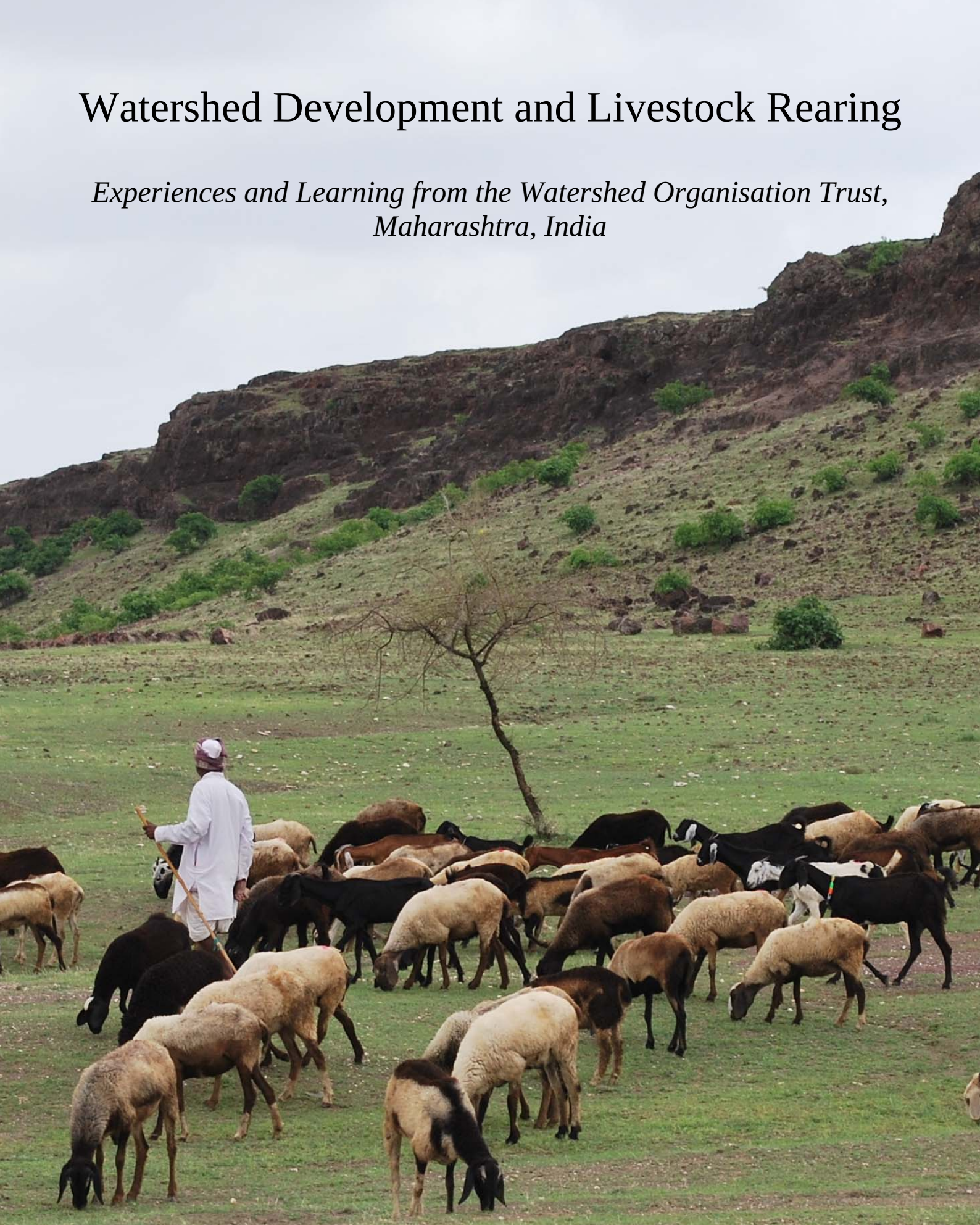
Watershed Development and Livestock Rearing

Experiences and Learning from the Watershed Organisation Trust, Maharashtra, India



SOUTH ASIA

Pro Poor Livestock Policy Programme

A joint initiative of NDDB and FAO

This report has been developed by K Bhavana Rao and Mihir Mathur for SA PPLPP, and documents the experiences of the Watershed Organisation Trust in implementing the Indo German Watershed Development Programme (IGWDP) in Maharashtra, India. The documentation is based on project completion reports, extensive field visits and discussions with field staff and livestock rearing communities.

Photo credits: K Bhavana Rao and Watershed Organisation Trust (WOTR)

Acknowledgements

Whereas there are many studies documenting and assessing the impact of watershed development on agriculture, natural resources and the income of participating communities, this study enabled us to document the results of watershed development on the livelihoods of livestock rearers. We are aware that this is a preliminary assessment and we are happy that Watershed Organisation Trust (WOTR) will take this learning forward.

We are indebted to households in the four sample watersheds of *Darewadi*, *Mhaswandi*, *Mandwa* and *Wanjulshet*, for patiently responding to our numerous questions. Without their active involvement and cooperation, this study would not have been possible.

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K. Bhavana Rao and Mihir Mathur
February 2012

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Executive Summary

The Watershed Organisation Trust (WOTR) is a pioneer in the conceptualization and implementation of watershed development programmes (WDPs) in the country, and notably in the design and implementation of the Indo-German Watershed Development Programme (IGWDP). IGWDP commenced in 1992 in Maharashtra following a bilateral agreement between the governments of India and Germany. WOTR played the role of a resource support organisation and, in partnership with 78 grass-root Non-Government Organisations (NGOs), implemented the programme in 146 villages covering 137,000 ha. The programme is still on-going with two new resource support organisations, in addition to WOTR.

IGWDP had a robust institutional, technical and social framework, and focused on the overall development of the village rather than on just water recharge and increased agricultural productivity. A number of innovative strategies were implemented such as the ridge-to-valley approach; facilitating collaboration and convergence between key government departments through a state government resolution that enabled the treatment of forest land in the upper reaches of designated watershed areas; the design and implementation of a distinct capacity building phase to enable community participation and resolution of inter-village and intra-village conflicts; clear processes to ensure the participation of all households (HHs) in a village; voluntary labour contribution *(shramdan)* and the creation of a fund to facilitate post-project maintenance of watershed structures.

The treatment of land in the designated watersheds, which often comprised common land and met the grazing needs of livestock rearing communities, was implemented through two non-negotiable strategies – (i) a complete ban on grazing and (ii) a ban on tree-felling in these areas. Whereas these interventions had benefits in the long-run, they often led to adverse short-term impact on those who depended on these lands for their livelihood, primarily livestock rearers.

In order to understand the changes in livestock rearing practices and the impact of watershed development on livestock rearing, a study was conducted in four sample watersheds, where watershed treatment was completed over a decade ago. The study included a comparative assessment of baseline data for households that witnessed no change in land category, with the current status of livestock and incomes earned. The selected watersheds were located in different agro-ecological zones of the State, and were selected based on the following criteria:

- Selected watersheds needed to have baseline data, feasibility study reports (FSR) project completion reports and other information from the commencement of the project.
- Watershed interventions should have been completed at least 10 years ago.
- The selected watersheds should have similar characteristics such as livestock preference and population, land-holding size, village size, area under common property resources (CPRs), to most of the other watersheds in the same agro-ecological zone.
- More than 70 % of the HHs should be dependent on livestock in the pre-watershed period and own all types of livestock (viz., cows, buffaloes, bullocks, goats, sheep and poultry).

Of the several watersheds completed in Phase 1 of IGWDP, four watersheds (*Darewadi, Mandwa, Mhuswandi, and Wanjulshet)* met the above criteria and were selected for the study.

Some of the key findings of the study were that changes in livestock preference and production systems primarily depended on the increased availability of water for agriculture and livestock rearing; improved access to agriculture markets and dairy cooperatives; and price fluctuations of agricultural produce. A general reduction in livestock numbers per HH for all livestock species was observed but there was an overall increase in livestock population in the watershed. This was mainly due to an increase in the number of HHs in the watershed village as many joint families split into nuclear families over the 15-year period. This change from joint to nuclear families also resulted in reduction in person power to manage livestock as well as land-holding per household. The increase in agriculture work-load as a result of more land being brought under cultivation and improvements in income, led HHs to invest in better education, which increased migration of youth to cities for better jobs. The reduction in additional ‘work-hands’ at the HH level led to a reduction in livestock numbers in each HH.

As informed by communities, the main reason for rearing indigenous cattle pre-watershed development was to earn some income from the sale of farm animals rather than the sale of milk. The lack of access to grazing resources, particularly forests (following the Government Order issued after the drought in 1972), followed by the ban on grazing in treated areas under IGWDP were stated to be the key reasons for reduction in the rearing of indigenous cattle. Over time, this led to a severe shortage of bullocks for ploughing agricultural lands and a significant increase in the price of a pair of bullocks, making this an unaffordable and unmanageable asset for small and marginal farmers. Currently, even though adequate fodder is available from the regenerated commons, farmers have not increased the number of animals, especially small ruminants and indigenous cattle. The priority has now shifted to agriculture and the person power required for grazing animals at the HH level is low.

In the context of securing crop and livestock-based livelihoods, the technical principle of treating a watershed from ridge to valley, thereby undertaking required soil and moisture conservation works on all types of land and not only on agricultural land or land below the ridge proved highly beneficial. Even after 15 years and three major droughts during this period, the watersheds are still able to provide continuous environmental services and support the water intensive crop-livestock production systems despite this being a drought-prone zone.

External drivers, improved access to markets and increase in water availability for extended parts of the year have led to farmers adopting water intensive crop-livestock production systems. The study shows, that until now, on account of the impact of IGWDP, the ecosystem is still able to provide adequate water resources supporting the shift to intensive production systems. The key question, however, is for how long can the eco-system continue to sustain these water intensive livelihood strategies? This question centre-stages the need for watershed development interventions, to necessarily include norms for water budgeting and limiting the extraction of water.

Case studies of the four sample watersheds detail the coping mechanisms that communities adopted in lieu of the ban on grazing in treated areas. Whereas *Mhuswandi* adopted an innovative CPR leasing system, in collaboration with the Forest Protection Committee, *Mandwa* continued to follow a traditional grazing system, employing a grazer (*charaiya*), who took the village livestock for grazing beyond the treated areas.

In spite of the considerable focus on conflict resolution, shepherd communities in the watershed areas were in the short term adversely affected by the ban on grazing on common lands. Shepherds reported having to reduce herd size or temporarily shift their flocks to neighbouring areas. In *Darewadi*, this was resolved by treating the area in a phased manner and by enforcing the grazing ban only in areas that were treated. This enabled the achievement of both objectives of CPR regeneration as also meeting the fodder needs of the shepherd community. However, it was also difficult for the shepherd community to negotiate better terms on account of being smaller in number. In the *Mhuswandi* and *Wanjulshet* watersheds, communities with small ruminants willingly reduced their flock size and adhered to the grazing ban, in the expectation of receiving benefits of water, which was perceived as a much greater need. In *Mandwa*, due to the availability of CPRs in adjoining areas of the watershed, no compromise was made by the communities and, in fact, they were not only able to treat the whole area but were also successful in keeping the high potential zones enclosed.

A key finding, therefore, is that the livelihoods of livestock-dependent communities, particularly those dependent on common lands, can be secured; while simultaneously regenerating and reviving CPRs under WDPs through the development of alternative sites, a phased treatment plan, and the protection and management of high potential recharge zones.

The study brought out that in the sample watersheds, there was a clear shift to rearing cross-bred cows since regular income from milk is perceived as economic security. This was more prominent in watersheds where external factors such as assured water and fodder availability, market access and roads, and the presence of dairy cooperatives were in place. However, the 15-year time-frame demonstrates a trend of a sudden increase in cross-bred cows immediately after the WDP, following which there is drop in animal numbers and, thereafter, stabilization at a certain level. The sudden drop was primarily on account of a lack of expertise in managing cross-bred cows, including feeding capacity, heat stress

problems and high disease incidence. This led to death/sale of the animals, reduction in milk yields and fertility problems. Stabilization of numbers resulted from those who were able to successfully raise and build their cross-bred stock, maintaining numbers. The only exception to this trend is the *Mhaswandi* watershed, where even farmers' falling in the 0–1 ha category are successfully rearing cross-bred cows on account of the assured availability of fodder through the CPR leasing system. Another trend noticed in some villages, was a shift from the rearing of cross-bred cows to the rearing of buffaloes. This was on account of the higher price of buffalo milk, a better adaptation to local weather conditions, and the comparatively lower resource requirements as compared to cross-bred cows.

