, ST and those below the poverty line, the contribution is only 5 percent (GoI, 2001).

## 6.7 Tackling equity: emerging issues

### 6.7.1 Share in the augmented resources

There is today a greater awareness of equity issues and more and more studies acknowledge that the earlier phases of watershed development tended to be inequitable in more ways than one. The main division is between the landless and the marginal farmers on the one hand and the better off farmers on the other, and between those with sloping lands in the upper reaches of the watershed and those with relatively flat lands in the lower reaches of the watershed. The need to address the special needs of these groups has now, by and large, been accepted. The rest of the chapter attempts to discuss the issues involved and the ways to resolve them. It has been argued that: "There is a need to protect the interests of the disadvantaged sections of the community such as landless families, the landed poor, women, etc. The most pressing issue is regarding access to common pool resources, especially water, to all sections of the community. As indicated earlier, access to water can be ensured only through delinking water rights from land rights fostered with clearly defined property rights on water. This requires an appropriate legal framework and effective institutional arrangements" (Soussan and Reddy, 2003).

However, the review shows that this has resulted in a two-way movement. The first is the recognition and emergence of the so-called NLBAs as a distinct component of watershed activity. Most of the NLBAs are, by compulsion, the same activities that were being carried out under different programmes ranging from general programmes like IRDP to target-oriented programmes like TRYSEM that sought to provide employment to tribal youth. On the other hand, there is a now a growing section among the erstwhile watershed development supporters who are increasingly disillusioned with the ability of watershed programmes to accommodate the interests of the rural poor. They tend to advocate an abandonment of the micro- or milli-watershed as a unit of treatment or planning and would rather prefer targeted programmes aimed at the spatially and economically disadvantaged sections that take up their lands individually or together for treatment. This is parallel to KAWAD's decision to abandon the ridge-to-valley approach and adopt a sequence based on when and who comes forward with the requisite contribution.

Both of these approaches have the potential effect of denying the rural poor a fair *share in the augmentation of resources* that watershed development brings about. The approach based on the NLBAs starts with the assumption that the poor need *separate* programmes, by implication suggesting that the poor do not have a right over the resources watershed development has created. The latter trend that advocates the abandonment of a micro- or milli-watershed as a unit and a shift to a targeted approach also has a peculiar, counter-productive net effect. Firstly, it refrains from directly raising the issue of the share of the rural poor in the augmented resources. Secondly, it is not capable of reversing the biophysical processes that, in combination with historically inscribed inequalities, lead to unequal distribution of watershed development benefits. Thus though they may target uplands, they cannot prevent externalities that will cause benefits to flow to the lower reaches.

In fact, the central issue is whether or not the rural poor have a right to a share of the augmented resources generated by the watershed development programmes, and this issue needs to be faced squarely and resolved adequately. This is not to deny the value of NLBAs or a targeted approach, but to emphasise that they do not solve the problem. At best, they try to work around it.

In our opinion, it is important to assert that at least the *augmented* resources that are generated through watershed development through public funds and collective effort must count as common pool resources, subject to collective decisions in respect of their fair allocation. There is a need to assert this principle, though there would still be a long road from that assertion to a practicable way of realising that principle on the ground. Without a clearly defined standpoint on this, we will keep trying to find workarounds.

### 6.7.2 The measures needed

As we have argued earlier, we would strongly suggest that the treatment plan should be articulated with the micro-watershed as a unit, and the actual sequence of activities may not fully follow a ridge-to-valley approach. A certain amount of sequencing and phasing may also have to be incorporated, some of which we shall discuss below, but the plan and the programme, we feel, still need to be based as closely as possible on a micro-watershed approach.

The following measures may then be taken to provide adequate access for the rural poor to the augmented resources:

i. A certain proportion of public as well as private wastelands may be leased to the rural poor on a produce sharing arrangement and additional support for managing them could be provided through targeted assistance from the project funds or through convergence of other programmes or as post-watershed intervention.
ii. All planting and plantation management activity within the watershed could be pooled together and handed over to tree growers" groups formed with the participation of disadvantaged sections of the community.
iii. A certain share of the augmented water resources should be earmarked for the rural poor and they should be encouraged to use it productively by extending targeted support to them.

Ideally, the rural poor should be entitled to a share of the augmented resource in a proportion that should not be dependent on their property holding. In effect, this would mean that the share vests not in the land but in the individual, who, as an individual, has a right to the augmented resources. This would imply that every member of the watershed community has equal share.

However, it should be recognised that concepts of equity are varied, and so long as the main principle is accepted and its spirit is not flagrantly defied in application, communities should be allowed sufficient space to work out their own ways of realising this principle. There are different ways in which this may be done on the ground. Some communities may try to strike a balance between allocation according to land and according to persons; others may carve out a share to be given exclusively to the landless and the poor farmers and distribute the rest according to land; some others may even take additional affirmative action and provide a greater share to some of the disadvantaged sections. In practice, once a community accepts a principle seriously, it is quite creative and adept at evolving a social consensus that reflects that principle. It is the initial acceptance that is the most important factor and, therefore, it is all the more important for that principle to be asserted rather than side-tracked in an attempt to find an easier solution.

### 6.7.3 Positive - sum game

It has often been argued that such provisions would be unacceptable to the dominant sections of the community and hence it is fruitless to try to do so, especially on a large scale. We feel that it is here that a different kind of targeting and phasing of watershed activity is required. In our opinion, it is the structure of priorities that have emerged around watershed development activity that allows this to happen on a large scale.

Watershed development activity carried its own distinctive baggage when it was seen as a soil and water conservation programme needed to arrest the continuing deterioration of rural ecosystems. This was reinforced by the fund-driven, area-specific, and target-oriented approach of the Soil Conservation Department. The primary concern was the urgency

to get the programme going, getting people to agree to soil and water conservation activity. Other concerns were secondary.

However, after several years of watershed development experience, we need to be more discriminating and select only those areas for full watershed development where people show a clear commitment to earmark a share of the augmented resources for the rural poor. What we are stating, in effect, is that this commitment should be a precondition for the programme.

In watershed development programmes, there is one favourable factor that should not be overlooked. Asking for a share of the augmented resource is not quite like asking for a redistri- bution of an existing resource. The latter is like several claimants asking for a piece of the cake, and what is one person's gain is definitely another person's loss. With the augmented resource in watershed development, there is an increase in the size of the cake for everyone; the share earmarked for the rural poor does not mean shrinkage of the share of the better off. Coupled with the fact that a major part of the expenditure comes from public funds, there is the likelihood that, if it is made an integral condition of watershed development programmes, the provisions will be seriously heeded and may be accepted. Watershed programmes should maximally utilise the "positive sum game" nature of watershed activity and its benefits to provide significant resource access for the poor.

### 6.7.4 Social arrangements of sharing to precede resource augmentation

The inclusion of a commitment to provide the rural poor with an adequate share of at least the augmented watershed resources will be a good starting point. However, this will need to be supplemented by other measures as well. It goes without saying that the realisation of that commitment will require a conducive social atmosphere that will need more than administrative fiat. What that entails, we take up in the last chapter of this report. What we are concerned with here are the additional measures that need to be made part of the programme and its running style.

One of the first measures, or precautions if you will, is that the programme planning must be such that *no resource is generated or augmented until the social arrangements for its sharing are decided upon and the institutional arrangements for that sharing are in place*. This is an extremely important principle that needs to be followed if the commitment to provide a share for the rural poor is to have any meaning. If a resource is created before social agreement and institutions are in place, rights will be established in the interim period. Such rights will practically be of the "finders are keepers" kind and will cover the entire resource, and by the time discussions and negotiations begin, these prior rights will be extremely difficult to withdraw.

This is not as simple a matter as it may seem. There are a few impediments in implementing this sequence that need to be taken into account. The first impediment is that watershed development programmes tend to build check dams, tanks and carry out all water harvesting measures that make water visible as quickly and as early as possible. Many factors are behind this: there is the desire to show visible signs of benefits as early as possible; since major employment benefit is comprised of these works, the local people, often poor, also want them to be initiated as early as possible; and since these are the components that entail maximum contract work, a strong lobby outside and inside the government acts in this direction. This tendency will have to be strongly curbed if we are to follow the policy of "arrangements first, augmentation later'. In this context, Madhya Pradesh has made a useful, indirect contribution by not allowing works to be contracted out except to the Panchayats and also putting a ceiling on the individual cost of the structures that can be built in the first phase. Such measures would help moderate the unseemly haste that watershed programmes sometimes show in their implementation.

A policy of "arrangements first, augmentation later" calls for patience and flexibility. It means that one is prepared to go slowly, to spend much more time in resolving conflicts and bringing people together. This calls for a restructuring of skills that are required of the Watershed Team. It also means that the project must allow flexibility. For example, one may have budgeted for an expenditure of Rs.2 lakhs on a large check dam this year. But if the negotiations have not been fruitful and discussion is still continuing, it means the freedom to delay the expenditure and carry it over to the next year. At present, this is not possible, though attitudes are changing somewhat and the importance of allowing roll-overs as a measure to bring in flexibility are being seriously considered within government departments.

# CHAPTER 7
# PARTICIPATION

Over the last two decades or so, the word "participation" has become a buzzword in the context of development in general and NRM in particular. Expressions like "bottom-up approach", "collective action", "community based natural resource management", "community driven development", and "decentralised governance" implicitly suggest that the inherent processes are participatory in nature. Local institutions, both community based organisations like forest protection committees, water users" associations, watershed committees, and locally elected bodies like Gram Panchayats and other Panchayati Raj Institutions, are supposed to mediate this participation. Institutional rules, regulations and norms set the contours of this participation.

Participation has become a buzzword. But more often than not, the way it is used varies significantly and little critical attention is paid to these differences. As Cohen and Uphoff say, "participation is often endorsed unambiguously on normative grounds even if the empirical basis is not as clear" (Cohen and Uphoff, 1980). This suggests that participation can be a goal/principle on its own, or it can be valued as a prerequisite for successful watershed development or, for that matter, any developmental effort. In fact, much of the attention on participation is based on the assumption, and to some extent, experience that suggests it has led to "good" outcomes.

It is also important to point out that participation can be conceptualised at two levels in the watershed context. It can be problematised in terms of institutional/ organisational structures, which attempt to involve communities in the overall watershed management process. And equally importantly, it can be examined in the context of individual actors or households and their participation in these organisations.

This chapter attempts to address the multiple concerns vis-à-vis participation in the watershed context. The primary focus of the chapter is on the organisational structures of watershed development programmes and the manner in which they involve local communities in the watershed development process. Evidence from the field is used to highlight the differing approaches to watershed development. Attention is also given to the gap, which often exists between participatory organisational structures in theory and practice and between the priorities of the implementing agency and those of local communities. Finally, a brief attempt is made to look at participation in terms of outcomes.

## 7.1 Theorising participation

As participation has become central to watershed development, it is necessary to, first of all, have some clarity as to what one means by participation. Kerr and Kolavalli (2002b) highlight three important dimensions of participation with regard to group participation.[65] These are: a) facilitating collective action, b) transferring critical decision making powers, and c) making communities share the development costs (and of course benefits). Implementing organisations, therefore, need to play the important role of fostering and increasing the overall level of community participation in the planning and development of watersheds (Kolavalli and Kerr, 2002b). The above mentioned benchmarks of participation need to be considered keeping in mind the fact that programme interventions often see people as mere instruments for delivering the desired outcomes. In such a context, development activists and agencies are seen as some kind of *tabula rasa* or passive instruments, merely expressing "felt needs" or what people "really" want. This tends to reproduce the status quo in terms of practices and concerns and neglects the contribution that development activists and agencies make.

Attempts have been made to operationalise the above mentioned dimensions of participation in a more concrete manner. Agarwal's typology (Table 7-1) of participation is often invoked to actually "measure" participation.

[65] As highlighted at the outset of this chapter, participation needs to be explored at the level of the community/ group and at the household (individual) level. Kerr and Kolavalli (2002b) primarily address the former concern.

**Table 7-1: Typology of participation**

| Form/level of participation | Characteristic features |
|---|---|
| Nominal participation | Membership in the group |
| Passive participation | Being informed of decisions *ex post facto*; or attending meetings and listening in on decision-making, without speaking up |
| Consultative participation | Being asked for an opinion on specific matters without the guarantee of influencing decisions |
| Activity-specific participation | Being asked to (or volunteering to) undertake specific tasks |
| Active participation | Expressing opinions, whether or not solicited, or taking initiatives of other sorts |
| Interactive (empowering) participation | Having voice and influence in the group's decisions |

*Source:* Agarwal (2001)

Agarwal's typology is a continuum of sorts with nominal participation being the least desirable form of participation and interactive participation being the highest form of participation. There are other typologies of participation as well. For example, Pimbert and Pretty (1998) distinguish between passive participation at the low end of the spectrum and self-organisation on the high end of the spectrum.[66] All such typologies, however, attempt, one way or the other, to distinguish between people being involved for the sake of involvement and actual decision making powers being given to people (or groups). It is also presumed that a more interactive form of participation will result in greater benefits for those who participate.

It is important, therefore, to see at the outset how participation manifests itself within the watershed community. While it is important to see how much control is given to the watershed community, it is equally important to examine how different sections of the community participate. To answer the latter question, one needs to examine how decisions are taken, who takes what decisions, who controls the money, how watershed development plans evolve and are implemented, and how institutions, rules, and norms are formed and evolved. Furthermore, questions of transparency and accountability are important, as are questions of capability building and outcomes.

Participation of the "local" people, furthermore, needs to be understood in terms of the questions of outcomes and informed choices. Although participation is important as an end in itself, it does not a priori lead to desirable outcomes. It is important to recognise that left to themselves, people do not necessarily make choices that are sustainable and equitable, not out of ignorance, but out of compulsions and pressing reasons (economic compulsions, sectional interests and so on). Another factor is lack of information; we have seen that people do change their choices in the light of new information and experiences. Seen in this light, participatory planning is a process that involves an equal partnership between development activists and agencies on the one hand and the ecosystem users on the other. It requires a joint investigation of sustainable livelihood options. In other words, it involves an interactive process between the "local" and what some researchers call the "supra-local", i.e., development activists, NGOs, academic institutions, donors, and state agencies.

We make an attempt here to examine participation by the local community and by individual actors within the community at two levels: within the "participatory" organisations increasingly being established for watershed development and in terms of specific functions related to watershed development. Although we do not make explicit reference to the typologies highlighted above, we examine the nature of participation keeping in mind these typologies.

[66] Pimbert and Pretty (1998) also talk about participation in information giving, participation by consultation, participation in providing material resources and functional participation.

## 7.2 "Implementing participation"

The increasing awareness about participation and its centrality in certain "successful" watershed experiments has, to a great extent, resulted in the increasing adoption of principles of participation within government and NGO watershed programmes in general. Watershed interventions such as Ralegaon Siddhi, Sukhomajri, MYRADA (for example PIDOW-Gulbarga), Indo-German Watershed Development Programme (for example, Pimpalgaon Wagha in Ahmednagar district) have resulted in government programmes incorporating a participatory component into design principles. This is reflected in the various guidelines that have come out after the Hanumantha Rao Committee's report, viz., the 1994 Common Guidelines, the WARASA-Jan Sahbhagita Guidelines of 2000, the Revised Common Guidelines of 2001 and the Hariyali Guidelines of 2003. Although there are watershed programmes that operate outside the government guidelines, the broad framework of these guidelines invariably underlies most watershed programmes (even those completely independent of the government). It is, therefore, important to examine these guidelines in terms of their participatory content.

### 7.2.1 Overall organisational structure

The overall structure of the programme and the various organisations that are common to most government-initiated programmes is summarised below:

*State Watershed Development Committee*

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*District Watershed Development Committee*

|

*Project Implementation Agency (PIA)*

|

*Watershed Development team (Technical team)*

|

*Watershed Committee (WC)/ Village Watershed Committee (VWC)/ Micro-watershed Development Committee (MWSDC)*

|

*Self Help Groups (SHGs), User groups*

|

*Watershed Associations/Gram Sabha*

The six major watershed programmes of the Government of India – namely the National Watershed Development Project for Rainfed Areas (NWDPRA), Watershed Development in Shifting Cultivation Areas (WDSCA), Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP), Integrated Wasteland Development Project (IWDP) and Employment Assurance Scheme (EAS) – have quite a bit of convergence in terms of the organisational structure.

Apart from the organisational structures at the state and the district level cited above, there are coordinating agencies. In Maharashtra, the Jalsandharan (Water Conservation) Department acts as the coordinating agency, whereas in Karnataka, the Directorate of Watershed Development assumes this role. At the district level, the programmes are generally coordinated by the DRDA/ZP.

Some bilateral projects have set up their own organisational structures which are slightly different in nature. KAWAD, for example, has been experimenting with three different institutional arrangements for the implementation of their watershed programmes. In Upparahalla watershed (Bellary district) the Implementing Agency (IA) is the Zilla Parishad; in Doddahalla watershed (Bijapur district), it is the District Watershed Development Office; and in Chinnahagari watershed (Chitradurga district), it is an NGO, MYRADA. The idea is to see which organisational mechanism will best help streamline the institutional designs during the scaling up stage (KAWAD, n.d.; Iyengar *et al.*, 2001). However, this organisational experimentation is limited to the IA level. Below the IA level, the structure is the same. In all the three cases, it is the Partner NGOs (P-NGOs), with the participation of CBOs like the MWSDCs and SHGs, who actually implement the programme.

Sometimes, especially in the case of NGO-managed watersheds (outside the GoI Guidelines), there is no WDT; in such cases, the role of the WDT is taken over by NGO staff themselves. In Bhavthan (Manavlok), the implementation of the programme was looked after by a Community Organiser and the social workers from the NGO, Manavlok, and the Krushak Panchayat, a committee of villagers representing all social sections of the village.

The Krushak Panchayat selected the beneficiaries for land treatment and for collective wells. The Krushak Panchayat was also the guarantor for loans taken for the collective wells and the water lifting system. In Adgaon, two engineers and two trustees of the organisation, Marathawada Sheti Sahayak Mandal, looked after the planning and implementation of the programme, though an Asthayi Samiti (ad hoc committee) was also formed in the village for consultation with the people.

### 7.2.2 Watershed Association/Gram Sabha

According to the guidelines, the watershed association (WA) or Gram Sabha is the ultimate decision-making body. When the watershed boundary coincides with the village boundary, the Gram Sabha (consisting of all adult members) is the WA. When the watershed boundary does not match with the village boundary, then the PIA is supposed to constitute a WA. All the major decisions – such as the decision to take up a watershed programme or the approval of the watershed development plan – have to be taken in the meeting of the WA or the Gram Sabha.

The constitution and functioning of WAs/ Gram Sabhas seems to be a mixed bag. In the case of Chale (under the Common Guidelines), the Gram Sabha is taken as the WA and apparently meets five times a year (a good number of meetings). However, we found that in many of the projects, Watershed Associations were not properly constituted. For example, in Dornali (AFARM), Adgaon, Ambewadi, Babulgaon (IGWDP), and in the ICAR model watershed projects in Karnataka, separate WAs had not been constituted. In the KAWAD projects as well, there are no separate Watershed Associations. It is difficult to say whether Gram Sabhas or WAs have been more effective in their functioning, as there is no comparative literature on this.

One other point is worth highlighting here. The existence of Gram Sabhas, or the constitution of WAs, in themselves, do not guarantee a participatory village community. In certain cases, the Village Development Societies (VDSs) appear to have played a more important role in the watershed development process (see Box 7-1). The VDS is not just a watershed project implementing agency, but functions more like a general development institution of the village. It is seen as a self-reliant and sustainable village level institution that has links with the government agencies, banks, and other funding sources. It is meant to support the long-term development needs of the villages in a sustainable manner.