Whereas the shift to cross-bred cows has increased income through milk production, it has led to a decline in the availability of bullocks and farmyard manure. A pair of bullocks in these areas now costs between Rs 50,000 and Rs 70,000, as compared to the price of Rs 10–15,000 in 2000.

Goat farming in the *Mandwa* watershed has emerged as a key support system to input intensive cash cropping whereas in *Mhuswandi* it is cross-bred cows. Livestock rearing in most cases has moved from being the primary source of income to a secondary, yet key source of income.

The interest in rearing backyard poultry (BYP) is still found among tribal HHs but not with other communities post watershed development. Increase in agriculture production[1] was the main reason stated by communities for reducing the rearing of birds. However, many women and HHs with small land-holdings whose homes are located at a distance from agricultural fields, expressed a keen interest to rear local birds. There are, currently, no programmes/schemes that support basic requirements such as the provision of night shelters and preventive health care. The theft of poultry is also a major problem. Hence, there is a strong need to lobby for a separate programme for BYP because the demand for both poultry meat and eggs has increased and traditional marketing systems are already in place. The price of poultry meat, eggs and live birds (Rs 450 per kg; Rs 4 to Rs 8 per egg, and Rs 250 to Rs 500, respectively) is much higher than meat and eggs from commercial and improved poultry (Rs 120 per kg; Rs 1.50 to Rs 3 per egg, and there is no demand for live birds). Further, the absence of sustained programmes on promoting BYP is proving counter-productive to the nutritional and financial security of poor HHs. There is a lack of understanding of the value of BYP and its significant contribution to the income and food security of resource poor HHs, being a zero-to-low input production system.

With regard to goats, it is difficult to conclude that there is a reduction in the number of animals per HH even though data collection at three points of time shows a decreasing trend except in the case of the *Mandwa* watershed. This is because, during the study period, high fluctuations were observed in goat populations at the HH level, as per needs/risk that the HH faced as also market demand (increasing during Bakr Id and tribal festivals in March each year).

In the case of sheep, the herd size has reduced, primarily on account of the shift from joint to nuclear families, and the adoption of settled agriculture.

During interviews with the community in the four watersheds, it was clearly evident that the intake of animal products by HHs has decreased even though milk production has increased. This is because the milk of cross-bred cows is not preferred and is produced primarily for sale. However, goat milk is used for home consumption if indigenous cows are not kept.

As demonstrated by this study, watershed development has immense scope to secure livestock-based livelihoods and, at the same time, build the natural resource base. This is possible, provided key elements such as securing availability and access to CPRs; investments in CPR regeneration with ridge (largely comprising forest lands)-to-valley approach; integration of grazing-based livestock systems and water budgeting in watershed planning; protection of 'high potential recharge zones'; and utilizing traditional livestock systems to manage watersheds post-project are in place.

[1] Scavenging poultry are viewed as pests as they tend to eat seeds and seedlings in the fields.

1. Introduction

Areas that receive an annual rainfall of 750–800 mm and have less than 30 per cent irrigated land are classified as rain-fed regions, according to the Central Research Institute for Dry-land Agriculture (CRIDA). Rain-fed areas are ecologically fragile, with degraded soils and acute water scarcity that often makes the land uncultivable. Shallow soil depth with severe soil erosion adversely affects soil productivity, limiting cultivation to a single rain-dependent crop each year. These regions are drought prone and, on an average, face drought once every three years. India's rain-fed regions are home to 43 per cent of its population and 60 per cent of its livestock. Nine states (Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Chhattisgarh, Jharkhand, Andhra Pradesh, Karnataka and Tamil Nadu) account for over 80% of India's rain-fed areas.[2]

Agriculture in rain-fed areas is characterized by low productivity, degraded natural resources and widespread poverty. The rural poor in these regions are heavily dependent on agriculture and natural resources for their livelihoods (Kerr, 2002). The development and management of a watershed[3] is perceived as a viable approach for reviving degraded lands and improving livelihoods dependent on these lands (Bendapudi et al, 2007).

Whereas the acceptability and recognition of watershed development as a viable development approach for rain-fed areas is relatively recent in India, work on soil and water conservation began in the early 1960s by the Ministry of Agriculture under a centrally sponsored scheme—Soil Conservation Work in the Catchments of River Valley Projects (RVP)—with the objective of stabilizing catchments of reservoirs and controlling siltation. Following the implementation of another scheme (Integrated Watershed Management in the Catchments of Flood Prone Rivers, FPR, 1980–81) and emerging lessons from other watershed development projects, supported by both government and bilateral programmes, the concept of integrated watershed development was institutionalized as the National Watershed Development Programme for Rain-fed Areas (NWDPRA) in 1990. It is operational in 99 districts in 16 states of India (S*ource: From Hariyali to Neeranchal, Report of the Technical Committee on Watershed Programmes in India, Department of Land Resources, Ministry of Rural Development, Government of India (January, 2006)).*

In India, Maharashtra has the largest area under rain-fed conditions, accounting for 14.49 million ha. To revive these highly degraded lands and improve the livelihoods of the rural poor, WOTR[4] took the initiative to design and implement a WDP under the IGWDP. Among the many NGOs working on watershed development in India, WOTR is a pioneer and played a key role in launching and designing the state-wide IGWDP (Kerr 2002).

This document describes the key strategies designed and implemented by WOTR that helped in making livestock-based livelihoods more sustainable and profitable without compromising the already fragile environment. It details the changes in livestock rearing practices by livestock rearers and farming communities in four sample watersheds and their adaptation to and sustainable use of the improved natural resource base as a result of watershed development interventions. Key lessons and learning for possible replication and up-scaling are also detailed.

[2] Vijay Shankar P.S., http://www.india-seminar.com/2006/564/564_p_s_vijay_shankar.htm

[3] A watershed is defined as a geo-hydrological unit, comprising all land and water within the confines of a drainage divide. Watershed management is, therefore, the integrated use, regulation and treatment of water and land resources of a watershed to accomplish stated objectives (Soil Conservation Society of America, 1982).

[4] WOTR was set up for the implementation of IGWDP in Ahmednagar district, Maharashtra.

2. Background

2.1 The Project Location

Maharashtra is the third largest state of India located between 16 and 22 N latitudes and 72 and 80 E longitudes. It encompasses an area of 308,000 sq km and is located in the north centre of peninsular India. Its dominant physical trait is its plateau character and only 17% of the state cover comprises forests (See Figure 1). The state has a diverse agro-climate and receives rainfall ranging from 500 mm in the dry areas of the rain-shadow belt to over 4,000 mm in the Western Ghats. A major portion of the state is semi-arid but lies in the rain shadow belt of the Western Ghats. Based on its geographical features, Maharashtra is divided into three natural regions - the Konkan, the Western Ghats and the Deccan plateau. The soils of Maharashtra are shallow and poor, with acute water shortage. Only 11% of the net sown area in the state is irrigated.

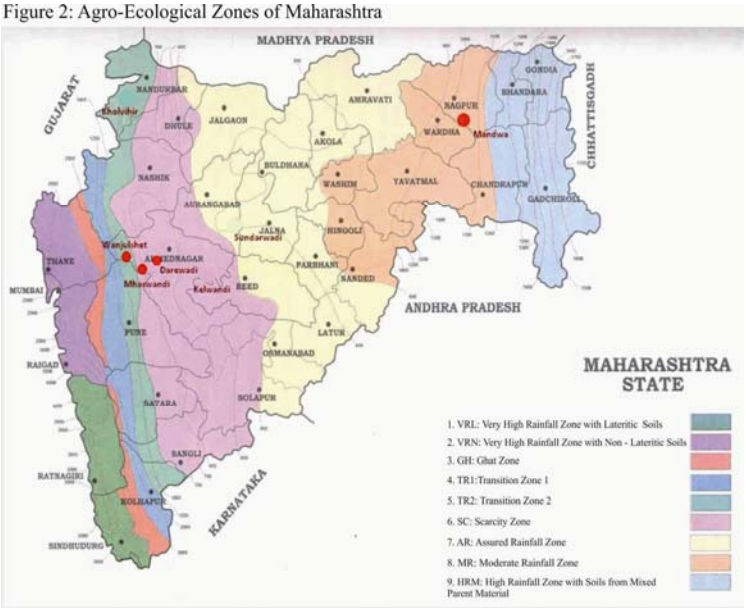
Figure 1: Project Location

2.2 Study Methodology

The IGWDP was implemented by WOTR in 146 villages, covering about 137,000 ha of land with 78 grass-roots level NGOs (WOTR, 2002). To illustrate the impact of watershed development on livestock-based livelihoods in the IGWDP, the following criteria were used for selecting watersheds for the current study:

- The selected watersheds were to be located in different agro-ecological zones of the State.
- The selected watersheds needed to have baseline data, FSRs, project completion reports and other information from the commencement of the project.
- The watershed project should have been completed at least 10 years ago.
- The selected watersheds should have similar characteristics such as livestock preference and population, land holding size, village size, area under CPRs, to most of the other watersheds in the same agro-ecological zone.
- More than 70% of the HHs should have been dependent on livestock in the pre- watershed period and owned all types of livestock (viz., cows, buffaloes, bullocks, goats, sheep and poultry).

Figure 2: Agro-Ecological Zones of Maharashtra



Of the several watersheds completed in Phase 1 of IGWDP, four watersheds met the above criteria and were selected for the study. These were *Darewadi, Mandwa, Mhaswandi, and Wanjulshet* watersheds (See Figure 2).

The qualitative and quantitative data are from baseline reports, internal project monitoring and project completion reports, post-project field surveys undertaken in 2011, as also FGDs with Village Development Committees (VDCs)/ Village Watershed Committees (VWCs)/ Gram Panchayats (GPs)/ Self Help Groups (SHGs)/ milk association members and interviews with large and small farmers and landless villagers on livestock composition and production systems in the pre- and post-watershed periods. Since the watershed village was taken as a whole, a first step was the categorization of HHs in the village into five groups, based on land ownership.[5] A fresh survey was then conducted to map the change in average livestock holding per landholding category, post-watershed development. To understand the changes in livelihood economics and production systems from crops and livestock, an in-depth interview was conducted with two livestock keepers/farmers per category. This was then cross-checked with 10 randomly selected HHs falling in the same category and practising similar crop-livestock farming systems, to ensure consistency of data and information.

Indicators Developed for the Study

The hypothesis of the study is that the poor and the landless, dependent on livestock as a primary source of income, which in turn is dependent on natural resources, benefit from WDPs. To verify this hypothesis, the following indicators were used.

i. Increase in income levels even though the number of animals kept by livestock rearers per HH has decreased in the post-watershed period.
ii. Ability of communities to manage the natural resource base in a sustainable way and maintain an optimal flock/ herd size, thereby securing livestock-based livelihoods.
iii. Access to and involvement in the use and management of CPRs by the poor.
iv. Livelihood stability/ security of the poor as compared to larger farmers with more land and larger livestock holding.

2.3 Limitations of the Study

There are many differences in the way communities choose to maintain and depend on livestock in the post-watershed phase, and often changes in livestock rearing practices are triggered by external factors. Therefore, not all changes described here are the result of watershed development interventions. Another problem faced was that many parameters required for the analysis were not available, particularly those related to livestock, even though adequate baseline data was available for all four watersheds under the study. Therefore, the recall method was used to obtain the nearest pre-watershed picture and different approaches were identified to cross-check this. This approach was time-consuming and only qualitative information and some quantitative data were obtained accurately.

Along with this, as work in the selected watersheds was completed almost 15 years back, a large number of HHs had moved from joint to nuclear families with considerable changes in the land-holding pattern. **Considering that the aim of the study was to highlight the actual change in livestock-based livelihoods, pre- and post-watershed, only those HHs that did not change their landholding category were taken into account because there was too much variation to calculate economic benefits to study indicator 1 (Table 1)**. However, all general trends and observations have been recorded and shared in the study.

Table 1: Landholding Categories

Watersheds	Landholding category				Total HHs
	0–1 ha	1–2 ha	2–4 ha	4–8 ha	
Wanjulshet					
Change in landholding category (number of HHs)	20 (38.4%)	23 (44.2%)	7 (13.4%)	2 (3.8%)	**52**
No change in landholding category (number of HHs)	52 (45.2%)	39 (33.9%)	18 (15.6%)	6 (5.2%)	**115**

[5] Landholding categories are landless, 0–1 ha, 1–2 ha, 2–4 ha, 4–8 ha and above 8 ha.

Table 1: Landholding Categories					
Watersheds	**Landholding category**				**Total HHs**
	0–1 ha	**1–2 ha**	**2–4 ha**	**4–8 ha**	
Darewadi					
Change in landholding category (number of HHs)	15 (17.8%)	32 (30%)	30 (35.7%)	7 (8.3%)	**84**
No change in landholding category (number of HHs)	13 (12.3%)	9 (8.5%)	18 (17.1%)	5 (4.7%)	**45**
Mhaswandi					
Change in landholding category (number of HHs)	52 (63.4%)	22 (26.8%)	6 (7.3%)	2 (2.4%)	**82**
No change in landholding category (number of HHs)	79 (56.4%)	43 (30.7%)	15 (10.7%)	3 (2%)	**140**
Mandwa					
Change in landholding category (number of HHs)	24 (41%)	27 (46%)	5 (8%)	3 (5%)	**59**
No change in landholding category (number of HHs)	10 (38%)	10 (38%)	2 (8%)	3 (12%)	**25**

Note: Based on data, there is a clear trend indicating a change in landholding size from the existing category to the next lower category as landholding gets divided among siblings. It was necessary to study the changes in landholding size over time because this directly influences the type of livestock maintained by the HH. Those HHs whose landholding size did not change comprise the sample HHs for the present study. Specifically, the sample size for each study watershed is: Wanjulshet 115 HHs; Darewadi 45 HHs; Mhaswandi 145 HHs and Mandwa 25 HHs.

3. Key Elements of the Good Practice

3.1 IGWDP and its Origin

Many of the concepts underlying IGWDP were developed in the late 1980s at the Social Centre founded in 1968 by a Jesuit priest, Father Hermann Bacher, in Ahmednagar, Maharashtra. Father Bacher was involved in development work in India; he saw an opportunity and conceived a large-scale community-driven programme for poverty reduction, centred on regenerating the natural resource base, using the principles of watershed development.

The Social Centre first began its work on watershed development in 1988 in a village called *Pimpalgaon Wagha*. As preparations for the first phase of the IGWDP were initiated at the same time, the successful rehabilitation of this watershed generated many lessons which were incorporated into the IGWDP guidelines.

Key Lessons, Incorporated in IGWDP Guidelines, from the Rehabilitation of *Pimpalgaon Wagha* Watershed

- Social mobilization in the village and support from an external agency in setting up a VWC, which then became the implementing agency for the project
- Building confidence and ownership among villagers through their participation in the design and implementation of watershed improvements
- Inflow of external funds, especially in the form of wages, to stimulate the involvement of those whose livelihoods depend on common pool resources
- Links with government departments from the outset, to provide technical guidance and support, particularly with respect to forest department land where many common pool resources (for example, fodder and trees) are located
- Training to communities at agricultural universities; credit from banks for both on-farm and off-farm livelihood activities
- Limits on the period of involvement of external support agencies such as the Social Centre
- Strategy to allow each partner (VWCs, government departments, agricultural universities) autonomy in their sphere of competence while ensuring joint responsibility for successful project management
- Strategy to manage social tensions, which allowed the legitimate interests of dominant groups to be met only if the interests of weaker groups were also met.

Source: (Farrington and Lobo 1997*)*

3.2 The Institutional Set-up

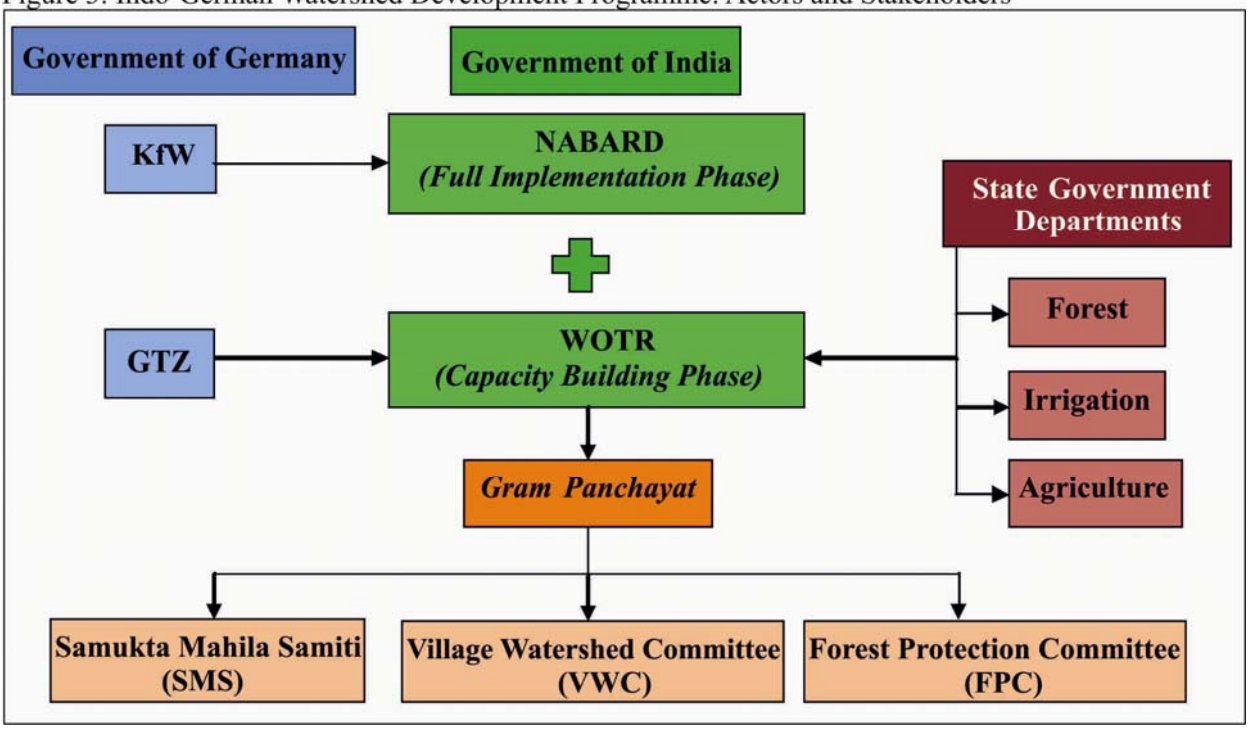
IGWDP was launched in 1992 in Maharashtra, following a bilateral agreement between the governments of India and Germany.

The programme was an NGO-GO multi-stakeholder programme with several collaborators at the international, national, state, district and local levels. At the international level, the German Ministry for Economic Cooperation (BMZ), the German Bank for Development (KfW) and the German Agency for Technical Cooperation (GTZ) were financial partners of IGWDP. Another unique feature was the creation of a position of Programme Coordinator, who was responsible for overall coordination of the programme. The institutional base for the IGWDP Programme Coordinator was in WOTR.

The IGWDP had two main phases—the Capacity Building Phase (CBP) and the Full Implementation Phase (FIP). At the national level, the FIP was funded by KfW through the National Bank for Agriculture and Rural Development (NABARD), and the CBP was funded by GTZ through WOTR. At the local level, the key stakeholder was the *gram sabha*, which nominated the VWC, which in turn worked in collaboration with the Forest Protection Committee wherever forest land treatment was required.

WOTR was responsible for the CBP because it was both a coordinating and a technical service organisation, and NABARD was responsible for the FIP. Together with capacity building on various technical and social mobilization skills, WOTR also monitored the progress of physical work in the watersheds.

Figure 3: Indo-German Watershed Development Programme: Actors and Stakeholders



3.3 Implementation Strategy

The IGWDP had a robust institutional, technical and social framework, and focused on the overall development of the village rather than on just water recharge and increased agricultural productivity. This section highlights a few *key* implementation strategies that have had an impact on the livelihoods of communities dependent on livestock rearing during and after the completion of the programme.

i. An integrated multi-stakeholder approach

A unique feature of the IGWDP, conceptualized by WOTR, was the 'Ridge-to-Valley'[6] approach. WOTR lobbied extensively with relevant line departments of the Government of Maharashtra regarding the benefits of treating a complete watershed. It focused on the convergence of three critical line departments—Agriculture, Soil and Water Conservation and Forests—which made IGWDP distinct from other programmes under implementation at that time. Ministers overseeing these departments successfully promoted a Cabinet Resolution in 1992 in support of the programme, and a special government resolution (GR) No. IGP-1091/ 43015/CR-36/JAL-7 along with other supporting GRs were issued (Annexure 1). This GR was issued by the Department of Water Conservation with the concurrence of the agriculture and the forest departments (FDs). It was an order that laid the foundation for facilitating convergence between different stakeholders.[7]

The GR laid the basis for all watershed development work in Maharashtra because it provided the required political and administrative approval to treat government-owned lands, that is, revenue lands as well as forest lands, even though the lands were under the jurisdiction of different government departments. In addition, the GR set up a Project Sanctioning Committee at the State level, with

[6]The 'Ridge-to-Valley' approach is a terminology generally used in watershed projects for the development of rain-fed areas by providing different treatments starting from the 'ridge' point to the 'valley' of a selected watershed area. The treatment, to be given at various points in the selected watershed area, varies, depending upon the land class and its capability and is decided as part of a holistic and comprehensive approach for development of the entire watershed as a unit. This approach is adopted because sporadic and scattered treatments, at different points without proper integration and coordination may not yield the desired results (Source: www.nabard.org/databank).

[7]The departments were secondary and not primary stakeholders; therefore, no funds were routed through them. They contributed to the watershed projects by way of their on-going schemes. In the case of the FD, whereas they put in their own funds, the project also funded them to undertake work on forest lands where required. This is because each project has a time period of 4–5 years whereas the working plans of the FD are not tailored to this time-frame. And since IGWDP followed a Ridge-to-Valley approach, it was necessary to complete treatment in the upper reaches first, which primarily comprised forest land.

secretaries of the departments of Agriculture, Water Conservation and Forests, created space for NGOs and made relevant data available to NGOs and village-level institutions. The above measures made it possible for WOTR to implement IGWDP in an integrated and comprehensive way by taking up soil and water conservation treatment of non-arable land, arable lands and drainage line treatment within the micro watershed.

ii. Protection of 'high potential recharge zones' in the watershed

With the objective of facilitating regeneration of tree and grass cover in the watershed, two non-negotiable strategies were developed and implemented by IGWDP. These were ***(a) a ban on tree felling and (b) a ban on free grazing of livestock in treated areas***.