The VDS has the overall responsibility for planning and implementation of all developmental activities in the village in a sustainable manner. Based on the needs of the villagers, different committees are formed by the VDS to plan and execute the programmes. For example, the Watershed Management Committee (WMC) are formed by the VDS to plan, execute and supervise watershed rehabilitation activities. Grassroots institutions like Self Help Groups (SHG) are integrated into the VDS to play a similar role, but more in terms of livelihood promotion activities. There are many examples of how VDSs have successfully taken the initiative and solved many developmental issues in the village. It appears that where VDSs have taken an active role, participation at the level of the village community has been greater.

**Box 7-1: Village Development Societies Promoted in ISPWDK Projects**

In the ISPWDK project areas, Village Development Societies (VDSs) have been set up extensively. These societies consist of two members each – one man and one woman – from each household in the village. They are something like a general body of the village. VDSs are registered under the Karnataka Societies Registration Act. Each household becomes a member of the VDS by paying a nominal fee – either in cash (generally Rs.10) or in kind (1 kg of millet/sorghum). The general body selects the Governing Council, which has 9-15 members representing different sections of the village community (landless, small farmers, marginal farmers, artisans, and large farmers) and a few ex-officio members (representatives of the Gram Panchayat). Thirty-three percent of seats in the Governing Council are reserved for women. In some cases, women constitute more than 50 percent of the membership of the Councils.

SAMUHA, one of the project partners of ISPWDK (the other partners are PRAWARDA

working in Upper Mullamari watershed in Bidar district and MYRADA working in Maramuri watershed in Gulbarga district), followed a different strategy in Kanakanala (Koppal district) by focusing on "Woni Gumpu" or street groups. A "Woni Gumpu" comprises of one male and one female member from about 10 to 15 households living on the same street or in geographical proximity. The Woni Gumpu is the primary association or building block of the VDS. Each Woni Gumpu selects one male and one female member to be part of the Governing Council of the VDS. The office bearers of the Governing Council form the Executive Committee.

*Source:* Based on information provided by Shri J. Jangal, Coordinator – ISPWDK

### 7.2.3 Watershed Committee

The Watershed Committee (sometimes known by different names like the Micro Watershed Development Committee [MWSDC] in KAWAD programmes; Village Watershed Committee [VWC] under IGWDP; Watershed Management and Maintenance Committee (WMMC) in MYRADA; Watershed Management Committee [WMC] in the ISPWDK supported projects), as per various guidelines and project designs, has a central role to play in terms of watershed planning, implementation, management, monitoring, financial control and repairs and maintenance. There are, of course, variations in their functioning across different modes of implementation. In the case of KAWAD, the main responsibility for planning and implementation (land based activities - LBAs) is given to the MWSDCs. The government departments and other project staff (especially of the P-NGOs at sub-watershed level) are only supposed to facilitate and act as support institutions responding to the demands placed by the MWSDC and other grassroots level institutions such as the SHGs. In PIDOW-Gulbarga, the committee, known as the Watershed Management and Maintenance Committee (WMMC), takes on the responsibility of management of the programme (implementation of treatments, monitoring progress, financial transactions and training activities) and maintenance of resources and assets in the long run. In Manjanahalli (under NWDPRA with ORP component), there is no proper watershed committee constituted (except one Shri Maruti Raitha Yuka Sangha, which was formed recently) and no emphasis on the participation of the people because the project staff (ORP staff) consider testing different technologies as the main objective of the project. In other words, responsibilities and nature of functioning vary from one case to another.

Significant efforts seem to have been made to include all sections of society in the participation process. Not only is there increasing awareness that various sections should be represented in the Watershed Committee, but detailed procedures and norms are laid out in various guidelines as to how to constitute the WC giving representation to various social sections. As per the KAWAD project guidelines, a MWSDC should have members representing landless labourers, small farmers, marginal farmers, women labourers, other women, SC/ST, village artisans and otwhers. In the case of PIDOW-Gulbarga, micro-watershed committee consist of 3-4 farmers, 1-2 landless, 1-2 artisans, 1-2 SC/ST members, 2-3 women and 2 Gram Panchayat members. However, there is no explicit commitment in the 1994 Common Guidelines to give representation to particular social classes. All they provide for is representation from SHGs, user groups and Panchayats. However, the revised 2001 Guidelines say that there should be 30 percent representation for women and also "adequate" representation from SC/ST.

There is also increasing awareness about women's participation in the WCs. Some groups have resorted to 33 percent reservation for women. In the newly initiated World Bank project in Karnataka, Sujala, there is a stipulation that 50 percent of the members need to be women in both the watershed committee and the general body. Also, at least one of the two most important functionaries – Secretary and President – has to be a woman. In the case of IGWDP watersheds also (for example, Babulgaon), 30 percent of seats in the committee are reserved for women and Dalits. The issue that needs to be explored further is whether formal participation of this sort

translates into significant participation on the part of women.[67]

Finally, it is worth highlighting that in some cases, attempts are made to address the spatial question in terms of people's participation. In Adihalli-Myllanhalli (BIRD-K), village watershed committees (VWC) are formed hamlet-wise. One member from each household in the hamlet becomes a member of the VWC. All hamlet VWCs together (about eight of them) form the central watershed committee (CWC).

Thus, the basic idea in watershed development today seems to be that of providing represen- tation to all social groups and hamlets in the village (Farrington and Lobo, 1997). Alongside this, there is the emphasis on multiple user committees, such as water users" committees, forest protection committees, fodder development committees, seed distribution committees, SHGs, social-cultural committees, in order to identify sectoral interest groups (Saravanan, 2002).

Given the centrality of these committees, it is critical to see how well they are financed and how much financial autonomy they have. In government-supported programmes, the money under the work component directly goes to the account of the WC. The WC also maintains a separate account (called Watershed Development Fund) for people's contributions, which is supposed to be used for repairs and maintenance of the assets and structures after the project period is over. The WC is supposed to function as the executive arm of the watershed association. In the KAWAD projects, the MWSDCs handle the funds related to the works component of the programme as well as the watershed development fund, which is actually the pool formed by the people's contribution. For example, in the case of ISEER, where the P-NGO is in charge of two sub-watersheds (about 6000 ha) in the Dodahalla watershed (Bijapur district), the total contribution amounts to about Rs.40 lakhs. However, the MWSDCs are not registered bodies and in some cases, the watershed development fund with the MWSDCs runs into lakhs of rupees. One key issue, therefore, is the legal status of the CBOs which handle huge amounts of money: can they remain informal or should they be formalised, and would the legal status help them be more accountable in financial matters. Apparently, the issue of registering the MWSDCs under the Societies Act is being actively considered in KAWAD and the necessary bye-laws are also being drafted.

In the case of some of the NGO-managed watersheds, the WCs have little or no financial responsibility or control though they are generally consulted during the planning and imple- mentation stage and are also supposed to supervise work and distribute the wages to the labourers. For example, in the case of Dornali (AFARM), Adgaon, Adihalli-Myllanhalli (BIRD-K), financial control rests with the NGOs or the implementing agencies.

### 7.2.4 Area Groups

The concept of area-specific groups is an innovation pioneered by MYRADA in the PIDOW-Gulbarga project. Area groups (AGs) are usually much smaller groups and if the MYRADA experience is anything to go by, they provide for much more direct interaction between the members. Usually, the size of the group varies from 10 to 15 farmers who have land adjacent to each other. The AGs are involved in planning and implementation of the programme. The representatives of such groups become members of the WDC. Activities for implementing works are actually taken up by the AGs but the money is routed through the WDC in order to meet legal requirements.

MYRADA distinguishes between the area group approach and the committee approach (where the Watershed Committee takes all the decisions), and prefers the area group approach due to the smaller size of such groups. It strongly feels that an area group approach is more appropriate, since the WDC "generally remains an inactive body" and its members "meet only

[67] In the context of women's participation in watershed development, the question that is often raised is whether participation is real or token. Very often, representation is not given to women in higher level bodies. For a detailed discussion of this issue, see Seeley (2000). It is also argued that new participative institutions that ignore gender - be it forest user group, water user groups, or credit groups - can potentially disenfranchise the women excluded. There are also implications for distributional equity and institutional efficiency Agarwal (2001).

when money is available." This approach is also being tested in the newly initiated World Bank project, Sujala. In Hollalakare project in Chitradurga, the area groups have been given portfolio loans ranging from Rs.3 to 5 lakhs.

In KAWAD, area groups cover areas about 100 ha; there are 4 to 5 such area groups below the MWSDC. Two members from each group are taken in the MWSDC. In PRAWARDA - ISPWDK project area (Upper Mullamari watershed in Bidar district) the groups are called *Shivar* Groups and are linked to the Watershed Management Committee and the Self Help Groups. ISPWDK believes it is easy to conduct serious discussions in small, manageable groups and that a single Watershed Association at the micro-watershed level is too big a forum for direct consultations to take place effectively.[68]

### 7.2.5 Self Help Groups

The formation of SHGs has been made a precondition in all watershed programmes, irrespective of the agency or mode of implementation. This condition has emerged as the result of the perceived positive experience generated by organisations like MYRADA (PIDOW-Gulbarga and other projects).[69] SHGs function mostly as thrift, savings and lending groups. SHGs, on paper, provide representation and organisational space for the resource poor and disadvantaged sections like women. The MYRADA experience suggests that this has been true, to some extent, in practice as well.

Overall, it could be said that SHGs have functioned quite well in terms of savings and lending. In fact, SHG activity is one area in which the members seem to have a greater control over processes and decisions. But some important decisions, such as the setting of interest rates for lending, are taken by the PIAs or NGOs or with their concurrence.

There have also been efforts at federating the SHGs at the taluk or district level to increase the bargaining power of these groups and to pool the resources at a higher level. One such example is the Gramina Mahila Aratika Seva Kendras in PRAWARDA - ISPWDK project areas. Only time can determine the impact of linking locally initiated activities such as those of SHGs with more formal banking systems. Such a linkage would require a very different set of skills and expertise.

Moreover, from the participation perspective, it will be necessary to see whether SHG members, especially women (a vast majority of the SHGs involve only women), retain or lose their autonomy. There are reports that some district level federations of SHGs are being approached by foreign insurance companies, which could be detrimental to the autonomy of the local initiative.

SHGs have not always functioned well. For example, in Dornali (AFARM), out of the four SHGs started initially (in 1999), only two continue to function. The remaining two were dissolved due to internal conflicts. AFARM had also started a Kishori Vikas Gat (group for the development of young girls), which has not been functioning for the last two years because there is no woman social worker. Similar stories of closing down of SHGs were also reported from some other villages like Bhavthan (Manavlok). The most common reason for such closure is internal conflicts, though we also came across certain cases where the SHGs wound up mid-way because of other factors like poor attendance in meetings, low repayment of loans, and drop in membership.

The reach of SHGs, in the watershed context, also seems to be rather limited, thus restricting the scope of participatory activities that can be taken up through these bodies. While in some of the newer projects like KAWAD, SHGs have provided the base for non-land based activities, in general, only a few groups have diversified into other activities. On the whole, SHG activity has been peripheral to the watershed programme. SHGs have, in fact, been running parallel to

[68] The issue of group size is a long-standing one. It needs further investigation with specific reference to the watershed context. The choice of group size has implications for the question of unit of planning: whether it should be the village or watershed. There are groups and people who believe that probably a hamlet may be a better unit of social organisation and the organisations at the hamlet level could be eventually linked to the gram sabha.

[69] In MYRADA watershed programmes, it is known as Self Help Affinity Group (SAG) - a cohesive socially functional group with 15-20 members having common interests, homogeneous to a large extent, having mutual trust and cooperation, and functioning on their own, imbibing a culture of self-help.

mainstream watershed activities despite being represented in the Watershed Committees. This is probably one of the reasons why SHGs which function properly often outlive the implementation phase of the project, whereas most of the other CBOs last only till the end of project.

### 7.2.6 User groups

Another common feature of the "participatory" organisational structure across projects is user groups (UGs). These UGs have been formed around certain specific interventions, such as the construction of structures (especially major structures like nallah bunds, check dams, etc). UGs are supposed to include both the prospective beneficiaries (those who would benefit from the recharged water) and those who would be negatively affected by the particular intervention. The main function of such groups is to supervise the construction, collect the mandatory contribution and resolve any possible conflicts (basically revolving around the location of the structure, especially if some land is going to be submerged). Guidelines also assert that the UGs are to look after the operation and maintenance of the structures/assets.

However, there seem to be a number of limitations to the UG model within watershed development. At one level, UGs are a misnomer because they do not actually carry out any function normally associated with such user groups, that is, in the way water UGs or forest protection committees do. Moreover, it is not very clear from the various Guidelines as to what the status of the UGs is after the project period is over. All that they mention is that the Watershed Committee, in consultation with the Gram Panchayat, would look after the repair and maintenance of the structures/assets created.[70]

Finally, decisions concerning the location of structures, their design, their (estimated) cost, technology to be used, and so on are taken by the WDT or the technical staff of the PIA and not by user groups. Part of the reason for this is that water – especially ground water – is considered a private resource in watershed development programmes and thus no social control is established over access to and use of water. UGs may be important in the context of common land management within watersheds. In other words, the scope of user groups in the context of watershed is tied to how far integrated water resource development, based on water as a common pool resource, comes into practice. If the conditions are right, UGs could become important instruments of regulating water use, distribution and management.

### 7.2.7 Other organisations

The rest of the organisational structure (like the WDT, various resource or support agencies) is an extension of the PIA (Government department or NGO), on which the watershed development community generally has no control. However, the PIA, the WDT, or the staff of the concerned NGO, do affect the functioning of the different CBOs in terms of the space given to them for decision making, financial control, capability building and democratic functioning. As Reddy *et al.* (2001) have illustrated, the PIA's commitment to participation can make a significant difference in terms of the empowerment of local communities. Equally important is the fact that the PIA, by encouraging local participation, can also bring in greater sustainability and efficiency. But for that to happen, it is necessary to identify the right type of PIAs (Reddy *et al.*, 2001), ones that are socially rooted in the area of work (Shah *et al.*, 1998). During our field visits, we heard a number of complaints against NGO staff, suggesting that there is still a significant gap between guidelines and practice.

## 7.3 Participation in practice

Thus far, we have looked at participation mostly in terms of different organisations within watershed development and the "space" they have been afforded in watershed programmes. We now turn to the question of whether such formal participation translates into actual empowerment of communities in the process of watershed development. Various studies show that the actual participation of the local communities in crucial aspects like the decision to take up watershed development in the village, control over financial matters especially in terms of fund allocations, deciding on the watershed development action plan, and the choice of technology has been pretty dismal. In a major

[70] For details see the Exit Protocol in GoI (2001)

study covering 36 projects in five states, Kolavalli and Kerr (2002a) highlight the fact that except for a few NGO and NGO-government collaborative projects, local decision-making is relatively insignificant. Major decisions are generally taken beforehand by PIAs and CBOs have very little power to modify these. It also emerges from the study that higher levels of participation are associated with greater beneficiary contribution (Kolavalli and Kerr, 2002a).

### 7.3.1 Operation and maintenance

Over time, there seems to have been an increase in community participation (especially through the user groups and WCs) in the operation and maintenance of the structures and assets; newer projects show more participation than older ones. In early generation projects like the ICAR model watersheds or in early efforts at soil and water conservation through the bunding programme in Maharashtra, it was taken for granted that even after the completion of the project, the implementing agency, mainly the government department, would be responsible for repair and maintenance work. Hence, no institutional arrangements were made for others to do such work. This resulted in a situation where post-project maintenance was nobody's business. This situation has changed and consent of the watershed community to take up repairs and maintenance in the post-project phase is now a condition for sanctioning watershed projects. Also a separate fund, generally known as the Watershed Development Fund to be operated by the WC, constituted mainly from the contributions of the people, is specially created for this purpose. After the project period is over, it is the responsibility of the Watershed Committee, along with the Gram Panchayat, to look after these tasks. The point to be noted here is that the necessary institutional mechanisms have been made part of the design of the projects. How long they actually work after the end of the project period is, however, something that needs further empirical verification. Most of the newer projects have been completed only recently and sufficient time has not elapsed in the post-project period to arrive at a firm conclusion in this respect, though in the immediate post-project phase, newer projects have shown better repair and maintenance of structures.

The maintenance of common lands is an important but neglected issue. Protection of common lands, if it has been taken up at all, seems to have lasted only as long as the project itself. Very often, there is little community protection of plantations on common lands. Sometimes, guards are employed and are paid from programme funds. But they leave as soon as the programme is over. KAWAD did intend to develop CPRs. But the intention has not been translated into any serious interventions due to the problem of encroachment (Iyengar *et al.*, 2001). In other projects, farmers said that they are not interested in protecting the plantations as they get no benefit from it. They expect the PIA to take the responsibility instead (Reddy *et al.*, 2001).

### 7.3.2 Financial transaction and transparency

Control over financial matters is another important indicator of local participation. By and large, local organisations do not seem to have much control over fund allocation and expenditure within watershed development – including within the WCs. Financial matters seem to fall more under the purview of the PIA (which is also supposed to be guided by the Guidelines in terms of spending on different activities), whereas the WC mostly acts as a conduit for channelling funds. In government programmes, the money for work component has to be deposited in an account in the name of the WC. Generally, one, and sometimes two, WC member(s) and one person from the PIA/WDT/NGO operate this account jointly. Because of this provision, the WC at least knows how much money is available for the programme and how it is being spent on different activities, though it may not have much control over the pattern of spending.

In most of the NGO-run and managed projects, the funds are directly managed by the NGOs themselves – more so in the case of NGOs which mobilise their own funds for the programme. In most bilateral projects, local organisations have, by and large, not been involved in financial matters. For example, in the first to third phase of the PIDOW-Gulbarga project, the money went directly from SDC, the funding agency, to the District Land Development Board (DLDB). The CBOs do not seem to have been consulted on any financial matter.

There does seem to be a trend, however, towards more financial transparency in some of the projects, mainly to reduce corruption. In phase IV of the PIDOW-Gulbarga project, which was managed entirely by MYRADA, the money first came to MYRADA which, in turn, transferred the money (except the component meant for administrative costs) to CBOs, which maintained all accounts. The KAWAD project, on the other hand, insists that individual beneficiaries open an account in the bank; payment for any work carried out by him/her (on his/her land), especially for amounts more than Rs.500, is made through cheques. ISPWDK-managed projects also try to maintain financial transparency at all levels, even the NGO budget is open for scrutiny by the people (J.Jangal, ISPWDK, *pers.comm*.). SDC is the funding agency and the funding has two parts. One part of the funds is for the biophysical development ("hardware" component) and this is routed through GoI to GoK to the Watershed Development Department, then to the District Watershed Development Offices and finally to the VDS/WMC. The VDS is accountable for the use of funds for watershed rehabilitation and non-land based development activities. The second part is for capacity building ("software" component) and is given directly to the Programme Support and Management Unit, which is in charge of the overall coordination of ISPWDK projects. However, since there is no bilateral agreement in the present phase of the programme, funds are directly channelled to the partner NGOs based on the approved action plan. Then the funds are given to the Village Development Society (VDS) as an advance. The VDS is accountable for the use of funds for watershed rehabilitation and non-land based development activities (Jangal *et al.*, 2003).

### 7.3.3 Contribution, cost sharing and participation

Peoples" contribution (or cost sharing) in watershed management is another commonly used indicator of participation (Kolavalli and Kerr, 2002a; Ninan, 1998). We have already discussed some of the issues related to cost sharing (and high costs for people) in the chapter on equity. The main purpose behind cost sharing is to give a sense of ownership to the community and, in turn, elicit greater enthusiasm for other activities such as the maintenance of assets. This cost sharing is supposed to enhance participation. Cost sharing also serves as an indirect indicator that people have been part of the decision-making process. Maintenance of conservation measures has been found to be positively associated with the share of the cost borne by community members (Kolavalli and Kerr, 2002a). It has also been observed that Indian watershed projects unfortunately tend to install unwanted conservation measures that do not outlast the project period, primarily because people do not share in the costs.

Associating cost sharing with participation is not completely unproblematic though. Even granting the validity of the core idea of cost sharing enhancing people's sense of ownership, the issue of the quantum or proportion of contribution needs to be explored. In some cases, all contributions come from wages withheld from labourers or from the differential between the wages recorded as paid and the wages actually paid to them. This means that the poorest of the poor, the wage earners, are made to pay on behalf of landowners, who do not work for wages (Kolavalli and Kerr, 2002a). This is apparently a widespread practice. Thus, the short-term indirect beneficiaries of watershed programmes are often "exploited" (Reddy *et al.*, 2001). Another situation is where the wages on the watershed work sites are relatively higher than the prevailing local wage rates. The labourers, in such cases, are paid the prevailing rate and the difference is taken as the contribution. The issue is whether or not this type of people's contribution builds the stake of the community and a sense of ownership (Saravanan, 2002).

There is a view that the state should take the prime responsibility for investments in land and water resources and that people's contribution often dilutes such responsibilities. Cost sharing needs to be seen in the wider context of resource allocation and political economy. It should be remembered that watershed projects are taken up mostly in areas that have remained outside the purview of mainstream development efforts of the state, especially development of irrigation facilities. Presently, the state spends more than Rs.100,000 to provide irrigation to one hectare of land in the irrigated belts. In the context of

watershed development, on the other hand, the costs generally range from Rs.6,000 to about Rs.10,000. There are a few exceptions, such as the KAWAD project, where the cost comes to about Rs.15,000 per ha. When the relative spending on watersheds is so little, asking people to share the cost – and that too up to 40-50 percent – seems unfair. This amounts to making people pay for their handicap, namely, being situated in unfavourable locations outside conventional irrigation commands.

It would seem that perceived fairness in the distribution of the additional resources created through the programme, as well as the resultant greater livelihood assurance and dependability, could be better incentives for participation, especially for the resource-poor sections (Shah, 1998). Thus, it is important to secure the rights, access and entitlements in water and common property resources for the poor people in watershed development programmes so that cost sharing is more feasible. Experience from the Pani Panchayat approach developed in Maharashtra and from examples of successful community forestry and CPR management provide evidence that this is possible (Soussan and Reddy, 2003). Moreover, local organisations need to have a greater role in deciding the mode of contribution. The size of the contribution should be flexible, given the different local situations.

In sum, though some amount of contribution may be necessary to bring about a sense of ownership, the quantum should be small. It would be fallacious to correlate the degree of contribution with the degree of participation and the sense of ownership. Beyond the small quantum perceived as being necessary to create a sense of ownership, it may be much more important to focus on other processes that ensure a greater stake for the rural poor in the programme in securing greater and enduring participation.

### 7.3.4 Decision making and processes of consultation

There are wider issues with regard to participation that also need to be addressed. One of the reasons for the low participation of communities is related to the way the PIAs approach the communities. Consent of the community is a crucial dimension of local participation.[71] All watershed guidelines insist that the community should give its consent to take up the watershed project and also abide by certain conditions (related to grazing, contribution, repair and maintenance). In early generation projects, consent was rarely total – majority consent was often taken as adequate. But it is often seen that in the case of decisions based on majority opinion, there is a danger that minority opinion (for example, of the herders) will be ignored. For this reason, some organisations such as MYRADA or IGWDP insist on 100 percent consent or a general consensus as a condition for taking up the programme (Kolavalli and Kerr, 2002a). The problem is that such consent is difficult to ascertain, given the fact that socio-economic differences within the village might actually hide dissent. There are also examples of villages where vested interests have blocked programmes. As a result, the vast majority, mostly resource-poor, who are in need of the programme, have lost out.

Consultation with local people, moreover, is often taken to be synonymous with consultation with the powerful in the community. In the case of Mittemari (ICAR-Model watershed), we were told that the project personnel always met only the big people in the hamlets and Mittemari *hobli*. Their interaction with others from the village was practically nil. No social mapping took place; nor were regular meetings conducted. The staff themselves selected the locations of the structures to be built, and in most of the cases, these structures were located near the big farmers" farms. While farmer involvement on the whole was anyway limited, in the case of marginal farmers, it was non-existent.[72] Ninan, in a study of four different projects funded by the European Union, has shown that though the projects were supposed to benefit the poor, the participation of the poor in the design of these projects was nil or negligible (Ninan, 1998).

A related issue is whether or not the "felt needs" of the community are actually addressed by watershed projects. There have been many examples where the priorities of implementing

[71] Kerr and Kolavalli's study refers to two dimensions of participation: consent of the community and "felt needs".
[72] Based on the discussions with a cross-section of people from Mittemari during the field visit.

agencies deviated substantially from those of the people. One example is the selection of plantation species. Another example is the selection of soil and water conservation and treatment measures. Watershed professionals focussed almost exclusively on reducing soil erosion, whereas the farmers had multiple interests, including gaining rapid financial returns, demarcating boundaries and working individually or in small groups. Technical biases of the funding organisations and implementing agencies often have not left any room for communities to decide what they want (Kolavalli and Kerr, 2002b). In other words, there is often a gross incompatibility between what the PIA wants and what the community wants. Good governance, transparency, accountability, equity and conservation discourses are often the priorities for the PIA, whereas immediate livelihood concerns have a higher priority for the communities (Saravanan, 2002). The success of the interventions would depend on how best one can match both these concerns.

**Box 7-2: Farmers" problems with some of the watershed measures**

Sometimes, not being sensitive to farmers" problems and not taking them into confidence while deciding on the interventions can lead to non-adoption or non-sustenance of certain measures. This is noticed in the case of measures like certain agronomical practices, soil conservation measures like contour bunds/trenches in croplands and planting trees on field bunds.

*Farmers" problems with agronomical practices:* In the case of ICAR and other ORP projects which had a heavy component of agronomical practices, the farmers practised some of the methods, like cultivation across the slope and mixed cropping, for the first couple of years and then stopped. They found some of these suggested practices very problematic. For example, ploughing across the slope is problematic as it is difficult to turn the bullocks very frequently. They feel more comfortable ploughing length-wise (along the slope).

*Contour bunds are not popular in croplands:* Though contour bund is one of the important measures for soil and water erosion, it is not widely acceptable to the farmers. While it finds ready acceptance in non-crop areas, it is not welcome in croplands. The reasons offered include: a) it results in the loss of up to 10 to 15% of the cropped area with the generally recommended vertical and horizontal intervals; b) the boundaries of plots do not match the contours and sometimes, the plots are of small size; c) the width of cultivable strips between contour bunds tends to be smaller and creates difficulties in ploughing, especially where cross ploughing or hired tractor-based ploughing is the norm for marginal farmers.

*Trees on bunds:* Though tree-based farming and planting trees on farm bunds are useful measures, sometimes they also create problems, especially if the farmers are not taken into confidence in the selection of the species, and their perceptions about the likely effect some of these trees can have on the crops are ignored. This, to some extent, has happened in the case of BIRD-K's intervention in Adihalli-Myllanhalli in Tiptur as some of the farmers complained that the productivity had gone down because of the shade effect of the trees. Here, the main issue was the selection of species. The trees promoted in this case were Eucalyptus, Acacia and Cassia Siamea, and their canopy and root system spread to the crop area. People feel that the tall trees block the rain and as a result, the area very close to the trees does not get rain. This, they believe, has affected both grain and fodder yield. There are also cases like that of K. R. Shivana (Konehally village), who has recently cut down the Cassia Siamea trees because he felt that due to the shade effect and competition, the trees were hindering other crops. He firmly believes that crop yields have decreased because of the trees on the bunds. This is, however, not to suggest that tree-based farming in itself is bad, but only to point out that farmers" perceptions about selection of species need to be taken into account.

Not all watershed programmes have, however, ignored local needs. Assessments of KAWAD programmes (Iyengar *et al.*, 2001), and certain recent initiatives in Andhra Pradesh (Soussan and Reddy, 2003), highlight the fact that local concerns are being addressed. There are also examples where programme interventions have been changed midway through their implementation to

accommodate the "felt needs" of the people as in the case of some KAWAD programmes. We also came across cases where the PIAs have been self-critical about the fact that they have not properly consulted the local communities. For example, an internal evaluation of AFARM projects lists problems that arose during the implementation of the project due to the lack of full consultation with the community. One such problem was that local people refused to carry out contour trenching and bunding in accordance with the plan because they were not consulted on its preparation. Problems also cropped up in some projects because no attention was paid to the farmers" demand to relocate some of the planned structures to prevent land inundation (AFARM, 1998).

The flip side of the coin, of course, is that measures that arise from local "felt needs" might not always be sustainable or equitable. In the absence of a proper exploration of the alternatives, people often opt for measures that give returns in the short run and do not bother too much about the sustainability of such measures. In KAWAD projects, for example, there is a great demand for land levelling and bringing non-crop land under cultivation, both of which may be environmentally harmful in the long run. What might be needed in such a context is a joint exploration and assessment of livelihood options by the implementing agency and local people with adequate information made available by the former to the latter.

### 7.3.5 Use of PRA as a tool for data collection and participation

Over the last 15 years or so, there has been a lot of emphasis on Participatory Rural Appraisal (PRA) both as a tool for data collection and as a means of community organisation and participation. In the watershed context, MYRADA has been one of the pioneers in the use as well as popularisation of the PRA. Today, almost all watershed programmes insist on conducting PRA exercises, especially because funding agencies also make it a condition for funding programmes. Like people's contribution, a PRA too is taken as an indicator of people's participation. If a PRA is taken as the benchmark, however, many of the early generation "successful" projects which were more rooted within the community, would prove to be non-participatory. For example, Anna Hazare never did a PRA in Ralegaon Siddhi!

At present, however, most implementing agencies use the PRA as a means to enlist people's participation and capture local development priorities. The priorities coming out of the PRA exercise is often taken to represent the priorities of the whole community or the consensus of the community. This is problematic because they often represent only the opinion of the resourceful and dominant sections of the village (Mosse, 1995). Also, as Kolavalli and Kerr (2002b) argue, bureaucracy often reduces the PRA merely to a prescribed procedure that has to be followed more in the letter than in spirit. PRA methods give an impression of achieving a consensus, which may not actually exist, as very often people do not (or cannot) intervene and give their opinion. Many organisations treat the outcomes of one or two-day exercises with ten or twenty people as reflecting legitimate community priorities (Kolavalli and Kerr, 2002b).

It is necessary to contextualise the PRA and to see what it can and cannot do. PRA techniques can be an effective tool for obtaining a qualitative and quick understanding of the situation, especially for NGOs, donor agencies, and development administrators, and may be treated as an initial working approximation. However, it does not provide reliable data, especially regarding resource access and utilisation, as well as land use patterns for different sections of the community, and hence needs to be followed up with more reliable quantitative methods. Since the philosophy behind the PRA is based on validating the experiential knowledge of local people, it looks upon any outside or expert knowledge as an imposition, PRA techniques leave little scope for any fruitful mutual interaction between the local people and their knowledge systems and the outside, "modern" systems of knowledge. Insistence on a PRA may restrict people's options of using different techniques, and also restrict their access to other methods of inquiry and knowledge. AFARM, which has used PRA techniques extensively in its watershed work, recommends detailed baseline surveys prior to the programme so that the impact of the programme can be quantified (AFARM, 1998).

There are other useful participatory techniques like participatory resource mapping (PRM), which can give plot-wise quantifiable data (through use of cadastral maps) and help in building up a more reliable database that can be a useful instrument of participative planning and monitoring in watershed programmes.

### 7.3.6 Participatory monitoring and evaluation

Though the various guidelines talk of the need for making monitoring and evaluation an integral part of the watershed programme, this has by and large not been taken very seriously. While some guidelines (for example, the revised NWDPRA guideline) have also worked out a very detailed indicator list for such monitoring and evaluation (GoI, 2000), in practice the major thrust has been on conducting a one-time evaluation, either internal (by the PIA itself) or external, at the end of the project to see what the impacts of the programme have been. The routine yearly monitoring is basically aimed at seeing whether the financial and physical targets have been met. Of course, there are also examples, like KAWAD, which have conducted mid-term evaluations with the idea of making mid-course corrections in the projects. Very often, however, such evaluations are more for the consumption of implementing and funding agencies than for the local people.

There is little evidence of participatory monitoring systems, which can be a tool to empower local people. Kolavalli and Kerr see community monitoring in terms of information flow, and talk of the need to devise innovative, transparent mechanisms to facilitate an objective flow of information from communities to donors and programme managers. According to them, such a flow of information could potentially change power relations within communities and between communities and development organisations (Kolavalli and Kerr, 2002b). They argue that this information flow needs to be a two-way process, kept transparent at both the ends of the spectrum – the local community as well as the PIAs and funding agencies. Otherwise, they maintain, participatory monitoring will end up simply as a cost-effective method for the PIAs and funding agencies to keep a tab on the progress of the programme.

For community based and participatory monitoring to be effective, reliable benchmark data (collected through a combination of participatory methods like PRA and PRM and other scientific methods) is necessary. It is also necessary to develop a set of critical indicators related to sustainability, equity, and other programme goals and to build a consensus around them within the community so that monitoring leads to corrective action.

### 7.3.7 Relationship with Panchayati Raj institutions

There seems to be a sharp division of opinion amongst both researchers and practitioners with regard to the role of Panchayati Raj institutions (PRIs) in watershed development. This issue assumes added importance in the context of the increasing efforts at decentralisation (political, administrative, financial and developmental) as a result of the 73$^{rd}$ constitutional amendment. The issue in contention is whether it is good or bad to link CBOs (involved in water and watershed management) to PRIs. Those who are in favour of such linkages argue that PRIs are elected bodies and thus are more likely to be accountable, that functions have been devolved to them, and that they have the provision and the powers to constitute different committees. In other words, if CBOs are not linked to PRIs, it would result in a certain amount of overlap of responsibilities. On the other hand, there are those who argue that CBOs should remain autonomous from PRIs because PRIs are ridden with politics, they represent the existing power equations within the village, and they are not constituted primarily to handle NRM issues.

The GoI guidelines seem to give priority to PRIs as implementation agencies, wherever they are ready to take up the responsibility. NGO-driven watershed programmes, on the other hand, route their work mostly through CBOs. One exception to the latter is FES. In practice, the relationship between CBOs and PRIs has been ambiguous in nature. In the cases of BIRD-K, KAWAD, Adgaon, and ICAR-model watersheds, there is no active relationship with the Gram Panchyat. In fact, the only relationship between CBOs and PRIs is at the time of initiating the programme when the consent of the Gram Sabha has to be

obtained. In some other cases like Dornali (AFARM), Chale (DPAP – Common Guidelines), Vaiju Babulgaon and Ambewadi (both IGWDP), there are common members (either by design or by default) who are part of the Gram Panchayats and the WCs. Thus, there is some sort of coordination between the two.

The relationship between CBOs and PRIs is, however, not always that of a partnership. The Mid Term Review of the KAWAD watershed programme highlighted certain tensions between CBOs and PRIs. The Micro Watershed Development Committees (MWSDCs) have been established outside the framework of PRIs. In Upparahalla watershed in Bellary district, this has caused a problem because the IA is the Zilla Panchayat. The Zilla Panchayat has raised concerns that PRIs have been ignored by the watershed project. As PRIs are expected to look after the local institutions and watershed structures after the completion of the project, there is a need to develop the capacities of the PRIs. On the other hand, representatives of the MWSDCs do not want to have anything to do with the PRIs and are very emphatic that the project should not be handed over to PRIs. From the perspective of the political leadership, MWSDCs are emerging as alternative power centres (Iyengar *et al.*, 2001).

It is difficult, however, to generalise the merits or demerits of CBOs and PRIs in the context of watershed development. One important point made by a recent study that went into the question of decentralisation and Panchayati Raj issues (Ramakrishnan *et al.*, 2002) is that the separation of Panchayats ("politics") from committees ("social capital") is an unnecessary one. The study shows that in states like Madhya Pradesh, where attempts were made to implement the provisions of the 73rd amendment, the decentralisation process has not led to better outcomes. It shows that mutation of watershed guidelines took place in area selection and at the pre-planning, planning and implementation stages of the programme. In selecting an area, subjective criteria played an important role and the selection was often made at the state and district levels. The mandatory Gram Panchayat resolution, more often than not, was a late formality. Very often, it is noticed that the initial contact or interaction is limited to very few people and the strategy followed is "VWC First". In Andhra Pradesh, the study indicates, the action plans were often dictated by WDT with limited participation of the people, and the village watershed association is generally forgotten. In Madhya Pradesh, the PIA has a central role in planning and the funds also go to the PIA (Ramakrishnan *et al.*, 2002).

A recent study in three states on the role of local organisations raises doubts about the ability of local PRIs to undertake watershed activities. It argues that the size of user groups needs to be small (processes were muted in large groups) as large groups covering several villages find it difficult to take up watershed development activities. Moreover, PRIs are already overburdened. The study suggests that local organisations specially created for undertaking watershed activities could be assigned with the implementation function under the overall supervision of the local elected bodies (Rajasekhar *et al.*, 2003).

## 7.4 Participation and outcomes: some issues

At the beginning of this chapter, we pointed out that participation is promoted largely because of the assumption that it leads to better outcomes. There is some evidence to suggest that this faith in participation has some basis. A study of a cross-section of watershed projects, (implemented by different agencies and under different modes) in Maharashtra and Andhra Pradesh, shows that participatory projects are more successful in terms of a broad array of indicators like improved natural resource management, higher agricultural productivity and poverty alleviation (Kerr *et al.*, 2000; Kerr *et al.*, 1999).

Experiences of some of the pioneering projects like Sukhomajri, Ralegaon Siddhi, Pani Panchayat and Chakriya Vikas Pranali were widely acknowledged to be successful because of the participatory element embodied in them. This faith in participation has often led to a distinction between NGO-run projects and government-run ones, the underlying assumption being that NGO-run projects tend to be more successful because they are more participatory and bottom-up. Such a generalisation might, however, hide the fact that government initiatives too are increasingly becoming more participatory, and that NGO

initiatives might not always address the "felt needs" of communities.

There are also suggestions that the relationship between participation and outcomes is not that straightforward (Cohen and Uphoff, 1980). Platteau argues that one needs to empirically test the assumption that community based development is more likely to succeed in poverty reduction than other forms of intervention. Platteau opines, quoting some recent studies like Conning and Kevane (2002), Bardhan (2002) and Mansuri and Rao (2003), that there is not enough evidence to suggest that community based development projects are more effective than more conventional approaches in terms of efficiency, equity (reaching the poor) and sustainability. He also warns that community based development is open to elite capture, especially in localities with high inequality (Platteau, 2003). Though some of these issues have been studied in detail in the context of NRM in general, there are not many studies in the specific context of watershed development. There certainly is a need for such studies.

### 7.4.1 Participation and social regulation

Finally, we would also like to examine the linkages between participation, institutional and social arrangements, and outcomes. Though we cannot do full justice to the topic here, we would like to point out that wherever people have been involved in working out institutional and social arrangements in terms of resource use and access, it has led to positive outcomes. In other words, participation is a means to work out socially acceptable and scientifically informed social regulation measures. For us, this is one of the highest forms of participation. Let us take an illustrative example of what happens when there is no agreement within the community on social regulation and participatory mechanism for monitoring. People who have the resources to dig wells and install lift systems appropriate most of the water that is generated due to the soil and water conservation works and water holding structures that are built as part of watershed development programmes. This is what happened in Adgaon in Maharashtra, which in many other ways, especially in terms of physical works, is a very "successful" one. It is also true that after the completion of the watershed development programme, the water situation improved and productivity increased. However, during the 1995-96 summer, drinking water again had to be provided to this village by tankers, as the case was before the programme. Since social regulations by the people did not cover how much water can be extracted, there was a pumping race between people. As a result, the extraction was much more than the annual regeneration or recharge.