The ban on grazing was restricted to ***high potential recharge zones***,[8] where land treatment activities were taken up first. The other areas were left open for grazing. Treated areas were enclosed and protected for a five-year period after which access was opened. The ban on tree felling, on the other hand, was applied throughout the watershed, but fuel-wood collection for domestic use was permitted.

iii. Well-designed pedagogy can make communities envision their future and contribute to improved conflict resolution

To achieve sustainable benefits for the community as a whole, there was a strong need for active participation by communities as well as their commitment to abide by certain rules that were non-negotiable. To bring this about, WOTR developed a unique training and capacity building curriculum, which was implemented in the CBP. The CBP not only contributed to the management of such a large project but also enabled communities to visualize and envision the future and resolve conflicts, keeping in mind the interests of all stakeholders. It was designed in such a way that it systematically built up the institutional, organizational and operational capacities of NGOs as well as members of the VWCs and other CBOs involved in the programme. In addition to specific approaches to facilitate community participation, particularly of marginalized groups within the village (including women), the CBP included a component of practical treatment of a micro-watershed, to build community knowledge on watershed techniques. The participatory methodologies and technical training were discussed/ disseminated in the *gram sabha*, using audiovisual aids, exposure visits and awareness tools. The CBP was for 12–18 months after which the FIP started. The FIP funds were approved only after the draft proposal prepared and submitted by the Village Watershed Committee (VWC) was considered. WOTR continued to provide technical support during the FIP phase.

iv. Bridging the gap between fund disbursement and implementation enhances the outcomes of CPR based activities

Complicated fund disbursement mechanisms of government departments and the involvement of multi-stakeholders in natural resource management (NRM) programmes often cause delays in project implementation. The delays, if not managed, have a drastic impact on the motivation of participating communities and cause hardship to those villagers dependent on wage labour in the project. Delays also disrupt the implementation of NRM activities thereby reducing the impact of watershed development when done in tune with the seasonal cycle. ***In order to ensure that there was no break in the flow of funds, an instrument called the "Disposition Fund" was created to bridge the gap between the end of the CBP and the beginning of the FIP. It ensured the smooth and continued flow of work in the watershed which had a direct impact on the regeneration of CPRs.***

v. Ensuring post project continuity by creating a "Maintenance Fund"

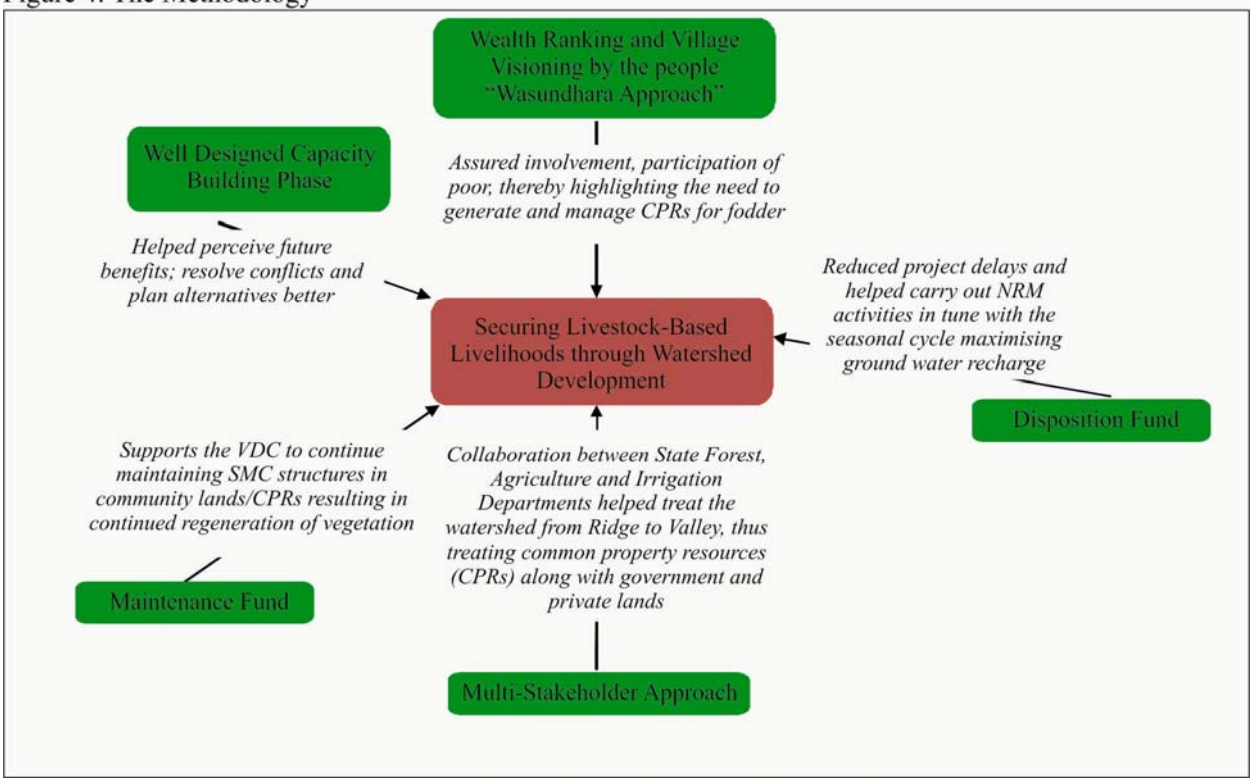
IGWDP was the first programme of its kind to place large sums of money in the hands of villagers themselves with partner NGOs as co-signatories. During the FIP phase, only the management costs required for the NGO were disbursed directly to them, whereas project funds were disbursed directly to the joint account of the VWC and the NGO.

Based on learning from completed watershed programmes, WOTR realized that the assets created during project implementation needed to be maintained so as to draw sustained benefits from the programme. As

[8]Recharge zone is an area where permeable soil or rock allows water to seep into the ground to replenish an aquifer or groundwater reserves (Source: www.groundwater.org).

maintenance requires financial resources, once the rehabilitation works were complete, half of the 20 % contribution made by the village to the cost of unskilled labour was returned to the VWC to form a Maintenance Fund. ***The funds from this account were to be used for the maintenance of public structures and common land treatment.***

Figure 4: The Methodology



4. The Problem and Alternative Strategies

To ensure sustainability of water harvesting structures and facilitate ground-water recharge, treatment of catchment areas in the upper reaches of a watershed is a critical approach in WDPs. Treatment and regeneration of land in the upper reaches, which is often common land, requires that this land is left undisturbed to allow root-stock to regenerate and newly planted trees and grasses to grow. While such interventions have benefits in the long-term, they often lead to adverse short term impacts on those who depend on these lands for their livelihood. These are most often livestock keepers.

Many HHs depended on livestock as an important source of income pre-watershed in all four land categories. The predominant livelihood strategy was a livestock-crop farming system, where HHs with larger land holdings kept larger herds of mixed livestock than HHs with smaller landholdings. The type of livestock and herd/ flock size of animals was directly linked to the size of land holding. The average livestock owned by large farmers (2-4 hectares) ranged between 10-15 cows, 2-4 pairs of bullocks and for marginal farmers with small land holdings (0-1 ha and 1-2 ha), livestock owned comprised a pair of bullocks, 3-4 cows and 15-20 goats. Sheep rearing was practised only by the *Danghar* community who kept around 100-200 sheep per family. (Source: FGDs and Field survey conducted in 2010). However, a wide variation was found in different watersheds on livestock preference. This depended on type of community, location of watershed/village, extent of farming activity and agro-climatic zone. Since agricultural productivity was very low, the main source of fodder was forest lands and CPRs.

Table 2 below indicates dependence on livestock as primary and secondary sources of income in each landholding category in the four sample watersheds before the commencement of IGWDP, that is, pre-watershed. The primary source of income indicates those HHs that were earning a constant income from livestock as the main livelihood activity. The secondary source of income indicates HHs for which income from livestock was a key income source but not the main livelihood activity. HHs that kept livestock for farming or as a minor supplementary source of income once in a while are not included in the table but form part of the sample of HHs studied. As mentioned in section 2.3, the study sample is restricted to HHs whose land category did not change over the 15-year time period and does not include all HHs in the village.

Table 2: Percentage of HHs Dependent on Livestock Pre-watershed (Land Category-wise)

Watershed and Sample Size	Dependence on Livestock	(No. of HHs)				Total
		0–1 ha	1–2 ha	2–4 ha	4-8 ha	
Wanjulshet 115 HHs	Primary source of income	6	2	0	0	7.60%
	Secondary source of income	4	8	11	3	25.70%
Darewadi 45 HHs						
	Primary source of income	1	8	8	2	42.20%
	Secondary source of income	0	0	1	4	11.10%
Mhaswandi 140 HHs						
	Primary source of income	22	17	4	1	31.40%
	Secondary source of income	4	11	7	0	15.70%
Mandwa 25 HHs						
	Primary source of income	0	0	0	0	0.00%
	Secondary source of income	4	0	1	0	23.10%

Implementation of the non-negotiable strategies - the 'ban on tree felling and free grazing in treated areas'- resulted in inter-community conflicts because it further decreased the limited sources of fodder[9] for livestock. These conflicts disrupted the programme in several villages. However, another key approach in IGWDP was the building of consensus between all communities in a village, and for all HHs to jointly agree to adhere to norms and to the non-negotiable strategies. Hence, the challenge that lay ahead for WOTR was to convince livestock owners- sheep rearers, in particular - to be part of the programme even though it would cause hardship for them in the first few years.

[9] A ban on grazing in forest areas imposed by the state FD was already underway.

Approach taken by WOTR to reduce problems that emerged:
To reduce hardship to livestock owners, watershed treatment was initially done only in those areas that were most essential to facilitate ground water recharge. These areas were designated as ***high potential recharge zones***, and were selected on the basis of the topography and the location of the catchment area. Watershed treatment was not only limited to soil and moisture conservation interventions but also included plantation of trees and grass, and the promotion of horti-pasture models. This too was done in a participatory manner with members of the VWC. The final decision on what activities were to be implemented on which sites was taken in the presence of all villagers.

The ban on grazing was restricted only to the treated area, and to reduce problems for livestock keepers, the treatment was taken up in phases. The ban on grazing in the high potential recharge zones continued for at least 4–5 years but fodder could be harvested through the cut-and-carry system after the first year. To ensure regeneration, penalties were levied on those who entered the restricted area and this included HHs from within the village as well as migratory livestock keepers. Conflicts were resolved in the GP in the presence of all villagers and VWC members, and a common fine was levied on those who broke the rule. To understand the need for social discipline, exposure visits to *Ralegaon Siddhi* and *Hivre Bazaar* were also organized, during the CBP. These watershed development and land treatment projects were already operational in Ahmednagar district and had strong elements of social discipline and community effort. Interactions in these villages helped communities understand the benefits of social discipline and how to better handle inter-village and intra-village conflicts. WOTR also involved all relevant government officials and political leaders in the district to explain the benefits of IGWDP as well as encourage communities to participate in the programme.

5. Outcomes

Impact on livestock-based livelihoods: Documentation of select case studies

This section illustrates the outcomes of the IGWDP by describing a few general achievements and documents case studies that describe the changes in livestock-based livelihoods post-watershed development.

a) *Treatment of large areas of non-arable lands by applying the ridge-to-valley approach led to an increase in fodder availability from CPRs and agriculture:*

Applying the ridge-to-valley approach and treating non-arable lands in the upper reaches of the watershed yielded positive results in terms of improved ground water recharge and regeneration of CPRs. This has led to increased agriculture productivity as also increase in fodder availability both through crop residue and fodder from regenerated common lands. Most farmers now also cultivate fodder crops, a new practice initiated after the commencement of IGWDP, primarily to maintain the cross-bred cattle.

b) *Changes in livestock-based livelihoods post-watershed development:*

The ban on grazing in forests is still applicable today; however, the initiation of WDPs in 1997 brought about a few changes in both agriculture and livestock-based livelihoods. It is to be noted that all **changes seen in livestock-based livelihoods cannot be viewed solely as the results of the watershed programme because discussions with communities revealed that there were many other external factors that induced these changes**. As each watershed has distinct livestock-related livelihoods, the findings specific to each watershed are detailed below as brief case studies. Graphs showing the percentage change in livestock holding primarily capture the current status. However, wherever possible an attempt has been made to document change over time and the reasons for this change, based on data available and information obtained through FGD.

Case Study 1: Improving the quality of life for sheep rearers through watershed development, Darewadi watershed, Sangamner Taluka, District Ahmednagar

Darewadi is a remote village located in the Sangamner block of Ahmednagar district. It falls in the rain-shadow region of Maharashtra. The watershed area comprises 1,535.24 ha, of which 1,063.43 ha is private land, 306.53 ha is forest land, 147.59 ha is revenue land and 17.69 ha is community grazing land (*gyran*). The village has 131 HHs largely comprising the *Maratha* and *Vanjiri* castes. Forty per cent of the HHs belong to the Dhangar community (the traditional shepherd community of Maharashtra).