As against this, in Ralegaon Sidhi, there was an understanding amongst the people that nobody would go for individual wells. They decided to have community wells behind/on the side of each check dam on the major stream in the watershed with a clear understanding as to how much water each one would receive. Each water user was also given a card, something like a ration card, in which the details of the irrigation rotations, etc., were recorded. They also decided not to grow water-intensive crops like sugarcane with this water. As a result, they never had to bring water tankers to the village to provide drinking water even in acute drought years like 1995-96. On the contrary, during the summer months of 1995-96, one could see water tankers going out of Ralegaon Sidhi to provide drinking water to the other adjoining drought prone-villages (Paranjape *et al.*, 1998).

### 7.4.2 Beyond local participation

Overall, participation has been a mixed bag of success and failure. For example, there have been reversals as in the case of the model watersheds of ICAR (like Mittemari) after the withdrawal of the PIA. One reason for this was a lack of emphasis on developing and nurturing local organisations. In contrast, there are also cases like Dornali (AFARM) where the PIA was able to withdraw smoothly and local organisations like the Watershed Committee took over the maintenance function with the help of the Gram Panchayat and the Mahila and Yuvak Mandals in the village. However, the PIA did not completely withdraw – it continued its association and still gives guidance to the micro-credit groups and the clean village movement, and also provides information and guidance for taking advantage of other government schemes. Studies show that in most NGO-operated watersheds, especially the successful ones, the NGOs still maintain a

presence, often with other programmes like health or work on issues like Panchayati Raj as in the case of Bhavthan of Manvalok. BIRD-K in the Tiptur area trains the local organisations to take over their functions after their withdrawal. In the absence of a smooth process of PIA withdrawal and preparing the community for taking over the watershed after four-five years, there will be a void in the process of watershed management that could hinder the sustainability of the programme (Reddy *et al.*, 2001). ISPWDK makes a distinction between the active project phase and post-project consolidation phase. It believes that pulling out should be a gradual rather than a sudden process. During the post-project consolidation phase, the PIA supports the local organisations from outside basically to see that they sustain themselves, besides tying up the loose ends. Thus, instead of planning a complete withdrawal, the best strategy probably would be to put in place certain mechanisms (in the form of support and service organisations), which help local organisations get information and technical support, perhaps from outside organizations.

### 7.4.3 Lack of nested institutions

The review, both in terms of the existing literature and field visits, shows very clearly that no efforts have been made to nest or federate institutions like the WCs and watershed associations at different levels. This is a very important issue in the context of watersheds because of the externalities (upstream – downstream) and also the interconnectedness of watersheds at different scales. Even in the case of watershed efforts which are pitched at larger scales like the KAWAD intervention, the earlier ICAR model watersheds or the World Bank initiatives like the Kabanahalla (the size of these watersheds range anywhere from 15,000 ha to 30,000 ha), no efforts have been made to federate the micro-watershed level organisations at a higher level so that issues like water can be dealt with at that scale. Federation would also help in dealing with some of the externalities created at micro-watershed levels. This question has become all the more important in the context of the macro impacts of micro interventions, the unintended hydrological impacts surfacing now, sub-basin and basin level water conflicts (like conflicts between states in a particular river basin) and inter-linking of rivers. Presently, there is no forum in which local people can deliberate on these issues, or which brings the watershed communities into wider decision making processes.

### 7.4.4 Capability building – a prerequisite for effective participation

Training and capability building of the CBOs (and also of the watershed community at large) is an important component of the "software" part of watershed development projects. This component is by and large handled by the NGOs. In some cases, the services of certain professional and support organisations are enlisted. In almost all programmes, there is a budgetary provision made for this. Generally, the training and capability building programme includes activities like exposure visits to "successful" watersheds and training in specific skills like vermi-compost, or non-land based activities. The office bearers of CBOs are also given training in various administrative matters and procedures. Realising its importance, the Government of India appointed a committee (the Eswaran Committee) to look into the issue of training and identified various training needs for different CBOs and personnel involved in the watershed programme.

The IGWDP programmes (for example, Ambewadi and Babulgaon) generally begin with a capacity building phase, during which exposure visits to successful watershed projects are undertaken, different personnel required for the project are put together, SHGs and other organisations are constituted, training is organised, and various types of treatments are demonstrated to the people in a very small part of the project area. This phase helps people understand the different aspects of watershed development, besides building up consensus around issues like voluntary labour, ban on open grazing, and other conditions. The larger area is taken up for treatment only after the successful completion of this first phase.

In the case of ISPWDK, a three-stage strategy has been worked out for the second phase of the programme. The initial capacity building phase continues and overlaps with the two other stages, that is, watershed rehabilitation and income generation, intensification and diversification (Jangal *et al.*, 2003).

There are significant variations, however, in terms of capability building and social organisation. The Kolavalli and Kerr study (2002b) shows that the time spent by the PIA in social organisation efforts prior to taking up biophysical activities ranged from a few weeks (in the GoI projects) to several years (in some NGO-run projects). The projects covered in the study were divided into two categories: those which spent more than six months in social organisation, and those which spent less than six months. The projects, which spent more than six months on social organisation efforts, consisted of all the eight NGO projects studied and 57 percent of the seven jointly implemented projects studied. Significantly, none of the 16 government funded/ implemented and the five bilateral/multilateral funded, government implemented projects under study spent more than six months (Kolavalli and Kerr, 2002b).

A major lacuna of the training and capability building programmes is that sufficient attention is not paid to enhance people's understanding about the resources so that they can effectively participate in the planning of watershed interventions. As said earlier, the emphasis has been on PRA techniques. Only recently has the need been felt to integrate PRA and other knowledge systems. There is a wealth of information from the scientific establishment about land, water, land use and water use and about local resources. This information needs to be integrated with information generated by PRA.

In this context, Participative Resource Mapping (PRM), developed by the Bharat Gyan Vigyan Samithi with the help of scientists from the Centre for Earth Science Studies, Trivandrum, is very relevant. It is not a rapid exercise like PRA methods. In fact, the PRA could form a prelude to PRM. The PRM is an extensive exercise undertaken by village volunteers who collect plot-wise and household-wise information in the village. Plot-wise information is collected on the basis of the plots marked on revenue or cadastral maps. The cadastral maps are familiar to the villagers. This creates the necessary bridge between participatory data and the data with the government or scientific establishments. PRM exercises have been conducted all over India as an instrument of participative planning. In Kerala, it has been part of the Panchayat planning or the people's planning programme. Efforts are now on to extend PRM to resource evaluation and monitoring and linking it up with the extensive information made available by the government and the scientific establishment.

A related concept is participative experimentation (sometimes also known as participative technology development) in the area of sustainable productivity enhancement (like LEISA and different types of organic agriculture). Some pioneering work in this field has been done by AME. They have been providing inputs for different watershed projects like KAWAD, ISPWDK and DANIDA by setting up Farmers" Field Schools. Similarly in Maharashtra, the late Shri S. A. Dabholkar had set up an informal network of farmer-experimenters known as Prayog Parivar, which was based on the philosophy of "learning through doing". The productivity levels the farmers from this network have achieved, especially in drought-prone areas, have been phenomenal. Dabholkar used to call this the "grey matter revolution" (as against the green revolution). This revolution radically altered the way one looks at agriculture (or biomass production). An interesting idea that has caught the imagination of many groups in Maharashtra as well as outside is his concept of intensive cultivation of small plots. It is his contention that a family of five persons can meet all its livelihood needs from a plot of just 0.10 ha. There are many groups experimenting on this idea.

Similar experiments have been tried in some watershed programmes like MYRADA and ISPWDK. For example, PRAWARDA, a partner of ISPWDK, has established Gramina Gyan Kendras in its project area. SAMUHA, another partner of ISPWDK, has set up a People's Technical Resource Group. People with traditional and local knowledge in agriculture, animal husbandry, health (like health healers), and so on are identified and their skills strengthened by giving them further training. They then function as important resource persons in the village.

In present day watershed programmes, however, there is not much scope for such experimentation and learning. As the AME staff told us: "Knowledge is the least attractive component in watershed development. There is no incentive in this. But for land based and non-land based activities, there are substantial financial incentives." Thus, the question is how best to institutionalise such efforts (and also efforts for data collection, resource mapping, etc.) and make them part of the programme itself. This is taken up for further discussion in the last chapter.

# CHAPTER 8

# ISSUES AND RECOMMENDATIONS: APPROACH, RESEARCH AND POLICY

During the nineties, watershed development was increasingly seen to be the lynchpin that would hold together all aspects of rural development, especially in rain-fed areas. The examples of Sukhomajri, Ralegaon Siddhi, Hivrebazar, Pimpalgaon Wagha, and Kamalapur showed the possibilities that watershed development represented and raised high hopes. As a result, watershed development programmes received increasing funds and support throughout the nineties and indications are that this trend would continue at least in the near future. In fact, the 25-year plan for the development of rain-fed areas on a watershed basis envisages treatment of about 63 million ha at an estimated cost of Rs.76,000 crores (MANAGE, 2000).

Our review has shown, however, that as experience has accumulated and serious studies have been undertaken, many problems have been uncovered that need immediate attention. In this chapter, we outline the responses or changes that are required to address these problems. Responses are required at various levels and in various forms. We have organised them into three broad categories: changes in the approach to implementation, research requirements, and changes required in policies.

## 8.1 Change in the approach to implementation

### 8.1.1 Changing mindsets: Conservation versus livelihoods

In most natural resource management programmes, there is often a conflict between the goals of conservation and livelihood (through productivity enhancement); watershed development is no different. It is reflected in the way programmes are designed, interventions are prioritised, and financial allocations are made across different activities. The watershed context offers us an opportunity to combine and integrate both the conservation and livelihood concerns. However, it must be recognised that the primary goal of watershed development is the enhancement of sustainable livelihood options of the people. If not, there is the danger that we start with wrong assumptions and priorities. The review shows there is a tendency to treat livelihood options merely as income generation activities. As a result, conservation concerns are not brought to bear on the activities taken up (like brick making, tailoring, petty business). There is also the other extreme. Driven primarily by conservation concerns, certain treatments like contour bunds, without regard for alignments to field boundaries or contour strips, are pursued inconveniencing farmer's operations. As Amita Shah observed, "soil erosion, if treated as a problem [in] itself, leads to solutions that are independent of the farming system and hence fails to enhance productivity and also people's livelihood" (Shah, 1998). Unless people identify a livelihood stake in watershed development measures, they will not participate and maintain the structures, plantations, bunds, and whatever other treatments that are taken up as part of the programme.

Thus, the goal of watershed development should be sustainable productivity enhancement and, consequently, increased livelihood options and support. Fortunately, there is no conflict between the needs of conservation and sustainable productivity enhancement and livelihood in terms of productive ecosystem potential. For example, the same species may not be preserved, but canopy cover may be preserved and even increased. Soil erosion may not be uniformly suppressed but may be guided and soil may come to be redistributed. In the case of water, instead of emphasising a complete suppression of run-off, one could focus on what may be termed "productivity oriented hydrological planning'.[73]

A simple water conservation approach tries to minimise run-off as a unilinear strategy, whereas the productivity-oriented hydrological planning approach tries to change the components of the water balance. It tries to maximise agricultural and other biomass production within the limits

[73] For a detailed discussion on this see Lundqvist (n.d.); Datye (1997); Paranjape (1998); Datye (2002b).

placed on water availability and on agronomic practices by requirements of sustainability and equity (after allowing for drinking and domestic water needs). This may result in substantially different strategies in practice and in their relation to livelihood.

The other implication of this shift in approach is related to the handling and storage of water. Either water, or the biomass product from water, may be stored. These options need serious consideration. One option is to consider whether there should be a summer crop, or whether the strategy should be to go in for an extended area under rabi crop. Except when water has to be used as water (as in the cases of drinking water, water for domestic purposes including sanitation and cleanliness, and water for cattle), minimising storage time and increasing early utilisation may be more useful in expanding livelihood support. Of course, there is a trade-off here. Sometimes, farmers prefer to have a smaller irrigated summer crop (as against a larger area under rabi crop) because summer crops might fetch better prices. There could be many options. What is important is to change the mindsets of the implementers and the people so that they can creatively explore the different options for sustainable, efficient, and productive use of water.

### 8.1.2 Paradoxes of watershed treatment

Watershed is usually assumed to be the natural hydrological unit for management of water. This is only partially true. It is true so far as surface flow is concerned: ground water flows do not necessarily follow watershed boundaries. Also, surface and ground water flows are not separate entities and are governed by complex interactions and conversion-reconversion phenomena. On the whole, one may say that watershed is a good unit for the management of surface flows.

This leads to an interesting paradox. Most watershed development activity aims at tilting the balance in favour of ground water by converting as much of surface flows into ground water or subsurface flows as possible. The paradox is that watershed development presently converts water flows from a form that is most suited for handling to a form that is not conducive for handling. Related to this is yet another paradox. In India, as things stand today, surface flows are generally considered a common/state/collective resource, whereas ground water is virtually considered a private resource. Watershed development then may be seen as a process that transfers a resource in the public domain to a virtually private domain. The review shows that sufficient attention has not been paid to these "paradoxes" in the implementation of watershed projects.

### 8.1.3 Technology choice

The review shows that the issue of technology choice is rather poorly understood. In the context of watershed development, the choice of technology could have a significant bearing – directly or indirectly - on sustainability, livelihood, equity and participation.

#### *Low external input sustainable agriculture*

The first relevant choice relates to agricultural technologies and management practices. As the review shows, the agricultural practices promoted through watershed development projects currently tilt heavily towards the high external input agriculture paradigm though there is a sprinkling of certain "sustainable practices'. It is necessary to shift away from this paradigm. Fortunately, a wide range of such practices is available to choose from. Some such options are permaculture, conservation tillage, organic agriculture, and natural farming. While they may differ among themselves in various ways, one might categorize all of them as low external input sustainable agricultural (LEISA) practices.[74]

The experience of organic farming has shown that it has generally been successful only on relatively large farms. It also involves long transition periods during which the yield tends to be low while the land regains its productive fertility (vigour) through organic methods and recycling of organic matter. Large farms have managed to take such constraints in their

[74] LEISA practices are aimed at reducing but not necessarily eliminating external inputs and using these inputs strategically and optimally. For example, they call for the use of moderate quantities of chemical fertilisers or other external chemical inputs. In other words, they are techniques that do not deny the benefit of secondary or incremental productivity so long as it does not lower primary productivity and risk environmental degradation.

stride. For smaller farmers, though, LEISA techniques offer both: a transition strategy for switching over to organic farming, or a viable sustainable alternative to organic farming.

### *Infrastructure technology*

The second area deals with watershed infrastructure technology, that is, the technology used for watershed treatment (especially drainage line treatment) and for the water application system. The review shows that no serious thought has been given to the criteria in the choice of technologies and the tendency has been to choose conventional technologies like cement masonry structures and such other technologies which use energy intensive materials aligned with centralised production systems without serious evaluation of alternatives. This is an area which calls for a major reorientation in approach as it has implications both for livelihood enhancement and the wider sustainability issues, especially in terms of energy.

It should be noted that the bulk of the cost of watershed development is spent on physical works; within this, a significant portion of the money is spent on the technology to be used. The scale on which this expenditure takes place is massive. If we look at this as an opportunity to weave a local income-generation and skill-improvement element into the programme, then the possibilities are vast, and the issue of technology choice acquires a different significance altogether. The choice of technology also offers an opportunity to modify the energy requirements of watershed development.

### *Participative experimentation*

As part of watershed activities, there is also a need to develop the culture of participative experimentation. AME's work in the area of participatory technology development (PTD) and the concept of Farmers" Field Schools as well as the Prayog Parivar network of experimental farmers in Maharashtra are models that need to be promoted as part of the watershed programme. The two experiences are not "watershed" experiences *per se*. But they highlight the potential to integrate into watershed development sound practices of sustainable and equitable management of natural resources, wherever they may come from.

Participative testing helps inculcate the spirit of experimentation among people and gets them out of the present mode of accepting "ready made solutions" and "packaged" practices. Most of the agricultural extension efforts incorporate Daniel Benor's views that recommend splitting every package of practices into simple units of what to do at a given point in time.[75] It is a set of "what to do's without the "why to do's. They implicitly devalue farmers" understanding and do not consider them capable of assimilating the "why to do's.

Prayog Parivar and AME's work in this respect is striking. However, we also feel that small farmers face a greater risk when they take on experimentation on their plots in that they are jeopardising a larger portion of their livelihood than that of large farmers. They perhaps need some degree of risk cover in order to take the chance element in experiments in their stride. For example, if they are offered risk cover against a shortfall in production in comparison to what they would otherwise have got that year, they would then be emboldened to try out some of the practices on smaller plots of say 5 or 10 *gunthas* (500 or 1000 $m^2$). A few groups (like AFARM, AME) have tried out this type of approach and the results have been encouraging.

### *Parameters for technological choice*

The priority should be to choose technologies characterised by:

(i) Equal or comparable performance or function as compared to conventional technology

(ii) Cost reduction

(iii) Energy saving

(iv) Higher component of local labour and local materials

(v) Amenability to modular design and modules

[75] The agricultural extension service in the country was primarily based on his approach whose premise was that farmers do not have the ability to grasp complex processes and there is a consequent need to split everything into prescriptive formulations without stating the underlying reasons for such prescriptions. In Maharashtra, this is known as *Prashikshan and Bhet Yojana* (Training and Visits Scheme). We believe that this type of an approach to agricultural extension had a negative impact on farmers" innovation and experimentation and made them "addicted" to ready made solutions and packages.

that can be fabricated or manufactured in dispersed rural industries or work places and assembled at site

(vi) Opportunities for development and improvement of local skills, and

(vii) Scope for easy comprehension and acceptance by local communities.

Characteristics i) and ii) are fundamental parameters. Many of the earlier appropriate technology efforts violated one or the other and earned appropriate technology a bad name. Substandard performance is not an option.

Characteristic iii) has a direct effect on sustainability in the global sense. The fact that materials also represent energy is not often taken into account, and the saving of energy-intensive materials is equivalent to saving energy. There is now a range of technologies that bring about energy saving by optimising materials.

Characteristic iv) is related to the portion of programme funds dedicated to the support of local livelihoods. In conventional technologies, energy-intensive materials like cement and steel and transport of external materials, which create no local incomes, typically account for a large part of the expenditure.

Characteristic v) is related to the potential of that technology to become the basis for dispersed industry. There are do-it-yourself technologies for housing, which may not quite become the basis for local industry, but modular design can make it possible. Combined with characteristic vi), this offers scope to incubate dispersed industry.

Characteristic vi) implies that the new skills needed are not alien to the general skills available. There are technologies that may call for a small number of highly skilled people and a very large number of unskilled labourers. The high skill required may be well beyond the capacity of the local people. As a result, only unskilled labour markets will be open to them. Contrast this with a technology that requires semi-skilled labour in large quantities.

Lastly, this process has to be participatory. Unlike profit-driven technology choice, here the choice is to be made by the people themselves, provided the decision-making in the watershed activity is participatory. The motive behind the general acceptance of a technology will then determine to what extent it will be useful.

There are now a basket of such technological options. There are technologies under development that provide equal function at somewhat smaller cost, but whose main advantage lies in reducing energy consumption in a big way, reducing the non-renewable energy consumed directly or indirectly, typically by a factor of 5 or more, generating substantial employment and incomes to the local population, and providing opportunities for skill improvement and technology development that can become the basis of a dispersed industry.[76]

### *Applying the choice to real situations*

The above discussion has described the range of choices from the standpoint of principles, but it would be wrong to apply them mechanically in real situations. Matters involving local labour and materials, in particular, require careful assessment of options. The actual choice always has to take into consideration the situation in respect of these two factors.

For example, take the issue of labour versus machinery. As discussed in Chapter 6, increased labour opportunities, especially during the implementation phase of the project, is one of the tangible benefits to the resource-poor sections.[77] This would imply a general choice in favour of labour-intensive technologies and interventions. However, in a given situation, it would also depend on the local availability of labour. Some of the issues related to labour, migration and use of machinery are discussed in Chapters 4 and 6.

It should be recognised that there will be situations when local labour may be in short supply, because they may have other more gainful options, or the supply may fall short of the numbers required by the volume of work. In such

[76] For a detailed discussion on the range of such technologies and their applications see Gore (1992); Gore (1998); Paranjape and Joy (1995); Datye (1997).

[77] In fact, the impact goes much beyond this and the impact on the economy in general, especially with the increase in the purchasing power of the people, is well recognized. As Keynes (1930) said, "paying people to dig holes on the ground can stimulate local economies'. The role of watersheds in providing employment to rural people and the wider impact on the rural economy is well discussed in Shah *et al.*(1998).

cases, a degree of mechanisation may become inevitable. Here, the strategy advocated and practised by ISPWDK is significant. They make it a point to first negotiate with the local labour as to how much work they can manage and only the remaining work is either given to labourers from outside or completed through machines. The objective remains to get the maximum local benefit in a given situation, but without making it an *a priori* choice dictated purely by principle.

### 8.1.4 Rainfall dependability - a crucial factor in planning

We argued in Chapter 2 that sustainable livelihood enhancement in drought-prone areas also means increasing the dependability of production. We argued that this requires planning on the basis of 80% dependability of rainfall. Our reviews of existing programmes suggest that rainfall dependability is not taken into account as a factor in watershed planning.

Taking dependability of rainfall into account while planning watershed interventions also helps to strategise interventions. It helps to build up reserves in better years to tide over bad years. One example of risk-proofing measures is setting up a grain bank. The watershed association or Gram Sabha could decide that in good years, the farmers contribute to the grain bank, which could be used in a bad year. A similar strategy can be adopted in the case of water, especially ground water. The watershed community could decide that water from stock (deep aquifers) would be used only in case of bad years (and that too primarily for domestic water needs), and would be replenished in good years. This can be done only if water use regulation (and also water balance studies) is made part of watershed development. Traditional irrigation systems did have in-built collective regulation and mechanisms of water use, especially in times of shortage. A good example of this collective regulation of water use as per water availability in terms of surface water is the old Phad system in Maharashtra (Datye and Patil, 1987).

### 8.1.5 The issue of deep aquifers

The review shows that the use of water for irrigation is expanding and receiving higher priority with watershed development. Although recharge has increased because of watershed interventions, extraction has also increased. In many cases, extraction has been much more than the annual recharge. Shallow aquifers are, therefore, being depleted much earlier because of large-scale agricultural use and hence domestic water needs are being pushed onto deep aquifers. This has serious implications not just for long-term sustainability of agriculture, but also for the domestic sector, as water from deeper aquifers is more likely to be contaminated with fluorides and heavy metals.

There is, therefore, a need to set up a regulatory mechanism within the community that will ensure priority to domestic water use and will also monitor and regulate ground water extraction. For example, the village or watershed community can decide not to go in for borewells beyond certain depths or restrict borewell use only for drinking and domestic uses. Besides self-regulation by the communities, it might also require certain enabling legislation or policy initiative on the part of the state. For example, self-regulation by the communities can be made a precondition to grant watershed development funds as in the case of other conditions like ban on grazing or cutting trees. However, this would require political will on the part of the ruling class as it will directly affect the interests of the rich and the powerful in the villages.

### 8.1.6 Equity

While there could be an enabling environment and legal provisions which can further equity, equity in and of itself cannot be legislated. A greater awareness of and sensitivity to equity issues and their implications are a precondition, if one has to even explore the various possibilities. The use of public funds for the programme means that measures to ensure equitable distribution of benefits has to be put in place as part of the institutional arrangements. Major resource development must be *preceded* by arrangements that ensure access to a substantial share for the resource-poor for at least the incremental resource generated. There are many ways to create this kind of an access and the following are some illustrative examples: a) creating rights over part of the additional water resources generated; b) preferential access to CPRs for the resource-poor; c) access to small plots of land where they can utilise the water they have obtained as part of equitable water distribution; d) access to

public and private wasteland with shared usufruct rights in lieu of planting of trees and grasses including sharecropping on private fallow lands; e) fishing rights to the resource-poor in the water bodies within the watershed; f) creation of food grain, fodder, fuel, and usable biomass pools that can be made preferentially available to the rural poor. There could be many more such avenues depending on the local situation. Another important area is to set up processing facilities (value addition) based on a combination of exogenous and local material and energy resources.[78] In the context of the resource-poor, NLBAs are important, but they need to be seen in combination with the measures described above, and not in lieu of them, as often happens.

In the context of gender, the first step is to afford women an independent status. In the case of representative local organisations (like various CBOs) the household representation (in terms of membership) should always be by one male and one female. If the representation is on the basis of one member per household, then it is usually the male of the household who gets into the CBOs. Another basic aspect is to see that equal wages are paid to women on the watershed work sites. There is also a need to go beyond the "reproductive roles" of women, (which tends to restrict women's concerns only to issues like drinking and domestic water and sanitation), to the "productive" sphere. This could be done by specially creating access for women to small plots and limited but assured quantities of water. There can be many such possibilities. Where NGOs have been sensitive to this issue, they have been able to come up with programmes that address this issue.

### 8.1.7 Institutions – Community as a regulatory layer

In traditional systems, the community used to act as the regulatory layer for natural resource use (forest, water). Of course, this needs to be qualified by recognising that equity within the community, the very notion of who constituted the community, and who took decisions in its name, were all bound by societal structure of that time. The regulatory space that earlier belonged to the community, recognising the internal hierarchies and inequalities, has decreased over the years. In the case of irrigation, it has almost disappeared. Now, the mechanism of resource use regulation has been reduced to two extremes – the individual (and/or the market) and the state. Thus there is a need to re-establish some form of community control over resource use and this should be an important objective of watershed development. New forms of such control, and indeed a new concept of "community', need to evolve.

Though there is an increasing awareness of the need for treating the Watershed Association (WA) or the Gram Sabha (GS) as supreme, in practice, this precept is hardly adhered to. This is not simply a matter of the implementing agency taking a decision. Several institutional design and policy issues are involved.

First, one needs to understand the functions of the WA/GS. There are essentially two kinds of tasks in a watershed project: implementation

[78] This issue has already been discussed in the context of technology choice. Addressing the livelihood needs of the resource-poor is an important area that implementing agencies have to take seriously, especially in areas where the proportion of the landless is high (say, more than about 20 or 25% as in the case of Marathwada region in Maharashtra). In fact, as discussed in the chapter on equity, some of the implementing agencies like MYRADA and IGWDP have realised that if the proportion of landless is very large, then watershed development alone may not be able to make much of a difference to their livelihoods. Also, instead of taking up the conventional NLB activities, dispersed biomass processing activities could be much more viable. That would also create a stake for the resource-poor in the watershed activities since the processing activity is intrinsically related to increased biomass availability as a result of the watershed programme. In fact, the biomass-based planning approach, discussed in our Normative Framework chapter, tries to tie both the sustainability and livelihood needs together. According to this approach, the assessed livelihood needs of a typical family include a built in surplus of 3 T biomass. This 3 T surplus per family may either be produced in the form of perishable commodities like vegetables or fruits and sold in the market directly to meet cash requirements or it may be produced as non-perishable biomass (like small dimension timber or fibre.), which becomes the main input to the decentralised processing unit. Thus, there is a potentially synergistic relationship between the alternative set of technologies and the increased biomass production as a result of watershed development. The limited purpose of this discussion is to point out the enormous potential that watershed development can contribute in moving towards "sustainable prosperity for all". For details, see Paranjape and Joy (1995) and Datye (1997).

tasks, involving the management of specific activities or resources, and policy tasks, including setting up the managerial tasks as well as deciding on resource allocation norms, priorities, and so on. In a sense, the latter have a "political" aspect where the assembly itself needs to decide through the WA/GS. Today, however, the policy tasks are often taken over by the NGOs or the PIAs and the community only has implementation tasks. This is a short-sighted and top-down approach, since (as we have repeatedly pointed out) a large number of regulatory tasks are required to be carried out in the long run.

Second, the question is how to structure the lowest level bodies (the GS or the WA) and their relation to other bodies to handle both these tasks. Both theory and practice suggest that small, homogeneous groups can carry out implementation tasks better, but regulatory or policy-setting functions require representation from the full spectrum of stakeholders and a consensus among them. Current watershed development programmes seem to attempt to cope with these pulls by creating sub-village-scale bodies (SHGs, AGs, UGs, etc) for implementation and then creating special representation for these bodies in the village/watershed level committee (which presumably will regulate). In our opinion, however, it would be better to go back to the basics: if the WA/GS is to be the primary regulatory body, then it should have special representation for disadvantaged groups like women, Dalits, tribals, and the landless and not specifically for bodies like the SHGs. When it comes to size, there are obvious advantages in having small, homogeneous groups carry out implementation tasks, and a larger group, able to handle the force of wider consensus, to carry out the regulatory or policy tasks. Nevertheless, the WA/GS must be at the hamlet or small village-scale, so as to ensure their proper functioning.

The review shows that even in the cases where the WA/GS is officially constituted, it generally comes into the picture only so far as the constitution of the WC is concerned. The WC handles all subsequent events. This is the case in the NGO projects too. In fact, in projects undertaken according to the Common Guidelines, the money at least flows directly to the WC account; this does not happen in most of the NGO projects. Thus, making the WC transparent and accountable to the WA/GS is a major requirement.

Strengthening the GS also requires giving it proper legal status. Ideally, recognition of hamlet-level Gram Sabhas under Panchayati Raj – as has happened in Karnataka – may serve the dual purpose of providing a legal status as well as solving the size problem. This approach is also much better than registration under societies or co-operative societies act, in that it gives them a statutory role in all development functions, not just watershed development.

### 8.1.8 Need for nested institutions

So far, we have only discussed the local-level institutions that would be required. However, one of the key impacts of watershed development highlighted by this review is the downstream impact and also the impact on ground water aquifers. This implies that there is also a need for adequate institutional arrangements to deal with these multi-village or even basin-scale problems. A first step in this direction would be a federation of Watershed Committees. Such federations could deal with issues at multi-village/milli-watershed scales. Scaling up to the basin-level would be much more difficult. The arrangements at this level would also need to recognise the basic asymmetry between upstream and downstream communities. The basin-level regulatory body would be obliged to establish some ground rules for the minimum entitlements of the downstream communities. Clearly, the basin-level body will have to deal not just with watershed development issues, but with all aspects of water use and all forms of water – surface and ground, infiltrated and harvested, return flows, and so on.

Indeed, at some point, these institutions will have to incorporate other interconnected issues in the ecosystem as well. For example, upstream afforestation or forest degradation or forest conversion will clearly affect watershed functioning, although the magnitudes and even the directions of change are poorly understood in the tropical context. Therefore basin-scale institutions for regulating water use shall necessarily have the authority to deal with forest issues. These regulatory institutions would have to be supported by other institutions that provide high quality technical data and monitoring services on hydrological aspects. Careful crafting

of such multi-layered institutional arrangements (Lélé, 2004) will be essential if the integrated watershed-based development approach is to be scaled up without generating major conflicts. This will, in turn, require major policy changes in the laws governing surface and ground water in the country. Some of these changes are elaborated in section three of this chapter.

### 8.1.9 Watershed development: limits and wider social issues

To achieve these outcomes, along with an enabling policy framework, there is also the imperative for social awareness and a wider social movement, committed to sustainability, equity and participation. It is important to recognise that this is not replaceable, and the realisation of the full potential of watershed-based development is tied to this.

It is also important to realise the limits of watershed development as the sole, or at least the main, instrument by which livelihood for all can be assured in rural areas. Below, we discuss some situations in which watershed approach, as understood today, may not work.

In the case of areas in the transitional zones (middle reaches) and the lower reaches of larger units like sub-basins and basins, the quantity of water flowing through the region or in close proximity is much larger than anything that watershed development of local water harvesting can bring about. Traditionally, this resource has been the basis of livelihoods in most of these regions. In these areas, land may be the main constraint, and not water. Thus, the land question is much more central in these areas, rather than watershed development proper.

Another situation in which the people may not be interested in watershed development is in areas where other employment opportunities exist because of close proximity to urban conglomerations and industrial centres (or also because of activities like mining). The Konkan strip of Maharashtra is an example of this because a) there is heavy migration to Mumbai and it is generally said that Konkan survives on the "money order" economy, and b) the area is being developed as a petrochemical industry belt as well as a tourist belt. The occupational impact of these factors is much larger and the opportunity cost of putting in labour for watershed development may be prohibitively high for many people.

Also in areas where there is sharp disparity between landless labourers and big farmers, and landless labourers are a large proportion of the rural society, the watershed development approach may not be able to address the livelihood issues of the poor. All measures suggested in the chapter on equity work only if the proportion of landless is relatively small. If their proportion is large, i.e., of the order of 20-30%, or more, then providing access to the increased resources (say water) may be much more difficult. It is difficult to visualise the landed class ceding their access rights so easily. It may turn out to be a social conflict that can be resolved only through radical social change (including measures like land redistribution).

As we have repeatedly mentioned in the report, in the arid and semi-arid regions, it is possible that watershed development alone may not be able to provide full livelihood assurance. We have clearly acknowledged the need for bringing supplementary, exogenous water to bridge the gap. Also, there is a much greater need in these areas for a strategy of integrated water resource management. Ozar (Nashik district, Maharashtra) is a good example of such integration – by combining watershed development with canal irrigation, they could greatly extend the area under irrigation. Similarly, even in areas where watershed development may not be able to provide sufficient livelihood assurance, it still has a positive and vital role to play in ensuring that whatever external supplement is needed is minimised and the social cost of livelihood assurance is brought down.

While watershed development, on the whole, goes a long way in ensuring fulfilment of basic needs, it does not provide sufficient capacity for labour absorption. For this, we need to have a definite alternative strategy of dispersed industrialisation during and after watershed development. This strategy is discussed elsewhere in detail.[79]

## 8.2 Research needs

The review shows two types of research needs. One, sometimes even existing knowledge does not seem to have a bearing on some of the practices

[79] See Paranjape and Joy (1995) and Datye (1997) for details.

and measures adopted and there is a need to bridge this gap. Two, there is a need to take up research activities on certain crucial issues and variables where there is a gap in the existing body of knowledge. In this section, we first pick up a few of the more important issues for elaboration and conclude with a broad listing of such needs.

### 8.2.1 Easy practical models for water balance studies

As the review shows, there have not been many water balance studies that have investigated impacts of watershed development, or of different technology choices on different water budgets. Many of the available models are physically based and are not directly and easily adaptable to field conditions that obtain under watershed projects. Moreover, establishing empirical relationships of water budgets in a watershed and evolving simple methods of assessment require extensive prior monitoring and data collection. Most of the detailed models created in developed countries are extremely data hungry and do not offer practical application in countries where extensive and well-authenticated secondary data are not available.

During the review, we came across very few cases like the KAWAD water budget or the BIRD-K attempt in Adihalli-Myllanhalli. Many such studies are also reported in grey literatures, but are difficult to access. These are mostly one-off water balance studies carried out by experts and professional bodies for their own purposes and often do not have any linkage with the way the project is implemented or monitored. What we need are practical models that are based on common criteria, are easily applicable, and offer some reliability in understanding the dynamics of watershed hydrology. "One size fits all" approaches in estimating water budgets have little or no practical value. What is needed is a "robust" model that gives good, workable, swift approximations that can guide participatory resource planning and at the same time has sufficient scope for improvement and adaptation as more precise data become available.

The value of rapid but good working estimates of water resources and their dependability cannot be over-emphasised. It is only with such an approach that one can build in this component right from the planning stage of the watershed in a participatory and cost-effective manner. Such a model may also make it possible to set up a typology of watersheds that will allow comparisons between watersheds. Knowing a few characteristics of the watershed would give us good approximations of some of the major components of the water cycle, how they may change, and also help keep track of these changes.

Such a model should be able to tell the watershed community and the implementers as to what is happening to different components of the water cycle and indicate whether the interventions have been able to reduce the "unproductive" components of the water cycle, which should be one of the main objectives of watershed development. It will also help the watershed community in understanding what quantity of water may become available for use and make appropriate social and institutional arrangements for use of and access to that water.

SOPPECOM has made such an attempt in its "Status of Small Water Harvesting Structures in a Sub-Basin in Udaipur Region" (2001) as well as in its NRDMS effort. In the study, it adapted the two layer model developed by C.T. Haan and modified it to combine the cumulative effect into a cut-off value of rainfall for run-off from different classes of land. It then assigned different values to the parameters and used a one-and two-layer model to arrive at run-off and ground water recharge values. The iterations were carried out on the basis of daily rainfall figures, but they can be approximated on the basis of rainy day calculations as well. The results were then checked by calculating the values for the Jaisamand reservoir catchment and choosing those parameters which came closest to the actual data of the Jaisamand reservoir storage. The model is now in the process of being improved upon and applied to other situations at a micro level as well as at a wider, sub-basin level.

The important thing about the effort was the method adopted, of building a model that is simple enough and having something on the ground to check it against. In fact, it is possible to set up such a process as part of the watershed effort and observation of terminal storage structures or flows at exit points can be used to calibrate/improve the model and its predictive power. The main lacuna in this area is that there is no well- accepted model that combines data and information collected through participatory methods like PRA and PRM and data gathered through conventional scientific

methods like surveys and remote sensing. Though GIS and other computer-based tools may not be necessary in the beginning (and the emphasis should be to begin with simple models without dependence on highly sophisticated tools and methods because they often become bottlenecks), they can be incorporated at a later stage to refine and improve the model.[80] In fact, GIS techniques should be adopted in order to integrate experiences at district and higher level.

### 8.2.2 Need to study the impact of different watershed treatments on watershed hydrology

The review shows that there are serious hydrological changes brought about by watershed development. Changes in canopy, leaf area index, soil texture, and other factors need to be correlated with watershed hydrology. The changes brought about have an impact that is not restricted to the micro-watershed alone; the aggregate impact is likely to be felt at sub-basin and basin levels too. It modifies downstream flow patterns throughout, including flows into existing tanks and into medium and major reservoirs while also affecting their dependability. Since water is a common pool resource and one unit of water used by one area is a unit denied to other areas, watershed development may well bring about a deep-seated restructuring in water access. In so far as this results in redistribution of water access in favour of those denied water so far, it should be welcomed. In any case, redistribution has to be studied and taken note of. There are indications that watershed interventions have begun to have some impact on downstream flows. The matter needs serious study and the problems that arise from such a change need to be anticipated, identified, and deliberated upon before they erupt into conflagrations.

Clearly, there is a need to go beyond impressionistic studies (or observations) and take up systematic studies to understand how different watershed treatments impact watershed hydrology, especially in relation to water balance. This study needs to be carried out in the context of the varying topographical, biophysical, and socio-economic characteristics of watersheds. Such a study would greatly help the local communities and the implementing organisations in planning watershed interventions and also in monitoring the impacts. It would also help in understanding the influence of the intervention at sub-basin and basin levels.

### 8.2.3 Long term, coordinated, multi-locational studies

Most impacts, especially the ecological impacts, of watershed interventions are long term, take a longer period to manifest, and need more time to work themselves out. The bulk of the present studies are one-off studies, not correlated with other studies and mostly done immediately after the completion (or just before completion) of the projects. Many of the researchers also recognise that their studies really could not capture the ecological impacts of the intervention mainly because of the long "window period" required for their manifestation. Thus, studies are needed to trace the impact on a long-term basis. Long term and periodic studies are also required to capture the temporal dimension of sustainability, especially with regard to productivity enhancement.[81] This could be in the form of a network that may form research groups (academic institutions, implementing agencies, NGOs and people's organisations) according to shared frameworks and concerns and take up multi-location, coordinated research on watershed activity and its impacts over a sufficiently long period. Or, it could be so planned that the same locations are visited periodically after a sufficient lapse of time. This could be a cost-effective method of generating reliable data (which is largely absent at present), and additionally may serve as a forum for mutual learning. Such a multi-locational, collaborative research network can also hothouse some "action-research" projects to bridge the gap in the present knowledge.