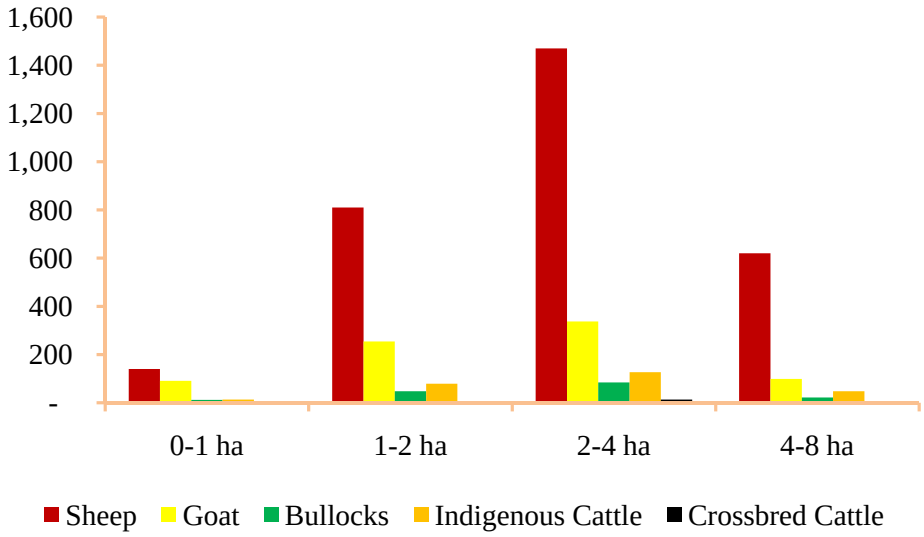
Prior to the commencement of IGWDP, water was scarce and the land was so unproductive that even during years of good rainfall, only 3–4 months of agriculture wage labour was possible. *Darewadi* was on the verge of desertification when IGWDP was initiated in 1996. Drinking water was supplied by tankers from February till July every year. Migration in search of work was high and livestock rearing was the next viable source of income for many HHs.

Pre-watershed, *Darewadi* had the highest percentage of HHs dependent on livestock, particularly small ruminants. Table 3 shows HHs that depended on livestock as a primary and secondary source of income.[10]

Table 3: Dependence of Households on Livestock as Primary and Secondary Sources of Income

	0–1 ha	**1–2 ha**	**2–4 ha**	**4–8 ha**	%
Darewadi (Pre-watershed)					
Primary	1	8	8	2	42.20%
Secondary	-	-	1	4	11.10%
Darewadi (Post-watershed)					
Primary	-	5	5	1	24.40%
Secondary	-	1	5	1	15.60%

Graph 1: Livestock Holding Per Landholding Category Pre-watershed in Darewadi (1995)

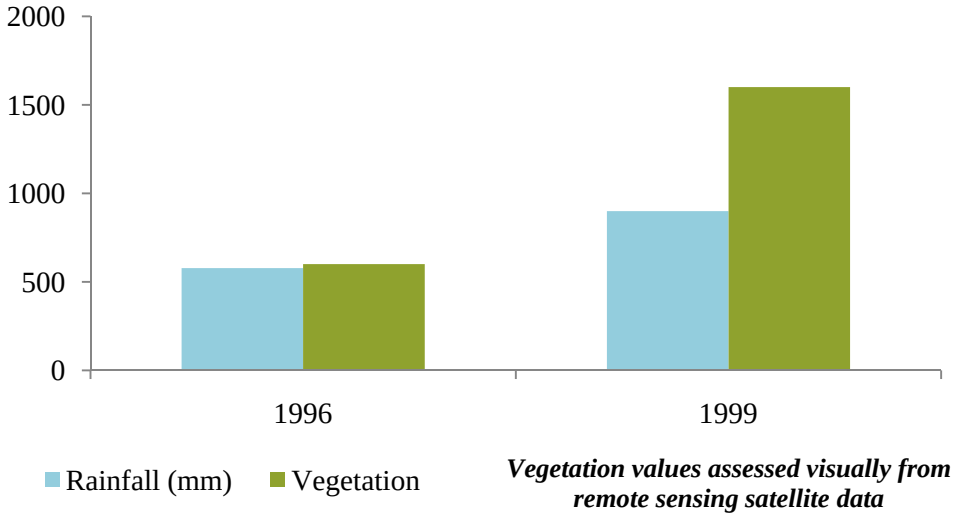


[10]These are from among the sample HHs for the study, which witnessed no change in the landholding category, pre- and post-watershed. As detailed in Table 2, Section 4 above, the number of sample HHs for Darewadi watershed was 45. The table details the number of HHs of this sample for whom livestock rearing was either a primary or a secondary occupation. HHs that maintained livestock only for agriculture, or only seasonally, have not been included in this table.

Impact of IGWDP on *Darewadi* Watershed

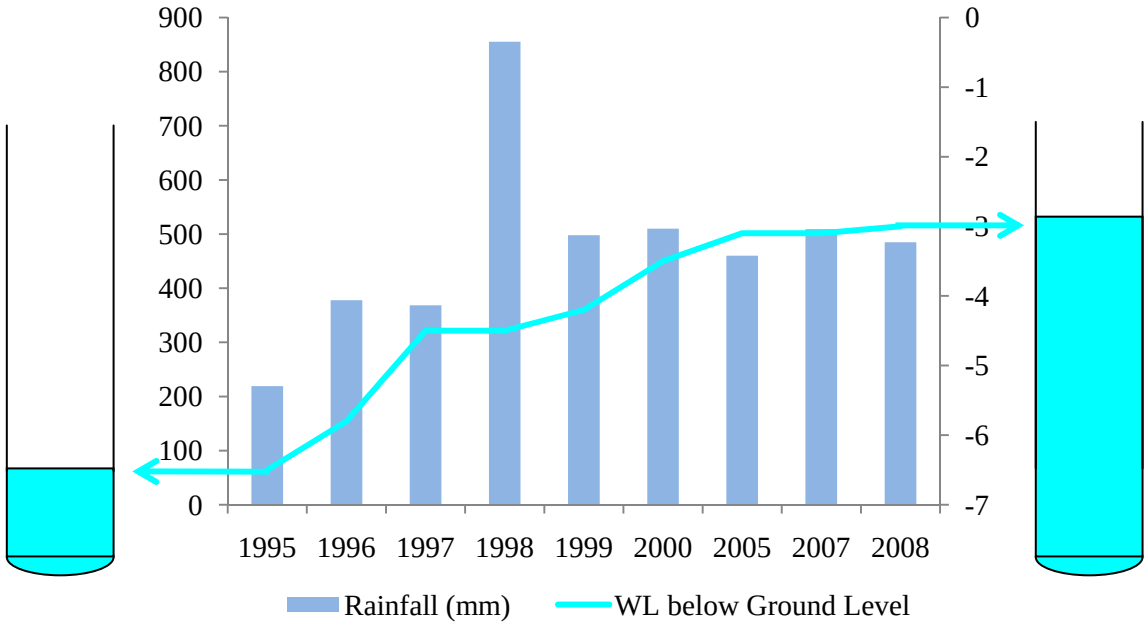
IGWDP substantially increased the water table in *Darewadi* (Graphs 2 and 3). This, along with social fencing of treated common lands, increased fodder availability both on common lands as well as on private agricultural lands. Sheep rearers also claim that there has been considerable increase in palatable species in the CPRs within the watersheds (however no bio-diversity based studies have been carried out by WOTR). The once barren and rocky terrain, with nothing but shrubs and cactus, now has several trees and grass (See pre- and post-watershed photographs). The survival and vigour of plant growth itself is witness to the changes that have taken place.

Graph 2: Rainfall and Vegetation Pre- and Post-Watershed Development



(Source: WOTR data base)

Graph 3: Increasing Water Table of Darewadi Watershed



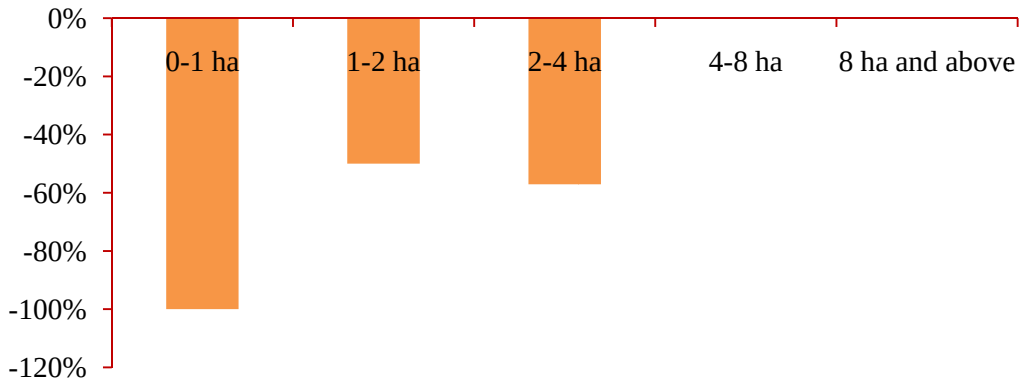

***Darewadi*: Pre- (1996) and Post–watershed (2008)**


In *Darewadi*, as also in the other sample watersheds, there was an increase in both the area under cultivation as also cropping intensity. With increased water recharge, farmers are now able to take three crops from their lands. The results are detailed in Table 4. Following the IGWDP, the watershed witnessed a sudden shift to cross-bred cows; however due to lack of knowledge on rearing and management practices, a drastic fall in cross-bred cows was subsequently observed (Graph 4). Graph 5 shows current changes in livestock holding with farmers across different landholding categories. A shift from cross-bred cows to buffaloes was also observed; however, it was restricted only to farmers in the 1–2 ha category. FGDs with farmers revealed that there is an acute shortage of bullocks and these are now unaffordable for many farmers. The price of a pair of bullocks has increased from just Rs 10–15,000 a pair to Rs 50–70,000 a pair. The main reason for this is that many farmers do not rear indigenous/non-descript cows anymore. Due to a reduction in the numbers of large ruminants, primarily due to a shift to cross-bred cows and the ban on grazing in forests, there is an acute shortage of farmyard manure much needed for agriculture. This has led to an increased use of chemical fertilizers and a resultant increase in agriculture input costs.

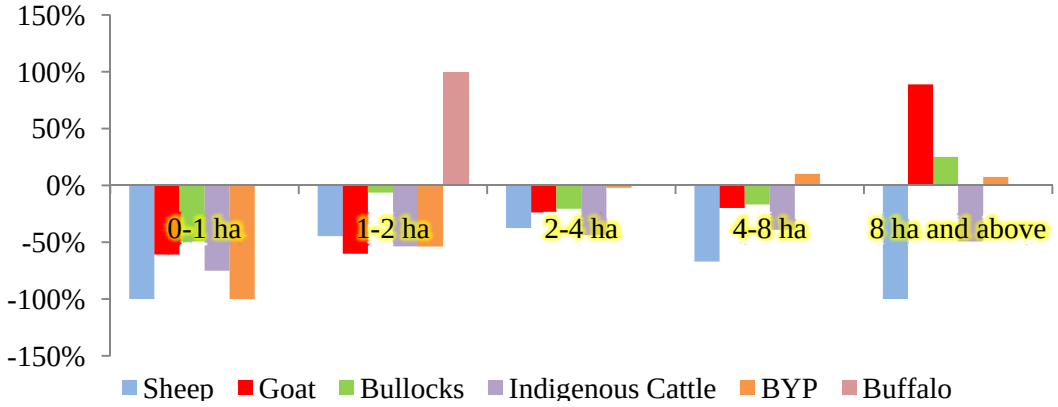
Table 4: Impact of Watershed Development on Fodder, Agriculture and Water Availability

Agriculture and Livelihood Parameters	Pre-watershed 1996	Post-watershed 2001	2009
Irrigated area			
Perennial	0 ha	13.31 ha	18.40 ha
Seasonal	197.23 ha	329 ha	470 ha
Milk production	Insignificant	788 l/per day	360 l/per day
Agriculture employment	3–4 months	9–10 months	9–10 months
Fodder production	1,054 tonnes/year	2,848 tonnes/year	3,915 tons/year
Number of wells	23	63	173
Average depth of water table	6.5 m	3.5 m	2.5 m

Graph 4: Percentage Change in Cross-bred Cows with Farmers in Different Landholding Categories (2009)



Graph 5: Percentage Change in Livestock Holding in Different Landholding Categories (2009)



Darewadi was the only watershed that had sheep rearers; therefore, in-depth interviews and FGDs were conducted with them. Pre-watershed, the average flock size managed by the *Dhangars* was around 100–200 sheep per HH and 3–4 members were involved full-time in the occupation. At that time, all families were largely joint families. Even under such conditions, at times extra labour was employed to manage the flocks. As fodder and water for livestock were scarce, migration was common, often for over six months each year. The shepherds would travel 400–500 km in search of fodder because the flock size was large. Sheep rearing was primarily based on the fodder available in the CPRs and forests, and grazing on agriculture fields where available. The average income earned per month was around Rs 16,000 per HH, including the sale of animals, sheep milk as well as sheep wool. Sheep were largely reared under a traditional loan system called *rakholi*.[11]

During the early days of the watershed programme, shepherds faced many problems because more CPR land came under the ban on grazing, and entry into forest lands was already restricted. However, participation in regular IGWDP meetings brought in clarity about the programme. Although faced with hardships, the *Dhangar* community agreed to abide by the rules set because there was hope that IGWDP would lead to an improvement in water availability. However, shepherd families also indicated that they were too few in number to negotiate with the larger village for greater accessibility to CPRs.