The most important and serious drawback in respect of watershed development studies is that they, almost uniformly, lack reliable information

[80] Over the last 5 years or so, SOPPECOM, with the help of K. R. Datye, has been able to do some preliminary work in this direction. SOPPECOM has been able to use this model in a couple of places in Madhya Pradesh in the watershed development context and has also used it in a study of small water harvesting structures in the Udaipur region in Rajasthan, especially using a modified Haan's model. For details, see SOPPECOM (2001b); Paranjape (2001); Datye (2002a).

[81] For a detailed discussion on the need for such studies, see Vaidyanathan (2001).

on the pre-watershed status within the watershed. Undoubtedly, there are various techniques that have been used to compensate for this lack of information, but the degree to which the compensation takes place is not clear. They may compensate for it to some degree when the associated information is part of the people's commonsense pool of information and is easier to recall – for example, for socio-economic information. However, for other kinds of information – for example, about the biophysical aspects of the watershed ecosystem – the compensation may be very poor.

### 8.2.4 Absence of inter-disciplinary studies

Watershed development, by its very nature, is a multi-sector intervention and the outcomes are determined by a host of factors ranging from biophysical characteristics and interventions to social arrangements and institutions, participation, knowledge systems and technology choices, and also broader political economy factors. All these fall under different disciplinary boundaries. Broadly, one can say that they fall under two categories – the natural (or biophysical) and the social sciences. The literature on institutions in the context of NRM also shows that the biophysical characteristics or attributes do affect the institutions (Ostrom, 1990; Lélé, 2004). However, in the context of watershed development, there is a complete absence of inter-disciplinary studies, especially those that try to combine the insights from biophysical sciences and social sciences. Most of the studies are carried out by researchers bound by disciplinary boundaries and, as such, have not been able to capture the multi-dimensionality of the problem in an integrated manner. The economists who do evaluation studies or impact studies are poorly informed about the biophysical and sustainability dimensions of the interventions and their impacts and *vice versa* with the biophysical scientists. In one such evaluation study of a watershed development programme by an economist, the researcher asked whether the small plantation/social forestry (woodlots) have helped in increasing the number of rainy days. Since this question was asked, people gave answers and these answers were neatly tabulated and presented as part of the findings of the study! It is probable that such a question would not have been asked if the researcher was aware that meteorological factors like quantum of rainfall, number of rainy days, duration of dry spells, or similar issues related to climate change have a long time horizon and are determined by a much, much wider set of factors than a couple of hectares of newly planted woodlots in a watershed. Thus, there is a need to initiate inter-disciplinary (as different from multi-disciplinary) studies to understand the issues in a more holistic and integrated manner. Our normative framework also calls for such a study.[82]

The donor agencies do have a responsibility to extend support, on a long-term basis, to the types of research that we advocate. Unfortunately, the increasing trend is towards funding short-term, quick-fix consultancies.

### 8.2.5 Some specific suggestions for research: biophysical and social

We list below some specific suggestions for research that need to be taken up on a priority basis. The list is by no means exhaustive, but does represent what we think are priority focus areas.

#### *Hydrological*

- Cross-scale and inter-scale hydrological effects (upper to valley portions, intra- and inter-watershed relations up to basin-scale)
- Surface water-ground water interactions (water as an integrated resource)
- Aquifer behaviours - balance between shallow and deep aquifers, their sizes, recharge rates, locations, etc.
- Net effect of different soil and water conservation measures as well as afforestation and agricultural practices on variables like infiltration and erosion under different geo-physical conditions.

#### *Land-Vegetation-Water interactions*

- Agro-ecological relationships: Inter-relationship of different land forms (as per

[82] Inter-disciplinary study is easier said than done. Sometimes, it is even difficult to get people across disciplines (and more so in the case of social science disciplines) to have a meaningful dialogue with each other. For a discussion of both the complexities involved and also the potential that exists, see Lélé (2001).

land capability classification) and their uses and the impact on one another as an ecosystem

- Grazing and forest management – productivity, sustainability, and offsite effects

***Socio-Economic Aspects***

- Compare asset-based approaches with income-based approaches, in terms of benefits, their distribution, and sustainability
- Scope for biomass-based value addition – biomass, labour, energy, capital, and financial requirements, and identification of possible bottlenecks
- Scope of watershed and NRM-based development in different regions, and the limits and implications of such development, especially in resource-poor areas
- Indigenous knowledge, its scope, and the issues related to its interface with modern knowledge
- Role of CBOs and SHGs in improving participation and sustaining benefits beyond project period
- Ways of better addressing the problem of local heterogeneity in programmes like watershed development where different social sections are supposed to cooperate, formulation of issues, strategies and institutional arrangements for the equitable and sustainable reconciliation of interests and conflict resolution
- Social and institutional mechanisms and capability building for incorporating rigorous participatory grassroots benchmarking, monitoring, and assessment in watershed based development programmes.

## 8.3 Restructuring the programme

Most of the policy level suggestions that follow revolve around a construct of how the programme should be restructured. In this section, we spend some time on describing how a restructured programme would look if it were to be enabled to take into account what the review has been suggesting in its earlier chapters. This is meant to clarify many of the policy issues and help lay the foundation for the discussion that follows in the next section.

In the context of how the programme should be restructured, there seems to be a growing convergence around two definite suggestions. First, it is commonly suggested that the time span of five years, which is generally the duration of most of the watershed programmes including a short preparatory phase, is not sufficient and there is a need for considering an increase in the duration of the programme. The suggested range is from seven to 10 years. Two, most development agencies have suggested post-watershed or watershed-plus components to be added on to the programme in order to realise and consolidate the full benefit from watershed development activity.

Added to this are some other needs thrown up by the review. First, the review shows that equity and sustainability concerns have not received adequate attention in many projects and most of the benefits are flowing to the resource rich in favourable locations. Since most of the funds provided are public funds, the programmes, however well-intentioned they may be, end up subsidising the development of the resource rich. We need some measures to ensure that public funds are not spent in this manner. Second, there is a grave neglect of building up a natural resource database for the watershed that can serve as an effective tool for participatory planning at the local as well as at the wider level. As suggested in the earlier section, there is a need to incorporate specific provisions in this respect in the restructured programme.

There is also a need to phase out the programme (over a period of 10 to 12 years), with the programme progressively moving from one phase to the next with the condition that funding for each phase would be tied to the performance of the previous phase. The core idea underpinning the restructuring of the programme is that if equity and sustainability are to be properly integrated, then conditions have to be built into the programme and institution building has to precede biophysical intervention. It is expected that the number of projects that can move on to Phase II shall be smaller than those completing Phase I. Phase II and III should follow the same pattern. *Thus, the restructured programme will ensure that while all areas get a minimum necessary treatment, only those areas which incorporate equity, sustainability and participation as central concerns will get progressive assistance.*

Thus, there is a need to restructure the programme so that these suggestions can be meaningfully incorporated and addressed. Table 8-1 provides a brief outline of the phases and their allocations and the subsequent sections discuss some of the aspects in greater detail. The details of restructuring are meant as an illustration; it is the principle behind the restructuring detail that is important.[83]

### 8.3.1 Flexibility

The phases in the restructured programme do not have a rigid duration. As we have emphasised earlier, it is important to make sure that social and institutional arrangements about the augmented resources are in place before the augmentation takes place. This approach requires a certain amount of patience and flexibility in timing and needs an enabling provision within the programme. Specifying a range of two to four years is aimed at providing the programme phases with this flexibility.

**Table 8-1: Suggested programme phases and allocations**

| Component | Phase I | Phase II | Phase III | Total |
|---|---|---|---|---|
| Duration | 2-4 yrs | 2-4 yrs | 2-4 yrs | 6-12 yrs |
| Database and monitoring information (Rs/ha) | 250 | 150 | 200 | 600 |
| Non-works component (Rs/ha) | 1,000 | 850 | 800 | 2,400 |
| Works component (Rs/ha) | 2,000 | 4,000 | 3,000 | 9,000 |
| Targeted toward resource poor (Rs/ha) | 500 | 2,000 | 2,000 | 4,500 |
| Total (Rs/ha) | 3,250 | 5,000 | 4,000 | 12,250 |

### 8.3.2 Characterising the phases

The first phase consists of basic soil and water conservation work but with special focus on land improvement and plantation activity. No major water resource development activity would be taken up during the first phase. It is expected that the natural resource database is set up and the social arrangements about the augmented resource are worked out and agreed upon by the end of this phase.

The second phase shall comprise of most of the water resource development and it is expected that the social arrangements worked out during the first phase are put in place and begin functioning in this phase.

The third phase may be seen as mainly a sustainable productivity enhancement phase based on resource augmentation and ecosystem improvement that has taken place in the earlier phases. The programme, over the three phases, is expected to be increasingly targeted at the disadvantaged sections with 20, 50, and 67 percent of the works expenditure targeted in this manner (see Table 8-1).

Another way of characterising the three phases is as follows. The first phase is an exercise in capability building, proving minimum capability, equity orientation, and institution building; the second phase creates the potential, proving capability and readiness to regulate water use; the third phase aims to realise that potential, and targets the resource-poor separately. By the time the programme reaches its third phase, it is expected that sufficient non-farm income opportunities through biomass-based

[83] The model presented here is based on suggestions made by SOPPECOM and particularly by Shri. K.R.Datye from time to time. For details, see Datye (n.d.-a). Some of the values used and assumptions made are drawn from various experiences and discussions with different groups involved in watershed and other related programmes. Presently, though the GoI Guidelines stipulate Rs.6000/ha as the cost, many of the NGO-run programmes like IGWDP or bilateral projects like KAWAD spend much more. In the case of KAWAD, the comes to about Rs.15,000/ha. Experience also shows that if people get access to applied water for a portion of their cropped land, then they are much more favourably disposed towards bringing a part of their land under permanent vegetative cover (plantation). This has been demonstrated very successfully in the case of Sadguru work in Gujarat where planting a certain number of trees has been made a condition to get access to water from the scheme.

processing activities, would be generated for the resource- poor, leading to sustainable prosperity.[84]

### 8.3.3 Should there be conditions?

If we are to ensure that sustainability and equity concerns are to be adequately addressed, there have to be some conditions attached to public funding. This is an extremely delicate question. While the need for conditions is clear, it may have the effect of concentrating more power in the hands of the state bureaucracy and moving away from the objective of decentralisation. Both these issues need to be addressed.

First, it should be pointed out that decentralisation should not and need not be an absolute end in itself. As an example, we should consider the case where a small minority is distributed among dispersed localities dominated by their oppressors. Decentralisation here is an active means used by the dominant to keep the oppressed minority subjugated. The example is not hypothetical. The oppression of Dalits by upper castes has been made easier because they have been dispersed in villages. They could resist this more effectively only by leaving the villages and migrating to the cities, where they could, so to speak, centralise their strength - a point realised by Babasaheb Ambedkar. Second, rather than do away with conditions altogether, they should be devised giving little scope for the state bureaucracy to exert unnecessary control.

### 8.3.4 The suggested conditions

Two measures are offered here for discussion. First, the transition to the next phase is allowed only in cases where certain minimum conditions set for the earlier phase have been satisfied. If not, public funds are not expended on the next phase. In effect, the programme terminates at that point. The second measure is performance-based funding.

The conditions for the phases need to be simple and yet reflect sufficiently the concern for sustainability and equity on the part of the watershed community. Accordingly we suggest the following conditions for Phases I and II in order to be entitled to public funds for Phases II and III respectively.

#### *Conditions for Phase I*

By the end of the first phase, the Watershed Committee (WC) should have achieved the following three objectives:

a) Completion of Participatory Resource Mapping;

b) Creation of permanent cover over at least 10% of the net cropped area plus the commons or 33% of the total geographical area, whichever is smaller; and

c) Consensus on a resource development plan covering Phase II and ensuring access to at least 20% of the increased resources of land, water, and biomass for the resource poor including women and Dalits, especially the landless.

If a) and c) have been completed and b) is still ongoing, overlap of up to two years may be allowed.

#### *Conditions for Phase II*

By the end of the second phase, the Watershed Committee (WC) should have achieved the following objectives:

a) Implementation of the resource plan and creation of access to at least 20% of the increased resources for the resource-poor including women and Dalits, especially the landless.

b) Setting up social arrangements and institutions for water use prioritisation and sustainable use; regulation and monitoring of water use accordingly for two years.

Here too there is sufficient leeway for the phase to be completed in two years.

### 8.3.5 Performance based disbursement of funding

The requirement for scrutiny of any kind generally results in two kinds of bottlenecks. Akin to a licence Raj, it provides petty bureaucrats with excessive power. Secondly, scrutiny of past

[84] Presently, this strategy of phasing has not been practiced anywhere. The general point is that if we have to address the question of sustainability and equity, then there is a need to phase out the programme. We have suggested one way of doing it. There is a need to take this up and try to implement it in a couple of places in an action research mode and then consider scaling it up.

performance delays the disbursement of funds for the next phase, resulting in loss of continuity and momentum. To circumvent this, it has been suggested that funding and disbursement of funds should be performance-oriented (Datye, n.d.-a).

Payment is released according to the work plan presented, without detailed scrutiny, except for larger structures, which may have a potentially significant safety impact. The scrutiny is confined to whether or not items broadly conform to cost norms. Initially, all funds released count as assistance. At the *end* of the period, *performance* is scrutinised. How much of the released funds would count as assistance and how much as loan would depend on this scrutiny. Inadequate performance would mean converting part of the assistance to recoverable loan.

#### 8.3.6 Transparent process of scrutiny

The conditions for entitlement of funds for the next phase as well as performance- oriented disbursement of funds require a transparent process of scrutiny. We suggest that the scrutiny should be carried out by a panel with appropriate authority set up at the district level, with adequate participation and representation from the stakeholders in the process, namely, government agencies, non-government development agencies, Panchayati Raj institutions, community-based organisations, researchers, and donors.

#### 8.3.7 The magnitude of expenditure and its allocation

The suggested programme outline pegs the total expenditure in projects, for all the three phases, at a little more than Rs.12,000/ha, which is of the same order as envisaged by the 25-year perspective plan. Of this, about Rs.9,000/ha comprise the works component, of which Rs.4,500/ha comprise the portion targeted at the resource poor. For the programme as a whole, the non-works component comprises about 25%; 5% more than the present proportion, ensuring that the minimal needs in building a database are met. If we distribute the non-works components secularly over the works component, then we have a total programme where the non-targeted general watershed development component is about Rs.6,000/ha and an equal amount for the targeted component, somewhat on the lines of having a watershed-plus component following the watershed component. All in all, the programme remains within the prescribed limits and the readiness shown by governments.

## 8.4 Other policy initiatives

### 8.4.1 Watershed Development related policies

#### *Ground water regulation*

The review clearly brings out the urgent need for regulation of ground water extraction both from the point of view of sustainability and equity. This is a critical area and unless immediate steps are initiated, the situation would become irretrievable. The Common Principles for Watershed Development brought out by MANAGE also stress the need for treating ground water as a common property resource (MANAGE, 2000). However, there does not seem to be any initiative on the part of the state in this direction. The role of the state is to come up with an enabling policy framework that would treat ground water as a common pool resource. The recent legislation by the Andhra Pradesh government on “land, water, and trees” attempts to bring in a certain degree of monitoring of the extraction of ground water. The legislation makes it compulsory to register all wells (Soussan and Reddy, 2003). Though this shows that the government of AP is seized of the problem, the solution provided makes for increased bureaucratic control rather than community regulation. In this respect, the state should aim at creating institutional space for the watershed association or the Gram Sabha to enforce restrictions on, or socially regulate, ground water extraction. Watershed associations and Gram Sabhas should be enabled to enforce a consensus in this respect such as restricting tapping of deep aquifers through borewells for irrigation. As discussed earlier in this chapter, watershed development funds in later phases could be tied to the Gram Sabha or WA agreeing to evolve mechanisms to restrict ground water extraction within renewable limits.

#### *Need to move towards integrated water resource management*

Watershed development creates externalities both within the micro-watersheds as well as outside, especially in respect of water. To address

such externalities and sustainable water use, there is a need to go beyond the micro-watershed boundaries and plan water resources in an integrated manner at a milli- or sub-watershed (or even basin) level. As one crosses the boundaries of each scale (from micro-watershed to milli-watershed to sub-basin, and so on), one would also have to deal with the issue of different uses, users, and user groups which also can lead to increasing levels of conflict. There is a need to evolve participatory regulatory mechanisms and institutional structures like federating the local organisations at different scales like nested institutions (Ostrom, 1990; Lélé, 2004)), or, as some researchers have suggested, setting up multi-stakeholder platforms as instruments of integrated water resource management (IWRM) within the framework of deliberative democracy. However, this also implies moving away from the present approach in which the subject of water as a state matter has been fragmented, with several departments independently looking after different aspects. The IWRM institutions and processes will have to embrace watershed development, participatory irrigation management, drinking water, as well as urban and industrial use of water. In the long run, if we do not have a vision that embraces this goal, we shall soon find the so-called externalities intractable.

### 8.4.2 Extra-sectoral policies

Watershed programmes are also affected by many other policies, which may not have anything to do with watershed development *per se*. Soussan and Reddy point to the effect of electricity power tariff on ground water extraction, the availability of a guaranteed price for certain crops like paddy affecting the cropping pattern, and so on. (Soussan and Reddy, 2003). Here, we focus on some important extra-sectoral policies which impinge on watershed development outcomes; a comprehensive treatment of such policies is outside the scope of this report.

One area that needs immediate attention is the policy framework around water. Though the New Water Policy (2002) talks of participatory management and also takes some account of eco-system needs in prioritising water uses, it does not give any clear directions for regenerative and equitable use of water. It still views surface water, ground water, and local water (harvested through watershed development) as separate entities, and is therefore far from being an IWRM framework. There is an immediate need to reorient the water policy towards more democratisation, going beyond the present PIM framework of sustainable use (through a combination of allocations, pricing, etc.), and equitable access (for example, by de-linking land rights from water rights).[85] One has also to take note of the increasing trend towards privatisation, an umbrella term used to denote many things ranging from contracting out delivery of service to privatisation of water rights. In brief, one can say that there should be a clear water and land use policy in place if the watershed effort has to deliver what it promises.

Another related area is regarding electricity tariff. The present system, where electricity is not metered and heavily subsidised, encourages ground water mining. One suggestion has been to increase the power tariff to reflect the real cost so that it would act as a deterrent against excessive use. Experience shows, especially in areas where ground water markets exist, that merely raising tariff may not work. Increases in tariff alone are unlikely to work unless measures and policies that regulate and control ground water extraction are also put in place.

A third major area is related to the use of chemical fertilisers and pesticides and the subsidies involved. Today's policy runs counter to sustainable agriculture since it makes chemical inputs cheaper (and more readily available) than organic inputs. Though there is now a trend towards reducing subsidies on chemical fertilisers and pesticides, these are not ploughed back to make organic inputs more affordable or readily available in a decentralised manner. In fact, the SHGs and other CBOs could be encouraged, with certain financial incentives, to take up production of these inputs in the villages. Mainstream research in agricultural sciences and allied sectors is also,

[85] In Maharashtra, the government's Common Minimum Programme mentions per capita water distribution as the first point in its agenda. This has not translated itself into any concrete action; instead, the government has been suppressing initiatives for equitable distribution of water.

by and large, determined by the high external input based agricultural paradigm. There is a need for a shift in the research agenda as well as the ways of conducting the research to make it more participatory and firmly oriented towards sustainable agriculture.

There is also a need to seriously follow up the 73rd constitutional amendment, which has largely remained on paper, and see that the necessary mechanisms are put in place so that the PRIs become more effective and real decentralisation takes place. There is a suggestion that the Constitution be amended to provide for a Fourth list apart from the central, state, and concurrent list, and transfer all subjects to the jurisdiction of the PRIs as per the 73rd amendment.[86]

### 8.4.3 Policies regarding research and monitoring

#### *Need for separate fund allocation for information system*

Absence of benchmark data and information prior to the watershed development programme has been reported time and again as one of the constraining factors for ongoing monitoring and evaluation of the programme. Presently, there is no separate allocation for an information system. There is mention of survey as an activity that can be taken up under the works component and some provision for PRA exercises. However, there is a need for a separate allocation for data/information gathering, resource literacy and capability building with regard to natural resources. The limited experience in natural resource data management systems, by combining participatory and scientific methods, show that an allocation of 7.5% of the total cost of watershed expenditure (2.5% from the PIA funds and 5% from the works component) would be able to meet the required cost (Datye, 2002a).

The important issue is that the expenditure on this head should not be linked to the expenditure on the works component. It is to be expected that a large portion of this could be spent in the first phase. It is possible to join this activity to science clubs in the high schools, rural polytechnics, distance education, and other programmes to expand its scope, stabilise it, and get scientific support. Each watershed project will generate its benchmark data and this would provide the basis for participatory planning and monitoring. The plan should be prepared by the WC with the help of the supporting NGO or government agency and ratified by the WA/GS assembly to be eligible to receive further funds. There should also be an allowance for certain experimentation, as discussed earlier, to be taken up under the works component, essentially as a capability building activity.

#### *Need to put data and information in the public domain*

One of the difficulties faced by implementing agencies, especially smaller NGOs and local organisations, is getting access to scientific data and information collected by scientific and public institutions. A few years back, even getting access to topographical maps (topo-sheets) was a big problem (while the same was available in the USA!). Fortunately, now one can (theoretically) get access to topo-sheets (except for certain restricted areas), though after considerable delays. Topo-sheets are now available at a scale of 1:25,000 (though all the area has not been covered yet).

Certain simple measures like making the latest topo-sheets and cadastral maps available in electronic form in the public domain would go a long way in strengthening the participatory process of learning and planning. This could be done immediately as the maps are already available; only the mechanical work of digitising them and placing them on the Internet is required. At present, getting access to them and converting them to electronic form is a bottleneck for small local organisations.

Apparently, agencies such as the National Remote Sensing Agency (NRSA) have collected time series data and have created different thematic maps related to geomorphology, water, land use and land cover, and so on. Very often, the information and data remain with these agencies and are not put to use for planning and

[86] For a detailed discussion on the issue of Panchayati Raj and natural resource management, see Ramakrishnan *et al.*(2002).

monitoring on a wide scale (though the concerned agencies may be using them in their own way[87]) and so do not get integrated with the participatory process taking place below. The efforts of NRSA and other agencies are in a way wasted, since their outputs are not available to the wider watershed efforts that are taking place in the country. Since these organisations are publicly funded, it is a legitimate demand that all the information and data should be made available in the public domain. The minimum that needs to be done is to make them available readily and at a reasonable cost, at least for resolutions comparable with toposheet data.

A related issue is that of putting information about the many ongoing projects in the public domain. Today, there is no system by which one can access information regarding ongoing projects and their performance. The first thing the government and other related agencies of watershed implementation should do is to make information on all projects available in the public domain. Once this is achieved, periodic assessments of the performance of these projects can be done on a representative sample basis by independent bodies like research institutions and professional bodies. The findings of such surveys also need to be made available in the public domain. This can greatly enhance accountability and transparency.

## 8.5 Watershed: the last frontier

We would like to conclude this review with words of both caution as well as hope. What makes watershed development issues in India crucially important is the historical conjuncture that we find ourselves in. In the process of globalisation and privatisation that is sweeping the country now, local natural resources, synonymous with watershed ecosystem resources, represent the last frontier: they are the last of the productive resources that the rural poor have access to. Watershed development represents a dual possibility in this respect. It may, with the right policies and political will, provide an opportunity to bring more and more of the ecosystem resources under social control, provide preferential access to the rural poor, ensure expanded and sustainable livelihood opportunities for the rural poor, and carry them beyond subsistence. On the other hand, it may result in the augmentation of ecosystem resource potential only to put it to unsustainable use, benefiting the already better-off and leaving the impoverished no better than they were earlier, to the detriment of both sustainability and equity. To realize the former possibility, it needs to be dealt with in a concerted manner by concerned stakeholders in watershed development – Panchayati Raj institutions, community based organisations, government agencies, non-government development agencies, academic community, and donors. They need to come together and evolve a course of action that comprises a set of focused options in respect of further changes in approach, research, and policy that need to be explored. We hope this review will contribute to furthering this process.

[87] For instance, in ISRO's Integrated Mission for Sustainable Development (NRSA, 2002).

# APPENDIX 1
# SUMMARY OF DISCUSSION IN REVIEW WORKSHOP

The Centre for Inter-disciplinary Studies in Environment and Development (CISED), Bangalore organised a two-day national-level Review Workshop on "Watershed Development Issues and Prospects" on August 7th and 8th, 2003 at the Institute for Social and Economic Change (ISEC), Bangalore. The workshop was supported by Winrock International India, New Delhi.

The objectives of the workshop were:

1. To present the findings of a comprehensive review of watershed development experience in India, with a special attention to Karnataka and Maharashtra, to a wide audience of experts, academics, practitioners, administrators, and donors for their critical comments;
2. To attempt to generate some degree of consensus regarding the key policy issues in improving watershed development activities in the study region and in India at large; and
3. To identify the priorities for future research and explore possibilities for multi-institutional and multi-disciplinary collaborative research on these topics amongst the participants.

Participants comprised academics, activists and practitioners, government officials and donors. A total of 53 participants attended the deliberations. The first day of the workshop was devoted to a presentation and plenary discussion of the review findings followed by discussion in sub-groups on Sustainability, Livelihoods, Equity, and Participation. Sharachchandra Lélé, Co-ordinator of CISED, welcomed the participants and provided the background to the workshop and Gopal Kadekodi, Director of ISEC, welcomed all the participants on behalf of ISEC. K. J. Joy then presented the highlights of the report. This was followed by a discussion in plenary before the sub-groups devoted to the four themes were formed. Discussions then continued in sub-groups for the rest of the afternoon. The second day opened with presentations and discussions on the sub-group deliberations, and was followed by discussions on possible research agendas and policy recommendations. The workshop concluded with a public plenary chaired by Shri Satish Chandran, the then Chairman of ISEC, which was attended by a large number of people including the Faculty and Ph. D. scholars from ISEC, and a wide gathering of people, from different organisations as well as individuals representing a cross-section of society. Sharachchandra Lélé welcomed the Chairperson, and K.J. Joy made a brief presentation highlighting the findings of the review report and the issues that came up during the two-day workshop. Prof. Gopal Kadekodi, Prof. Amita Shah, Shri K. R. Datye, Prof. A. Vaidyanathan and Shri Satish Chandran spoke on the occasion. The workshop concluded with a vote of thanks by Esha Shah.

The discussions at the workshop were intense and wide ranging. Watershed development embraces many disciplines and the viewpoints brought to bear on the report at the workshop were as diverse as the participants. The discussions were very fruitful and provided a host of insights for future work. It is very difficult to summarise such an all-sided, intense discussion. Naturally, there were many issues left open and the workshop did not attempt to come out with a common statement, though many common and shared concerns were apparent. The following is only a brief summary of the major points raised by the participants. A fuller and much more detailed summary of the proceedings is available in soft format with CISED.

## Discussion in the plenary session on the presentation of the report

The normative framework presented in the study was much debated. Some found it intrusive while many felt it to be an important contribution.

- The normative elements identified in the review report can potentially overload the watershed programme and create unanticipated contradictions. There is a need

to delimit the scope and decide the core objectives of the watershed programme. The report also needs to explain as to what extent the shortcomings observed in the review are a result of the normative framework.

- The four components of the normative framework should be integrated conceptually into a system explaining the inter-linkages. This will help deal with the outcomes in the watershed much better.
- The normative framework says that basic needs are determined by livelihood patterns and present relations of production, but then it needs to consider whether the norms it sets forth can be realised with present production relations intact. Unless radical restructuring of the society is achieved to deal with inequality, the iniquitous distribution of natural resources is not going to be solved.
- There is a need to operationalise the normative framework through adequate quantifiable indicators of sustainability. Better clarity is needed on the normative position on issues like self-sufficiency, market integration, and dependence on (low) external input needed.

The present study also seems to put undue emphasis on exogenous water and when it is treated as part of the normative framework, the evidence should not be based on isolated instances. Similarly, indigenous knowledge systems and the need to build upon them require greater attention. The review does not give sufficient attention to the treatment needed to conserve in situ soil moisture in the unfavourably located lands of the poor. In the old hilly areas and even in a place like South Rajasthan, there is still evidence of old ponds, which perhaps cannot provide applied water, but do provide water retention and soil moisture improvement. These types of systems are there all over the country, and are different from the exogenous water cases the review has cited. It is necessary to look at them in greater detail and explore their technical possibilities in the context of watershed development.

While the participants felt that major concerns had been addressed in the review report, they also identified areas that required much more attention and gave a number of specific and detailed suggestions. These are summarised below:

- The review brings out the lack of hard data; this ties in with the recommendation about systematic, long-term impact monitoring of the technical, hydrological, institutional, and other aspects.
- There should be a greater attempt to understand what is happening to the soil itself. Nutrient content of soil, where the change is gradual and also not easy to monitor, should be properly monitored. Soil is a basic input besides water.
- The economic dimension seems to have been left out. This is especially relevant because the findings eschew undue optimism in view of the fact that the overall impact has been moderate at best; even while impact on soil erosion and ground water recharge is good, there is also a tendency towards over-extraction. With these findings, the benefit of the investments in watershed programmes becomes questionable.
- More attention to the macro perspective is needed: Why did watershed come into focus in the 1980s and 1990s? How much importance did they give to poverty alleviation, wage employment and non-farming activities? Why things happened, and when and how they did, need to be explored. This also involves macro policy and macro structure.
- Remote Sensing (RS) as a tool has not been given sufficient importance. RS is a proven technology and is useful for baseline information generation, water prioritisation, and monitoring. This needs to be incorporated in the watershed development programmes.
- Linkages with non-land based activities (NLBAs) are missed out by watershed development. There is a need to understand the historically diversified livelihood systems in dry land regions. The neglect of CPRs and livestock is especially important since the landless will have to be supported mostly by non-land based activities based on CPR and livestock as the linking sectors. There is a need to rework the entire farming system to serve everyone, including the landless.
- Simply advocating ground water regulation after so many years of watershed development, disregards a whole lot of work that has gone into laws and state of the art of

ground water regulation and that needs to be studied in detail.

- Over the last ten years evidence shows there is no design of policy dialogue at the grassroots. Though there is a provision of five percent of project cost in the various guidelines for building data base and monitoring, there is not a single case in which the administration or the NGO has actually utilised this in a cost-effective manner. There has been no operational research built into watershed programme.
- The report makes an important point that dependability is an important issue, particularly in drought-prone regions where "drought has become a normal phenomenon". There is a need to obtain more information and understand the relationship between rainfall, precipitation and its distribution and the kind of livelihood pattern a certain region can support. A new vision of farming systems and livelihoods in a dry region needs to be evolved with help from agronomy and other disciplines.
- There is a need to study the watershed development experience state-wise. Many states and external agencies have made significant contributions that may otherwise be missed out. The concept of integrated watershed development has emerged out of this.
- The real cause of drought is not lack of quantum of water, but availability of moisture to crops. Even watershed programmes focus on harvesting more water instead of providing more water at the root zone.
- We have not given serious thought to non-land based assets. Check dams, feeder canals, and water bodies can also be treated as CPRs. We need to look at options for creating such new common property resources and then we may be able to build a stronger stake of the rural poor in watershed development activities.
- In the context of participation, the issue is how many decisions such as cropping pattern, land use, and management systems have been converted into collective decision-making situations. That would increase the space for poorer sections.
- At the grassroots level, NGOs tend to end up focusing more on soil and water conservation rather than on sustainable livelihood enhancement. Capacity building is a precondition for this shift. Stabilising local and indigenous farming systems, organic farming and Integrated Pest Management make farming sustainable, enhance local participation, and need to be seen as an integral part of sustainability, emphasised and promoted.
- Market development is often taken for granted. The shift from food crops to commercial crops may not be sustainable unless proper marketing of dry-land produce is developed.
- The study report does not give sufficient attention to institutional convergence. SHGs remain entry points, and continue independently without convergence with NRM activities.
- It is rather unfair to say that SHGs are a standalone programme and not integrated into the watershed development activities. This is not true. In Karnataka, replicable models have been developed by organisations like MYRADA, OUTREACH, etc.
- Keeping productivity enhancement as a focus for watershed programme in arid and semi-arid areas may be problematic. Employment generation *per se* can be a recommendation. Donor agencies are shifting to non-farm based livelihood options since watershed programmes have not made much of an impact on productivity and livelihood generation for the poor. Thus the impact on livelihood needs to be assessed. The report highlights the need for equity and this needs to be made as a recommendation. Equity should not be a means for financial viability and other viability.
- The report has been able to capture the shift from equality to equity and argue for equitable access to newly created natural resources in the context of watershed development.
- It may be better to focus on significant sustainable increase in respect of biomass production and on creating spaces for contestation in respect of equity and gender issues because there is a limit to 'implementing" such things from outside.
- In the Indo-German Watershed Programme, the issue of equity has been addressed by

increasing the contribution of farmers who have land at the lower reaches and have irrigation.

- Sometimes this creates a rift in the society and hence the issue of equity should be left to community itself, and the outsiders should give only certain guidance.
- The ecosystem impact chapter in the report would benefit from a discussion on water balance and characterisation of watersheds in terms of rainfall, and other physical aspects such as soil, water, availability of ground water, and so on. Also it is important to see whether ground water is regional or local because this has a lot of implications for sustainability. As the report correctly observes, there is no rigorous monitoring of hydrological parameters on the ground. More study is needed on what variables can be measured cost effectively, and whether any watershed has done so. Monitoring ground water changes may show that although ground water levels increased, it has not ensured equity because ground water mining depleted it faster. It will also help isolate watershed programme that fared well in drought years, real proof of resilience, and success.
- The issue of scale is important. Hydrological processes are better captured at the basin or sub-basin levels, while socio-economic impacts are captured at lower levels, at the household or village levels. How does one integrate all these at an appropriate scale that is both small enough to enable micro level planning and good enough for macro level policy making?
- Micro watershed development has to be a part of three level/tier planning; if not, not only would the biophysical and environmental aspects be missed out but also aspects related to self-reliance and self-sufficiency. Extreme decentralisation may not be good.
- The study seems to ignore population, an important issue. If one disagrees with its importance, good evidence to this effect is needed.

Joy and Suhas responded to some of the issues raised and their response is summarised below.

- The concepts of equality and equity in the review are basically an issue of whether or not a radical restructuring is pre-supposed in what one is proposing. For example, radical land reform is one aspect of equity the review does not go into, but this does not mean that such radical social transformation is undesirable. Even bringing about equity, in the limited sense that is implied here, is not a simple matter, and will not happen unless radical concerns are involved. But here too it is important to realise the importance of equitable access to new resources generated, an aspect not seriously considered in most programmes, despite being concerned about equity. This need not be confined to water or land, but can be applicable to all new resources or the productive potential generated. Equitable access should not be an add-on objective, though for people focusing on water and soil conservation work this appears to be external and overloading the programme. The review also criticises programmes for landless and others being restricted to NLBAs because those NLBAs are external to watershed development programmes and does not mean equity is integrated with watershed development concerns.
- The abandonment of the ridge-to-valley approach is leading to many things including inequity. The ridge-to-valley approach must be included and must inform the plan, even though the progress of implementation may not be from ridge to valley.
- As pointed out during the discussion, the part about relations of production and exchange in the normative framework is seemingly contradictory. For example, equal exchanges in terms of energy and value in the real sense cannot come about within the given relations of production and to that extent it contradicts the notion of equity in the sense of not asking for a radical transformation. But it does provide us with the direction in which one must move.
- As mentioned in the chapter on normative framework, there is a limitation in imposing a framework on the existing studies that may not have used the same normative framework. But, doing so helps in two ways: one, it shows what someone with this type of a standpoint sees in the existing studies as well as the ground reality;[88] two, it also points

[88] To some extent the present study has been able to capture these.

out the need to carry out a primary study based on a rigorous normative framework.

- The point about pitching watershed planning at two levels, namely at micro watershed level and at sub-basin/basin level is also well taken. Things cannot be handled at micro-watershed level alone; otherwise the externalities at micro-watershed level cannot be captured since they change as the scale changes.
- Finally, many important suggestions have come up during the discussions and to take account of all of them might require a fresh study. They are valuable as guidelines for further collaborative research that needs to be planned together and may be tackled in the next phase of this initiative. This is also important in the sub-group discussions: what are the type of issues that we need to take up for further research and how we are going to go about it.

## Discussion on the break-out group reports

### Group One: Sustainability

- It is difficult to establish indicators of outcome in response to combination of inputs. Traditionally, unsustainable resource depletion levels are fairly well known.
- There is a collective myopia on benefits in terms of system sustainability.
- Equity and sustainability are interconnected. For example, if there is surface or ground water resource augmentation, in the absence of regulation of resource use, benefits accrue more to the resourceful.
- Watershed development interventions emphasise supply side more and the demand side is taken for granted. More attention to efficient use and reduction of losses is needed.
- There are no regulations on drilling, extraction of resources, and cropping patterns. Surface hydrology has changed and deeper aquifer extractions occur more often.
- With respect to recharging of ground water, the use of small versus large spread areas for water harvesting needs to be examined taking evaporation losses into account.
- Uncultivated land or wastelands are being converted to cultivable land and cultivable land is being converted into irrigated land. These are seen as a positive indicator of success without regard to sustainability.
- There is a shift in agro-systems through wasteland development away from those earlier utilised by the resource poor.
- There is confusion on methodological approaches in solving a problem (imposition of scientific norms as sustainable practices). For example, should subsidies, conversion of land use, and so on be supported? Should there be prescriptive statements? Or should one only say something about where an intervention is possible? Or should one say when interventions should be made and where it should not be?
- Policy formulation on subsidies is very complex and should take into account various factors like the role of the World Trade Organisation, rich farmers, vote banks, international and national agricultural policy, and donors.
- Prescriptions or strong statements that are made should also consider long-term social implications.
- To achieve sustainability there needs to be regulation on excessive resource use and exploitation. This requires both an enabling legal framework and awareness within the community.
- Institutional sustainability needs consideration. The role of functional organisations such as Panchayati Raj systems and traditional management strategies need to be considered. They may become instruments for socially progressive changes provided they are part of a democratic process. Institutional sustainability is a necessary, but not a sufficient, condition for success. For studying institutional and financial sustainability, more research is needed on watersheds that are at closing phases, especially with regard to flow of funds for maintenance of structures created, and management of the corpus created during the process of implementation.
- Water balance studies and participatory processes should be linked through practical tools and norms that can be used in field implementation.
- Knowledge gaps exist in understanding biophysical processes and their linkage to interventions and various agro-climatic situations.
- Market fundamentalism cannot solve all the problems. Free market is often seen as a key

instrument to achieve sustainability: Role of researchers is to inform what it does to sustainability.