The discussions revealed that perceptions on the benefits from the watershed programme among the *Dhangar* community varied. This was mainly due to the location of their land in the watershed. However, practically all agreed that there is much more water available through the watershed programme and that the vegetation has also improved. They further said that the impact of the WDP is more in terms of an

[11] *Rakholi* is a loan system, in which a rich landlord gives a loan to buy animals and rear them. At the end of each year, the sheep rearer needs to return not only the principal loan amount but also all the female progeny in the flock to the landlord.

improvement in the overall quality of life and increase in other sources of income rather than benefits to sheep rearing. They now practise mixed crop-livestock farming and, with the more settled lifestyle, they are also able to send their children to school. Some families shared that the main impact is that they are now out of the *rakholi* system and the animals they raise are their own. The sudden increase in income from agriculture as a result of watershed development activities enabled them to get out of the vicious loan cycle and invest in their own livestock.

Due to increased cases of theft during the past few years, the *Danghars* feel it is difficult to maintain a flock size of more than 50–80 sheep per HH. Further, the available person power per family has also reduced because some family members are now involved in settled agriculture. They continue to migrate for over six months each year, and the grazing route has decreased to just 100 km because the flock size per HH has also reduced.

They concluded by saying that access to grazing lands is still an issue because the FD has banned them from entering forest areas for grazing. However, after the WDP, they are able to stay back in the village for a longer time, especially during the monsoon season. IGWDP brought more land under agriculture production which has increased land available for grazing post harvest. The main source of fodder now comes from farmers' fields, which is often in exchange for sheep manure, and, therefore, available free for the shepherds. At times, they also get paid for penning their sheep in agricultural fields, which is an increasing trend due to the decreased availability of farmyard manure. They added that even now the villagers do not allow them to graze in the treated areas and no measures to support their grazing needs are taken up. However, no action is taken against those who cut trees in *Darewadi*, and they hoped that measures would be taken in this regard.

Apart from the above, the main benefit to shepherd communities has resulted from an increase in the price of meat and animals, adoption of settled agriculture and changes in rearing and management practices. Table 1 in Annexure 2 shows the change in income and profit of a sheep rearer over 15 years. It is worth noting here that even though the flock size has reduced, the revenue and net profit has increased substantially. In this case, the economies of scale are working in favour of the sheep rearers as the profit per sheep has gone up even though the total flock size has gone down. The reasons for this growth are doubling of the sale price of animals; negligible labour cost due to reduced flock size and grazing route (family members now manage the flock and external labour need not be hired); lower mortality and morbidity rates (perhaps on account of improved feed availability and shifting back to rearing local breeds[12]) and, most important, a shift out of the traditional loan system, *rakholi.*

[12] Group discussions with sheep rearers revealed that they tried to rear other sheep breeds that gained weight faster than local breeds (mainly cross-bred sheep, but the breed could not be identified) due to higher demand for meat. However, losses due to high mortality, morbidity and unsuitable climate made them shift to keeping mixed flocks. This strategy also failed miserably due to disease spread and, ultimately, led them to shift back to rearing local breeds. The local breed raised is distinct to this area, and WOTR is working on a formal recognition of this breed.

Interview

Name of Person: Shivaji Rambhau Karande
Age: 38
Education: 7th Standard
Occupation: Sheep rearer belonging to the Dhanghar community and member of the VDC of Darewadi Watershed
Address: Darewadi Watershed, Sangamner, District Ahmednagar

Before the IGWDP started in our village, WOTR organized a meeting to brief the community regarding the programme, the implementation structure, the benefits and the social discipline systems that needed to be followed in the village. I learnt that one non-negotiable principle in the project was a 'ban on grazing in watershed treatment areas'. I did see the importance of this but also knew it would not be accepted by my community. Of 140 HHs, 40-60 families reared sheep and goat, including myself. But the many meetings and trainings organized changed my thinking. Fodder in the village was only available for two months due to which we had to migrate for long periods of time over large distances. I could understand that after the watershed development work, this may change and, due to increased moisture in the soil, there would be more fodder for our sheep. With this understanding, I supported the ban on free grazing even though I had the largest flock of sheep in the village. I temporarily shifted my sheep out of the village and being a member of the VWC started telling others also to support the ban on free grazing in treated areas and aim to increase the vegetative cover in the watershed.

I was looked upon as an enemy by other sheep rearers but I did not give up and continued telling people the importance of the watershed treatment work and the returns we would get. As I practised what I preached, others slowly began to understand the concept. I also thought that rather than just rearing sheep, I could start agriculture and also rear dairy animals because I knew the effect on our lands of having too many sheep. Since many of us did not have the capacity to shift our livestock out of the village, the conflicts did not subside. We then came up with the idea of dividing the treated lands into blocks, and enforcing the ban on grazing in a rotational manner. We also allocated a separate patch of land for grassland development and grazing.

Today, along with sheep and goats I have a few indigenous cattle and poultry, and I cultivate four acres of my land. I earn almost Rs 200,000 just from my livestock every year!

Case Study 2: Traditional livestock systems support improved watershed management and livelihood security, Mandwa watershed[13], Nagpur District

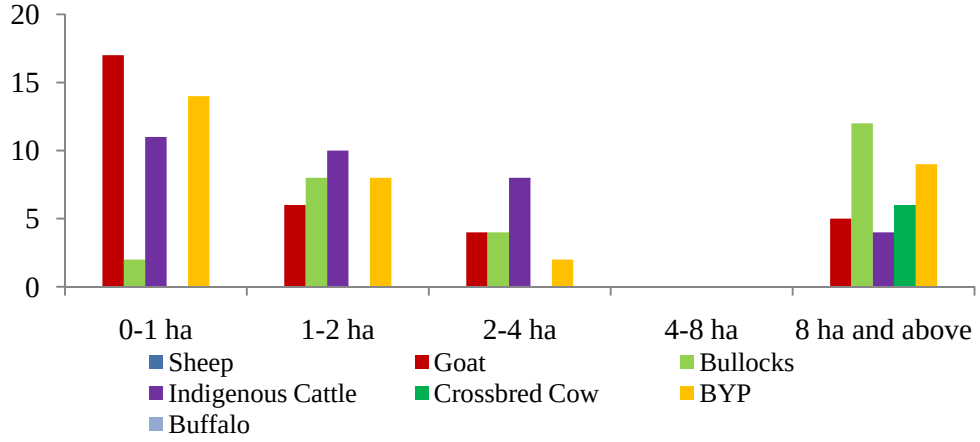
Mandwa is located in the Hingna block of Nagpur district in Maharashtra, and falls in the moderate rainfall zone of Maharashtra. The watershed is remotely located, accessible by a *kaccha* road. The nearest milk collection centre is 8 km away and the nearest market is 17 km away. *Mandwa* is 40 km away from the Nagpur district headquarters.

The area gets 59 days of rainfall on an average from June to September each year, adding up to 1,161 mm. The monsoons bring storms of high intensity. Therefore, high soil erosion is observed in the watershed area. The climate in summer is very dry and hot and the humidity is down to just 20%. The average temperature in the summer months is 48º C and, in the winter, it drops to a minimum of 20ºC.

The area under the watershed is 912 ha, of which 404 ha is forest land, covered by thin forest. Of 218 ha of revenue land, 88 ha has been encroached upon and is de-facto private land. Of the 290 ha private land, 80 ha is irrigated and the rest is rain-fed. Under IGWDP, 667.44 ha have been treated. There are 29 wells in the village; only one well is perennial and serves as a drinking water source for the village.

The village had 65 HHs when IGWDP started and now has 88 HHs. More than 90% belong to the Scheduled Tribe category (*Gonds, Mama, Mali, Dhivan, Teli* and *Kunabi*). The average landholding size is 4.86 ha/ HH. However, the ownership of land is highly skewed, with 30% of the population owning 65% of the land.

Graph 6: Livestock Holding Per Landholding Category—Pre-watershed in *Mandwa* (1995)



In the pre-watershed scenario *Mandwa* had problems similar to the other sample watersheds, and was plagued by unproductive land, recurrent droughts, acute poverty and migration. During the pre-watershed period, more than 90% of the area was under rain-fed agriculture, with only three HHs having wells for irrigation. Agriculture was primarily subsistence and livestock rearing was a primary source of income. As depicted in Graph 6,[14] goat rearing and the sale of farm animals was a key source of income. Poultry rearing was a widespread practice both for home consumption as also for the sale of eggs and birds. FGDs revealed that since livestock rearing was an important source of livelihood for farmers in *Mandwa*, they found it difficult to abide by the ban on grazing in treated areas. However, due to the effort and time on the part of the implementing agencies, compliance to the rule was brought about even though the community was not fully convinced of the positive effects of the ban. The remote location of the watershed facilitated compliance of the ban, as there was enough wasteland beyond the treated area for grazing livestock, thereby reducing hardship. This may be the reason why the numbers of both indigenous cattle and goat population are still considerably high post-watershed, in comparison to other sample watersheds.

[13]The watershed programme in this watershed was implemented by a Nagpur-based NGO called the Comprehensive Rural Tribal Development Project (CRTDP) with capacity building support from WOTR under IGWDP.

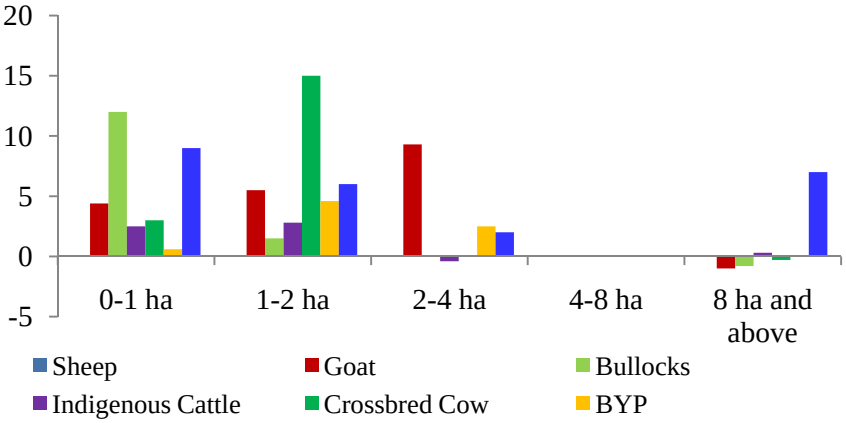
[14] The graph shows no HHs in the 4–8 ha category because they fall in the sample of HHs that have witnessed a change in land category post-watershed and, hence, have not been considered.

There have been numerous positive post-watershed impacts (See Table 5). A recent study undertaken by AFPRO (2008) shows a striking change in the income level, and the farm sector has emerged as a major primary source of income, with a ten-fold increase in income, primarily on account of the cultivation of cash crops. However, the contribution of livestock (sale of milk, farm animals, eggs, birds and milk products) to HH income has decreased considerably post-watershed. As informed by the community, there is no deficit in both grass and tree fodder for livestock post-watershed development.

Table 5: Impact of Watershed Development on Fodder, Agriculture and Water Availability

Agriculture and Livelihood Parameters	**Pre-watershed 1995**	**Post-watershed 2001**	**2008**
Cultivated area			
Perennial	15 ha	40 ha	200 ha
Seasonal	300 ha	260 ha	100 ha
Vegetable cultivation	04 ha	40 ha	60 ha
Production—crop yield (Rs/acre)	20,000	75,000	1,25,000
Milk production	20 litres per day	200–270 litres per day	200 litres per day
Agriculture employment	3–4 months	9–10 months	All year round
Fodder production tonnes/year	8	12	Surplus (it was not possible to quantify this because only grazing is practised now.)
Number of wells	3	20	33
Depth of the well (feet below ground level)	20	8–10	6–7

Graph 7: Livestock Holding Per Landholding Category—Post-watershed in Mandwa (2009)



Graph 7 shows the percentage change in livestock holding post-watershed. Even though fodder availability has increased tremendously and the hardship faced in reaching the milk collection centre/ other markets has reduced considerably (purchase of two wheelers) post-watershed, livestock rearing and the numbers of livestock have reduced at the HH level. This decrease, however, is mainly on account of a shift to an agriculture-based economy. Further, FGDs revealed that income from agricultural labour work is much more lucrative than rearing livestock, particularly if the number of animals is high. This is because HHs need to depend on the '*charaiya*' (see description below) for grazing livestock since family members are busy in their agriculture fields. The increase in agriculture has augmented the demand for labour, resulting in an increase in wage rates, ranging from Rs 25,000 per annum for the relatively younger to Rs 18,000 for older people. Wage rates change as per the crop and the type of work required in the fields because vegetable crop production is highly labour-intensive. Agricultural labourers also receive 500–600 kg of grain (wheat, *jowar*, etc.), in addition to the above wages.

Despite the above, livestock-based livelihoods are more profitable and secure than in the pre-watershed days, particularly for HHs falling in the 0–1 and 1–2 ha categories. This is because the *increase in*

agricultural production as well as successful watershed development has facilitated traditional livestock rearing systems, to emerge as a viable livelihood opportunity.

The charaiya/ village herder: Parts of the treated area are still under the grazing ban in *Mandwa*; therefore, grazing of livestock needs to be carried out on land available at considerable distance from the village. A few HHs belonging to the 0–1 ha category generate a livelihood by grazing village livestock. They collect the animals from the HHs in the morning, graze them throughout the day in and around the watershed and bring them back towards evening. Each *charaiya* manages up to 40 animals in the case of large ruminants and slightly more in the case of small ruminants. The grazing fee (Rs 55 per animal per month) is the same for both large and small ruminants. The HHs that have large flocks do not use the services of the *charaiya*, who are few in number. In *Mandwa*, currently there were three persons managing the total livestock in the village, earning an income of Rs 26,400 each per annum. *The appointment of a charaiya is a viable solution to the problem of overgrazing and facilitates the protection of enclosed areas more effectively.*

Grazing of livestock on lands at considerable distance from the watershed by using the services of the charaiya was a key coping mechanism adopted by households in the Mandwa watershed in lieu of the ban on grazing in treated areas

The sale of bullocks*:* As the price and demand of bullocks has increased substantially, it has become a highly lucrative livelihood option for the landless and for farmers falling in the 0–1 ha category. Discussions revealed that they generally purchase calves around 2 years old, costing Rs 2,500–3,000 each, rear them for two years and sell them for Rs 10,000 –12,000 each. Input costs are marginal since the calves are entirely grazed on common lands. Cross-bred male calves are also sold. However, they are not preferred because these animals are apparently unable to work in the heat and, as reported by the community, have no aesthetic value.

Grazing based dairy farming: Communities in the *Mandwa* watershed found it difficult to understand the 'cut-and-carry' method of fodder harvesting, and it appeared a waste of time. Even now, they are of the opinion that cattle must be left free to graze, particularly with increased agricultural work in the post-watershed period. In this watershed, the community entirely depends on free grazing even for cross-bred cows and buffaloes! However, the community did recognise that there is a reduction in milk production by cross-bred cows when they are grazed. This was, however, not a concern because a cross-bred cow would produce between 5 and 7 litres of milk a day. Cross-bred cows are largely low-grade Jersey crosses; therefore, health care costs are low and fodder requirement in a free grazing system is negligible. The only investment required is for feed concentrate (oil cake and cotton seed cake) and the monthly fee to the *charaiya* (Rs 55 per animal per month). Discussions revealed that pre-watershed, the farmers of *Mandwa* had put in a lot of effort in rearing and maintaining high yielding cow breeds, to earn income from the sale of liquid milk; this continued in the initial post-watershed years. However, due to remoteness of the village, lack of roads, high disease incidence and failure of a diary initiative by a Self Help Group (SHG) as well as interventions by the Animal Husbandry Department introducing a breed from Haryana, the community now prefers the rearing of low-grade Jersey cows. The failure of initiatives, based on higher grade crosses and new breeds were mainly due to animal death and disease, difficulties in accessing markets on account of remoteness and unmanageable workloads. This negative experience appears to have contributed to restricting community preference to low-grade cross jersey cows and the rearing of indigenous buffaloes, which is a recent trend.

Goats—critical support system to agriculture: Goat farming in the *Mandwa* watershed shows an increasing trend, together with more land being brought under cultivation as a result of watershed development. Goat rearing has emerged as a key support system to input intensive cash cropping. The goats reared are often sold when inputs (fertilizers, seeds, labour, etc.) are required for agriculture production. FGDs revealed that the goat population was much higher before 2008, and reduced following the occurrence of an epidemic that wiped out goat flocks. This instilled fear among many about rearing goats again. The nearest veterinary hospital is 8 km away and no health-care services are available within the village.

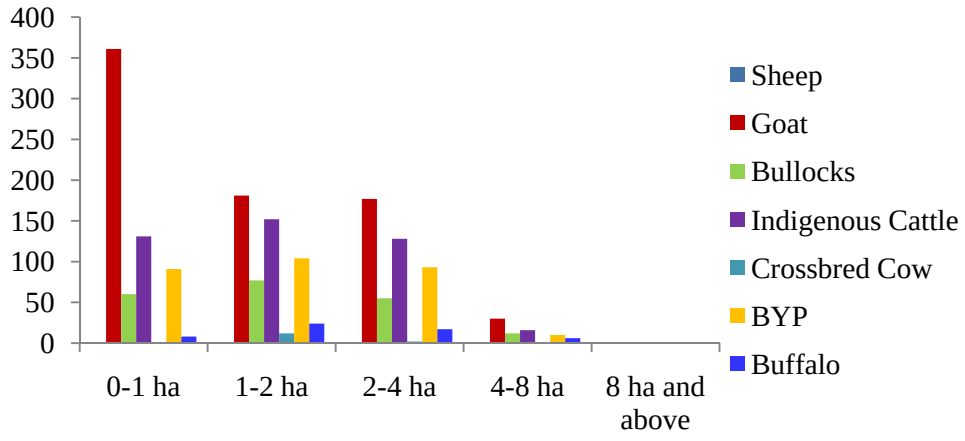
Goat rearing in the Mandwa watershed emerged as a key livelihood support activity for agriculture

Case Study 3: CPR-based dairy farming, Mhaswandi Watershed, Sangamner Taluka, Ahmednagar district

Village Mhaswandi is located in the foothills of the Sahayadri ranges of Western Maharashtra in the Sangamner taluka of Ahmednagar district, and falls in the rain shadow zone. The average annual rainfall is 399 mm. The topography of the watershed is undulating with over half the total area under forest, with steep slopes of over 25%, devoid of protective vegetative cover, resulting in extensive degradation and erosion. The area of the watershed is 1,145 ha of which 377.49 ha is arable land, 20.75 ha is cultivable wasteland and 231.50 ha is uncultivable wasteland. Forest land in the watershed is 502.10 ha and *panchayat* land comprises 13.16 ha. *Mhaswandi* is home to 220 HHs spread across nine hamlets. Sixty per cent are *Marathas* and other sub-castes such as *Chambhar*, *Navhi*, and *Sutar*. The remaining 40% are *Thakkar Adivasis*.

Prior to the commencement of IGWDP, water for both agriculture and domestic use was scarce in the village. Agriculture was primarily rain-fed with the irrigated area restricted to the valley and lower ridge areas of the watershed. Residents depended on water tankers from nearby areas between April and July each year. The pressure on cultivable land was immense. This led to an over-exploitation of resources such as land and water, in order to meet basic requirements of grain, fodder and fuel. Village grasslands and forest lands were overgrazed by the existing livestock population, which mainly comprised non-descript cattle and goats (Graph 8). Cattle were reared mainly to produce bullocks for sale and the milk produced was consumed at home. Other sources of income were agricultural labour and migration in search of work to cities such as Nashik, Pune or Mumbai. Those who did not get any employment started brewing and selling liquor in the village, which led to the deterioration of family and social life.

Graph 8: Livestock Holdings in Mhaswandi Watershed (1994)
(Source WOTR-IGWDP Database)



The main impact of the watershed programme was the increase in land under cultivation, and an improvement in the availability of water for irrigation. Increased agriculture productivity and water availability resulted in farmers moving away from the rearing of non-descript cows to rearing high grade 75% *Holstein Friesian* cows. The cropping pattern also changed from the earlier focus on groundnut, pearl millet and sorghum to crops such as potato, tomato, onion, wheat, soya bean, floriculture, and fodder crops such as maize and hybrid napier. A general decrease in the numbers of all types of livestock in each landholding category is observed. However, the total population of livestock in the watershed has increased over time. Currently, for many HHs, livestock rearing has become a key secondary source of income (See Tables 6 and 7, and Graphs 9 and 10). During FGD and specific interviews, farmers shared that market rates of agricultural[15] produce fluctuate so much that income from milk is a stable and secure source of income for all. In Mhaswandi too, farmers said that the ban on grazing in forests enforced by the forest department is the main reason for reducing the numbers of indigenous cattle. The watershed development programme has enabled the rearing of cross-bred cows in this once very barren and water-deficient village due to increased water availability. HHs that depend on goat-rearing, with larger flock

[15] Maharashtra, particularly district Ahmednagar and its adjoining districts, are the largest producers of tomato, onion and fruits in the country.

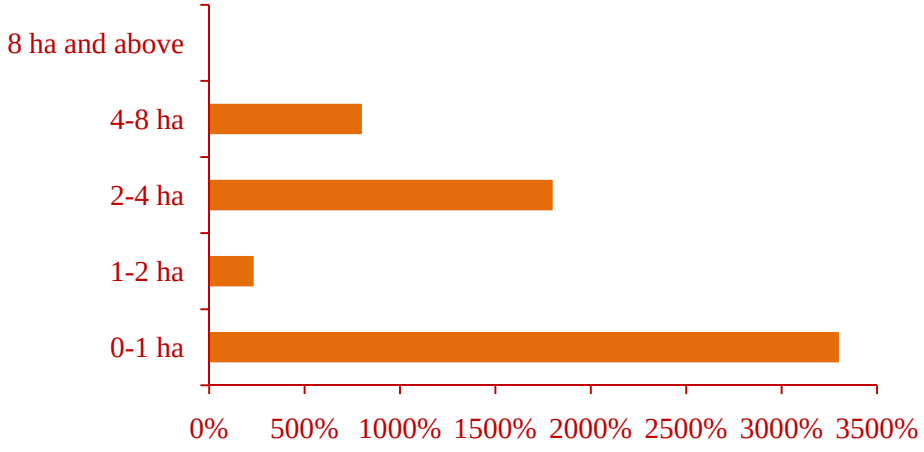
size, mentioned that access to grazing is still a major problem. This is because entry to forests is completely banned and the remaining area is under agriculture production.