**Group Two: Livelihoods**

- There is a need to critically look at areas where there have been concentrated watershed project interventions. Some of the projects could be: Western India Rain-Fed Farming Project (Panchmahal, Jhabua and Banswara), Aga Khan Rural Support Programme's (AKRSP's) efforts in three districts in Gujarat, Indo-German Watershed Development Programme in Maharashtra, Samaj Pragati Sahayog's intervention and Rajiv Gandhi Watershed Mission programme in Madhya Pradesh, Seva Mandir in Rajasthan, and MYRADA and BAIF in Karnataka. Compilation and analysis of these and other experiences would help us to get a clearer picture of the state of livelihoods.
- Traditional coping mechanisms have to be discussed in the context of feasibility of providing livelihood security with or without self-sufficiency to all communities in the next 10 years. For example, how have people traditionally survived droughts? Some examples are the selling of livestock and migration. Such traditional coping mechanisms seem to disappear in the wake of watershed-based development. There is also a need to investigate the role market and state interventions (for example the present mode of subsidies) in view of the decline in traditional practices.
- There is a need to evolve new linkages to cope with different livelihood strategies, for example, the issue of migration and livelihood security. Earlier completely stopping migration was considered the goal of any developmental strategy; but now other policy measures and some migration together are being considered to ensure livelihood security. There are different factors that force people to migrate or to stay back. Watershed development should be able to buffer the degree of migration. It is important to investigate what motivates people to migrate before making any definitive statement. As mentioned in the review, migration is not always induced by distress; but could be part of a strategy of the household to build upon the livelihood base, or raise capital to invest in agriculture. It needs careful investigation of their livelihood needs, the availability of local sources to fulfil them, and other driving forces of migration. One of the studies in Gujarat shows that migration had a precautionary motive rather than being the result of already occurring livelihood shock. There is need to understand existing livelihoods patterns including migration as an option so that proper planning can go into project as feasible or not.
- Migratory habits need to be studied across watersheds and seasons also because by identifying skills and developing them further, the resource poor could be helped through NLBAs, supporting traditional occupations that are disappearing, and provide the resource poor local opportunities to meet their livelihoods.
- There are different reasons for migration to the cities. In case of Dalits, it is also a conscious choice to escape social discrimination in the villages. These have to be understood clearly, as migration is a complex phenomenon and search for livelihood need not always be the main driver.
- There is also a need to promote livelihood components in projects by engaging professional groups; presently most of the projects are unable to do it.
- There is a need to understand and assess feasibility of livelihood security within the context of self-sufficiency or self-reliance within the locale of a micro watershed or larger at larger scales.

**Group Three: Equity**

- There is a need to consider bulk and diverse biomass production on CPRs and subsidising the produce from CPRs rather than going for agriculture on CPRs and wastelands.
- The recommendation in the review report about making the newly generated benefits and resources available to the resource poor is already there in the various Guidelines, though it is not practised commonly. In the Guidelines, there is enough scope for improving benefits to the landless, especially to create access to newly generated resource after an intervention. Whether or not watershed development programmes should

ensure this, as a necessary condition, is not emphasised in the Guidelines.

- Non-land based and/or natural resource based activities such as land leasing, fishing rights on water bodies, and better integration of different programmes would help integrate resource poor into watershed development programmes.
- Andhra Pradesh offers examples of community based ground water management and use such as group borewells that help regulate ground water use and cropping pattern; these need study.
- Regulation and control of ground water exploitation is limited by institutional capabilities.
- Traditional crops and cropping practices should become part of project design; some examples of this exist.
- Resource mapping cannot help in correcting existing asymmetries – both natural and social – in the absence of a social movement or awareness during the first phase of the programme itself. Planning for equity issues should be done right from the start of the programme itself rather than dealing with it at a later stage. Resource mapping could be used to understand the existing asymmetries and tackle those inequitable accesses towards more equitable resource distribution through the intervention. Resource mapping should not be limited to physical resource mapping, but should include disparities, property rights and access to quality of resources. Different forms of equity and inequality exist. Socially and culturally generated asymmetries to a great extent coincide with NR/physical asymmetries. Participatory resource mapping for the above should give an understanding of present use of resources and the ownership to be incorporated later in the watershed development programme.
- Ban on grazing affects the non-agricultural livelihoods, especially of those who are livestock dependent during the start of the project. The reference in the Guidelines of "no free grazing" is generally interpreted as ban on all grazing rather than controlled grazing. This type of problem relates to most CPRs that are controlled by Forest Department and needs to be taken into account at the policy level.
- To deal with issues of encroachments it is important to discuss with local communities the quality of CPRs and their present use rather than just the size and location. This helps in planning and addressing issues of CPR management and use.
- Goats are generally seen as villains in CPR management and this has led to selling of goats owned by Dalits and agricultural labourers affecting their livelihoods. Hence it is important to understand and consider livelihood linkages of livestock in watershed development and CPR management projects and the policies guiding them.
- In the phasing of watershed development projects, objectives in first phase should be to create a resource plan that includes how the resource poor will participate and how they will benefit from resource creation. Rights over the generated resources should be discussed and norms worked out before major water sources are created and rights get established (in the second phase of the programme).
- The pace of the projects should be tied to the time required for institutions to be developed and established.
- Ground water resource mapping prior to intervention helps in discussing regulatory issues with the community. In Ozar (Maharashtra), regulation, sharing and use of ground water for irrigation have been possible. The WUAs developed methods of measuring and charging private wells according to increase in well water availability.
- One has to see whether to keep equity as a central issue to watershed development or just let it act on its own as an indirect benefit to the marginalised.
- Equity is not automatic and in parallel there needs to be struggles of the marginalised groups for them to be heard. The external interveners should consider whether the equity issue has been dealt in the project especially with regard to the resource poor or marginalised sections.
- There is a need to explore the lessons that could be learnt from existing interventions and the way different asymmetries have been addressed or not addressed and also how this learning can be used to address equity in various contexts, for example, single-caste village versus heterogeneous communities.

- In situations of unequal landholding, equity considerations cannot be met substantially, similar to livelihood impact constraints. Yet, most upland catchment treatments are done with marginal farmers who may have developed small water sources, but may not have the means to extract/utilise that resource. Utilisation and extraction are usually not considered in project budgeting although equity considerations are considered to be crucial.
- Sometimes equity and sustainability considerations can clash and one has to decide how to reconcile the two. There could sometimes be solutions that address both considerations. One example is community borewells for marginal farmers.
- If the variation in landholding is significant (for example more than 30% landlessness), the trend is more towards inequity. The extent to which watershed development could be recommended in such situations is debateable; this is true with CPR issues in general. If the benefits are themselves meagre, then how these benefits may be distributed equitably (as in the case of central Rajasthan) and what are the means to support equity in such cases could be a researchable issue. Also it is difficult to achieve equity in extreme cases of resource access like central Rajasthan when compared to what is considered possible; this has to be kept in mind when setting standards in project designs.
- Prioritising drinking water over other competing uses should be part of the equity agenda.
- In common lands, equitable distribution of resources generated is thought about only after the growth is achieved.
- Equity is relative and the context is relevant to see if the concept of equity changes; equity is what the community accepts as equitable between groups of people using resources.
- It is important to examine equity issues in a project, as against what is claimed as having been achieved.

**Group Four: Participation and Institutional Issues**

- A thorough review of the Hariyali Guidelines is required. The process of formulating the Guidelines has been non-participatory and reflects the skewed view of bureaucrats. It closes all options for other institutions. Governance functions are included in executive functions. PRIs and village level institutions are given executive functions and no space for other CBOs and UGs. The process of creating such institutions is highly undermined.
- DPAP is the only programme where drought is mentioned (in the Guidelines). There has been a deterioration of watershed philosophy since the 2001 revised guidelines, and in Hariyali there is major shift backwards, institutionally and conceptually. Hariyali recommends reduction in budgets for capacity building agenda by 50%. The role of NGOs is not highlighted. Hariyali has in some sense closed doors for CBOs and NGOs. Even in the case of PRIs, it is only the Sarpanch and the Secretary who would play a central role. It is nothing but centralisation in the name of decentralisation.
- In Andhra Pradesh a series of consultations were held with GOs, NGOs, CBOs, PRIs and watershed communities for arriving at a consensus on the relationship between PRIs and CBOs. The general recommendation was to recognise the role of PRIs and strengthen them. But, by giving the Sarpanch and Secretary executive and financial powers, the Hariyali Guidelines kill the agendas of both PRIs and CBOs.
- Plurality versus simplified notions of institutions (like Gram Sabha versus Gram Panchayat) reflects the difference between conceptual ideas and practical problems. In theory at the level of a hamlet there should be a single institution as regulatory body (to take broad policy decisions, access and allocation of resources, and for conflict resolution). If this body exists and functions as it is supposed to, then there is no need for a watershed association, which essentially represents all the people and it is effectively the Gram Sabha. However, in practical terms the problem comes when the PRI structure is very different from the ideal PRI. In today's context, a Gram Panchayat with 3000-5000 people (across 3-4 villages or 10-15 hamlets and dependent on higher level bodies for money) is far from being a viable and

meaningful governance institution. Hence, multiple institutions might be a better solution although functions overlap, than a single institution.

- Identifying the differences between models involving a single institution versus a plurality of institutions could be part of the research agenda.
- Governance needs to be understood better in the context of direct governance (Gram Sabha mode) or formal representative structure.
- Governance institutions versus financial bodies: should they overlap or stay separate is an issue that needs consideration. One example in this context is that of the Pani Panchayat movement in Maharashtra. Pani Panchayat was seen as governance institution for distribution of water. But, there was another separate institution, a registered trust (Gram Gaurav Pratishthan), that provided support to 60-odd equitable water distribution lift schemes.
- Sometimes there is confusion about the role of the Panchayat since it is a governance body with no executive functions; in fact there is no institution with two separate functions in any government bodies.
- With reference to Hariyali Guidelines, it needs to be seen as to how it would work, as only PRIs would (primarily) undertake watershed development work.
- The importance of communities contributing to the cost of watershed development needs to be recognised as an important instrument for ensuring the stake of the community in the developmental benefits. Pure external financial support without community involvement in cost sharing would undermine the possibility of creating viable institutions.

## Discussion in the plenary session on research needs and policy issues

### Research needs

Many of the participating organisations reported the type of research they were engaged in.

- The research should understand the impacts in a more rigorous and scientific manner. Gujarat Institute of Development Research (GIDR) has just begun an effort to create a baseline data for watersheds in three kinds of sites. Simple two time-point data (typically 'before and after') leaves out the processes that take place in between. A parallel exercise is being taken by GIDR to select a set of plots and households, which could be tracked for a period of five years to study the long-term impacts of watershed interventions.
- International Water management Institute is presently studying a) hydrologic processes in the larger river basin contexts of Godavari, Krishna, and Indo-Gangetic plains; b) the water-energy nexus and related policy indications; and c) the livestock-environment-livelihoods interaction and nexus in five states in the semi-arid regions. The sites represent different levels of biophysical production potentials and different levels of market embeddedness or external linkages.
- If the purpose of the research network (as being suggested in the review report and this workshop) is for policy advocacy, then it may be better to get sanction from the Government for the research agenda of the network. WASSAN has experience in conducting research for the administration on watersheds during which the mandate of the government (or the donors) and the findings of the studies were effectively used in making changes in policies. There is a need to research on how the earlier Guidelines have been put in practice in the field. However, the important question is, how would all this research shape the policy dialogue?
- Ashoka Trust for Research in Ecology and the Environment (ATREE) has a collaborative research project in Jabhua looking at relationships between stocks of natural resource and poverty with the help of remotely sensed imagery for pre- and post-intervention, and also with some district level ground water data. Forty plots are being monitored to relate stocks of natural resource (especially fodder and tree biomass) to remotely sensed data. There is also the ongoing collaborative project between UNESCO, National Institute of Hydrology, CISED and ATREE to investigate the relationship between levels of use and/or type of forest cover and watershed services both from hydrologic and social angles.
- SOPPECOM has been operating at the interface of research and field activity/

activists in an interdisciplinary manner. It is interested in participating in collaborative work in drought prone regions of Maharashtra, on long-term commitments.

- TARU Leading Edge was involved in a two-year study on PRI and NRM including watershed development in Andhra Pradesh and Madhya Pradesh and has also reviewed the Rajiv Gandhi Drinking Water Mission in Madhya Pradesh, water resources in Maharashtra and Andhra Pradesh, and drought proofing initiatives in Hazaribagh (Bihar).

The participants also gave a number of suggestions and observations in respect of research needs. They are summarised below.

- The workshop has shown that there is a need to develop a long-term partnership between practitioners and researchers to conduct research and in order to address the complexity of issues involved. It is also important to undertake long-term, comparative research across several sites, states, and regions. There is also a need to recognise that distinction between academic researchers and practitioners is no longer as sharp and the collaboration will benefit both.
- For comparability, there is a need to evolve a set of common variables, indicators, and methodology. A research network based on commonly shared set of indicators would help evolve a larger picture of the watershed development efforts in the country.
- Two kinds of research are needed: one, research aimed at stopping people from doing wrong things and motivating them to do the right things; and two, learning from different experiences. The needs are different in both the cases.
- There is a need to look at both successful and not-so-successful cases; it would contribute to our knowledge base enormously if information from different experiences can be integrated to understand the actual impact.
- NGOs do not have the infrastructure and time to critically examine several things that happen in the field and this is where researchers can step in and initiate a joint investigation. This joint investigation would help in drawing more insights. Here the first thing that needs to be done is to prepare a list of interesting experiences that could form the basis of systematic study.
- There are also large knowledge and data gaps. Some of the innovative ways of technical investigations of small watersheds from available data (for example the type of methodology which Datye talks about) could be taken up on a much larger scale.
- There is a need to institutionalise research by setting aside at least one percent of the funds available for watershed development for research on issues in watershed development.
- The research also needs to embed itself at the grassroots with the stakeholders, such as conducting research concurrent with implementation rather than after implementation.
- There seems to be lack of appreciation amongst the researchers for integration of technology-institution interface. This could be done as documentation of processes and learning from experiences to develop process guidelines in the larger context of land-water resource development and equitable resource management.
- The experience of working with mainstream technological research institutions like International Water Works Association and International Commission on Irrigation and Drainage has shown most of their efforts are totally dissociated with this interface. Institutions like CISED could contribute in filling this gap.
- The significance of biomass production in the context of watershed-energy nexus issues (decentralized energy production) could be part of the research agenda of the proposed research network.
- Though policy makers and NGOs are important target audience for the research, there is also a need to look beyond them and conduct research to address the issues of the communities and also undertake research with their participation.
- The research should focus more on agriculture interventions in the context of watershed developm ent and also on issues that could integrate the different components of watershed development.
- There is also the need to decide on the logistics of operationalising the research-network initiative – CISED could act as a facilitator or nodal agency for the initiative. CISED would also help evolve a clearer set of

research questions and circulate it to all those who want to be part of this network, seek responses, and decide how to move forward without evolving any rigid structure.

**Policy Issues**

The discussion on policy issues as suggested in the report generated lively discussion. Some of the major points made during this discussion are summarised below.

- The suggestion in the review report to restructure the programme in three phases with a total project duration of about 6 to 12 years may be a non-starter if one goes by the experience of how Government functions. It could also lead to mis-utilisation of funds and the costs would also go up. Thus it may be more practical to tell the Government to restructure the programme in two phases: Phase I of two years for capacity and institution building; and Phase II for implementation. It is also important to explain the rationale to the government for the longer time span in each phase. In the latter phases of the programme the quantum of money required would not be much, but the emphasis should be on organising support services, and this needs to be clearly spelt out.
- While arguing for increase in cost per unit area (cost/ha), it is better to breakdown the watershed programme into its various components, and then argue that the cost is quite underestimated. It could be also argued that since there are large societal benefits and common benefit sharing, the State has to completely finance the programme. Also it is better to take into account the interface with the credit market while making the assessment and arriving at per ha cost norm. There is another question related to subsidy: if irrigation is subsidised so heavily, then why not watersheds?
- There is no guarantee that the performance will improve even if more money and time is made available. It is also time to introspect and ask questions like: Why is that institutional aspects have not been "realised" even where NGOs have worked? Why is it that even after five years of "participatory" programmes under the 1994 Guidelines, Hariyali has come out? There is a backlash from the Government and the rationale for Hariyali, which the Government would probably give, is that the PIAs have failed in implementing the participatory approach (of the 1994 Guidelines).
- There is a need to assess whether the very assumptions about the "participatory" approach are too optimistic, and what can be realistically expected from the PIAs. There is a need to exercise caution and one should not be too "heuristic" about the assumptions and expect 2000 odd PIAs to do the right kind of institutional work; else this could lead to political backlash.
- In some cases there has been some flexibility in implementation as shown by the example of IGWDP in Maharashtra. There is a need to build upon this.
- There is variation in costs across different programmes: the GoI projects are presently pitched at 6000 Rs./ha whereas KAWAD has a cost norm of about Rs.15,000 per ha. Thus the norm of 12,000 Rs./ha suggested in the review report is not far out of the present-day norms.
- The discussion on subsidy needs to be contextualised. In some projects the contribution is as high as 40 to 60%, and is expected to be paid in cash up front; or contribution is taken as a proxy for participation, which, very often in practice is becoming an "instrument of exclusion". There needs to be flexibility built into the design of the projects in the quantum as well as mode of contribution. Contribution in kind could be one option. The higher contribution norm and the resultant exclusion of some of the people, to some extent, is also very much related to the abandonment of the ridge-to-valley approach. Since there is asymmetry in the sharing of benefits with the valley people gaining more, people benefiting from the augmented resources should be charged for it and cost-recovery should be tied to the benefits people derive from the augmented resources.
- The experience of cost recovery is good in certain projects like AKRSP, MYRADA, and IGWDP; cost recovery is important for institution building and sustainability of the intervention. Thus cost recovery should not be looked upon from the narrow point of view of recovering a fraction of the costs only.

- There are two questions involved: One, how much should be the contribution norm to get a strong sense of ownership? Two, should the cost recovery be general or should it be tied to benefits gained by the people?
- If the contribution does not go to the village fund (as in the case of Seva Mandir and AKRSP), then contribution is nothing but subsidising the common good.
- According to the Hariyali Guidelines, the costs are to be fixed as per the Standard Schedule of Rates (SSR). Experience with honest NGOs shows that the job could be done at a lower cost with technical efficiency. There is a need to suggest to the Government that the could be taken as some sort of a ceiling. However, if the local communities are able to do the same job at lower cost, then the saved money should accrue to the village development fund/ maintenance fund. This would be an incentive for economising on costs.
- Labour contribution could be the first step towards cost recovery. After the community is confident of assured returns through soil and water conservation works and improved availability of biomass, cost recovery in cash could be undertaken but not exceeding 5 to 10%. Along with the monetised value of the labour contribution of the labour costs, the total cost recovery would work out to about 20 to 25%.
- In the watershed guidelines there is no emphasis on spill-over of knowledge from one project to another. Credit has to be given to such watershed communities, which put in time and effort to undertake such a task.
- The age composition in most of the watersheds is in favour of elder people and it is they who are interested in the watershed development issues. Younger people have different expectations and, by and large, are not interested in the watershed programme. Thus one needs to see what changes have to be brought in the design of the programme to involve younger people.
- Forest policy has a bearing on the watershed development process, particularly in watersheds where there is a significant amount of forestland. FES in Kolar district is grappling with these issues, and despite JFPM, the Forest Department still insists on establishing VFCs completely under their control.
- The roles of line departments are very crucial, especially departments like irrigation, agriculture extension, and so on. Agricultural interventions generally tend to promote HYV crops and high input based agricultural practices. There is a need for irrigation department to interface with the watershed development processes. This is also crucial for larger scale like sub-river basin planning.
- AME has had close collaboration with their partners, which has been a process of joint learning. A serious issue that needs attention is the role played by the private agencies, especially companies that are interested in promoting high input-based agricultural practices.
- We need to interface with agricultural universities and identify a pool of scientists with a different mindset. In general, there is reluctance on the part of NGO staff to interact with agriculture research institutions.
- Issues related to accountability are important and a lot of 'leakage" takes place. There is a need to ask for an independent sample verification of works completed and whether the structures built exist, etc. The findings need to be made public.
- Apparently the Ministry of Rural Development was thinking of imitating a social audit process but it is not clear what has happened to that proposal.
- In Madhya Pradesh, formerly the guidelines required the constitution of a committee at the village level to undertake social audit. But this was discontinued after a year or so.

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