Table 6	**0–1 ha**	**1–2 ha**	**2–4 ha**	**4–8 ha**	**%**
Mhaswandi (pre-watershed)					
Primary	22	17	4	1	31.40%
Secondary	4	11	7	0	15.70%
Mhaswandi (post)					
Primary	11	5	1	0	12.50%
Secondary	12	14	8	1	25.00%

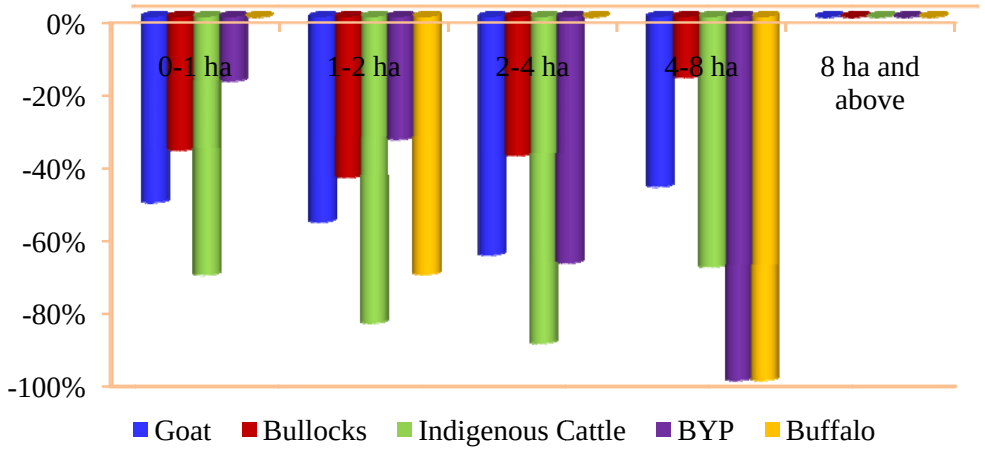
Note: The sample size for this watershed was 140 HHs and, of these, the above table details those for whom livestock rearing was either a primary or secondary source of income. Primary source of income indicates those HHs that were getting a regular income from livestock to sustain their livelihoods with income from other sources as secondary to this. A secondary source of income indicates that those HHs for whom income from livestock is a key income source but is not the main source of income. HHs that kept livestock for farming (for example bullocks for draft purpose) or for minor supplementary income once in a while are not included.

Table 7: Impact of Watershed Treatment on Livestock and Fodder Availability			
Items	**Pre-watershed Prior to 1994**	**Post-watershed**	
		2001	**2006**
Irrigated area			
Perennial	29 ha	70 ha	175 ha
Seasonal	35 ha	135 ha	423 ha
Total	61 ha	205 ha	598 ha
Dairy (milk)	190 litres/day (in 1992, 70 litres/day)	790 litres/day	464 litres/day
Agriculture employment (landless HHs)	3 months	8 months	Throughout the year
Land Value (Rs/ha)			
Agriculture	Rs. 15000	Rs. 80,000	7.5 lakhs
Wasteland (Rain-fed)	Rs. 5000	Rs. 45,000	1.25 lakhs
Fodder production	950 tons	1,920 tons	2,500 tons
(Source: WOTR Database)			

Graph 9: Percentage Increase in Cross-bred Cows with Farmers in Different Landholding Categories in *Mhaswandi* - 2009



Graph 10: Percentage Change in Livestock Holding in Different Landholding Categories in *Mhaswandi* 2009



CPR-based Dairy Farming System

The CPR-based dairy farming system under implementation in *Mhaswandi* is managed by the forest protection committee (FPC) in collaboration with the GP, the VDC and the state FD. Under this initiative, 502.10 ha of forest land and 13.16 ha of revenue land (*gyran*) are protected and managed, to produce fodder for dairy livestock in the village. This involves the division of CPRs into plots, ranging from 15 to 30 ha, which are auctioned in the village in the presence of the GP, FPC, VDC and the FD officer in charge of the area. The price for each patch of land starts from Rs 500 and goes up to Rs 3,500. The rationale for patch valuation depends on the quality and quantity of grass/fodder in the patch, which is evaluated by the GP, FPC and VDC members. The auction is conducted annually and the funds generated average Rs 50,000 to Rs 60,000, depending on the number of plots auctioned. The money generated from this is deposited in the FPC account, and a register is maintained by the various committees. The fund is used for village development activities and community gatherings during festivals, etc. Once a patch of land has been allotted to a particular HH, it is in-charge of this and collects fodder from the land only through the cut-and-carry system. Surplus fodder is sold to other farmers within the watershed. As the plot sizes are large, groups of small farmer's pool money to bid for the land; re-bidding of the land by the allottee is also permitted. Once the plot is taken on lease for a year, the farmers divide it among themselves, depending on how much money they contributed and the number of cross-bred cows they own. Similar to other HHs in the village, landless HHs are also eligible to bid for the plots, and sell fodder.

Rearing of cross-bred cows and the sale of milk is a key livelihood activity in the Mhaswandi watershed. Fodder needs are met through an innovative common land leasing system in collaboration with the Forest Department

As milk production in the village increased considerably from 190 litres per day in 1994 to 790 litres per day in 2001, a milk association, managed by the VDC, was formed in the village. The daily milk output after 2001 has however come down from the high of 800 litres a day, stabilizing in the range of 400-600 litres a day. This has mainly been due to the initial lack of knowledge on management practices for rearing cross-bred cows. The association currently comprises 40–50 farmers supplying milk on a daily basis. A Bulk Milk Chilling Unit was set up in 2004 in the village. Prior to this, there was a daily loss of 150 litres on account of improper storage facilities. The association then invested close to Rs 200,000 for acquiring the Bulk Milk Chilling Unit with a storage capacity of 500–800 litres a day. Other capital

investments incurred for the construction of the building and office were Rs 650,000. The VDC played a key role in leveraging these funds from different government schemes and from the district milk federation. The net profit for the association has gone up mainly due to an increase in milk prices.

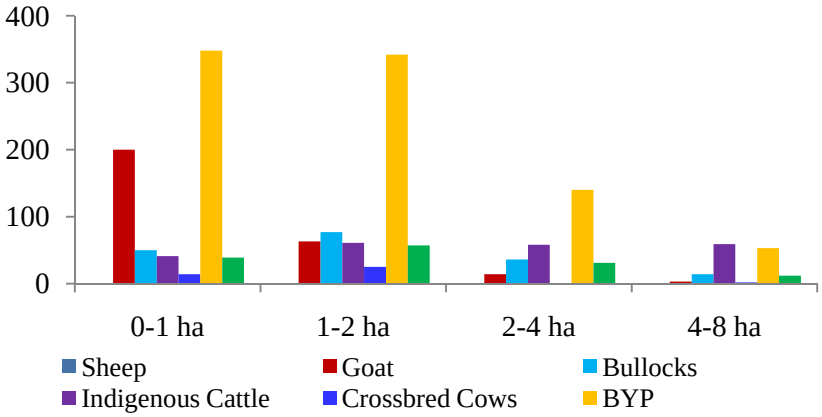
Based on the number of cross-bred cows being reared by farmers (per HH) detailed interviews were conducted and a comparison was done of input/output costs between farmers rearing one cross-bred cow and those rearing more than two cross-bred cows. As shown in Tables 2A and 2B in Annexure 2, the income stream pre- and post-watershed for farmers in this category has shown remarkable improvement because the net income from milk sale has gone up, primarily due to the introduction of cross-bred cows. The net income per cow (6% inflation adjusted) has gone up from Rs 327 to Rs. 9,640 per annum, for a 1–2 ha landholding farmer whereas for farmers with landholding below one hectare, it has gone up from Rs 800 to Rs 11,502. The drivers for such a prolific rise in net income have been the high yields of milk production, doubling of milk prices and entry of new income via manure sale. However, there is also a substantial increase in the amount spent on top feed/fodder for cross-bred cows. Further, the CPRs taken on annual lease jointly with other farmers are now not yielding any income through fodder sale because the fodder is now being consumed within the village owing to a larger number of cross-bred cows.

The net income per cow is more for a 0–1 ha landholding farmer, who has one cross-bred, as compared to a 1–2 ha landholding farmer, who has four adult and one cross-bred calf. Based on this preliminary comparative analysis, indications are that increasing the number of cows beyond 2 adults and one calf will not increase the net income because it does not result in incremental gains or higher profitability per cow. Hence, a marginal farmer rearing one cross-bred appears to have a higher profitability per cow as compared to a large farmer with a greater number of cross-bred cows.

Case Study 4: Mixed Livestock and Crop Farming, Wanjulshet Watershed, Akole Block, District Ahmednagar

Wanjulshet is a remote village located in the *Sahyadri* ranges of *Akole* block of Ahmednagar district. The average annual rainfall is 950 mm and is largely confined to the monsoon months from June to September. The soils are sandy and silty loam, with low water-holding capacity and diminishing productivity on account of high soil erosion. The steep slopes, high rainfall, tree felling and bush clearing had resulted in tremendous rainwater run-off increasing soil erosion. Approximately, 531.37 ha of the watershed is hilly terrain, of which 277.17 ha are arable and 254.2 ha are uncultivable wasteland. With regard to CPRs, around 56.07 ha are government forest land and 20.35 ha are revenue/common land. Private agricultural land is 454.95 ha. Of 31 wells in the watershed, only 18 were seasonally functional at the time of project commencement. The average water table in summer was about 0.40 m, and in winter it was 2.10 m. The population of the village is mostly tribal (*Mahadev Koli*) with Scheduled Castes comprising 3% of the population.

Graph 11: Livestock Holding per Landholding Category – Pre-watershed in *Wanjulshet* (FSR 1997)



Before the commencement of IGWDP, *Wanjulshet* was home to 131 HHs. The land holding per HH at that time was quite high, averaging 3.53 ha per HH. (Source: *Feasibility Study Report (FSR) 1997*) However, in spite of many HHs owning large landholdings, hardly 2 acres of land per HH was cultivable. Income from agriculture was low; thus, income from livestock rearing was crucial. HHs with smaller landholdings had more livestock of all types compared to HHs with larger landholdings. All HHs reared BYP irrespective of landholdings, with the number of birds increasing with decreasing landholding. Small ruminants decreased with the increase in landholding (See Graph 11[16]). The *Danghi* cattle and a non-descript indigenous breed of buffalo were the main livestock breeds raised for milk production. The income from livestock was mostly through the sale of milk and milk products as a cooperative dairy was established in *Akole* in the 1960s. Due to this, a few HHs in *Wanjulshet* were already rearing cross-bred cows much before the WDP began. Milk was sold at Rajur (a nearby town) at Rs 3 per litre. It was just enough for survival but not profitable. Prior to the commencement of the WDP, fodder availability for cattle was a major problem. The forests and CPRs were the main sources of fodder. HHs rearing livestock would also migrate for up to six months each year, in search of fodder, under a system where a group of 4–5 men would take all the cattle in the village for migration in turns. During migration, the income earned through the sale of milk was sent back to the family. There was no income from the sale of manure at that time. Migration for work to other parts of the state, and agriculture wage labour to other areas outside the village were other sources of livelihood.

In *Wanjulshet*, IGWDP was initiated in 1997 and completed in 2002. Details of watershed treatment undertaken are provided in Annexure 3. Since the commencement of watershed development work, the number of HHs has increased to 166, with an average per capita landholding of one hectare. The income from agriculture has increased tremendously after the completion of the WDP (refer to Table 1 below). Farmers are now able to take three crops annually due to increase in water availability. From the

[16] For this graph, data from all HHs has been taken to show the general trend of livestock holding among farmers belonging to all landholding categories.

cultivation of just four crops (rice, millet, groundnut and Bengal gram), farmers now produce a variety of vegetables, pulses, millets, paddy, wheat, etc., throughout the year.

Table 8: Impact of Watershed Development on Livestock and Fodder (Source WOTR—FSR and PCR)				
Items	**Pre-watershed (1996)**		**Post-watershed (2002)**	
Cropped area (ha)				
a) Kharif	268.18		315.05	
b) Rabi	167.91		163.80	
c) Summer	19.00		37.50	
Irrigated area (ha)				
a) Perennial	19.00		38.00	
b) Seasonal	10.50		163.80	
Number of wells	31		36	
Milk (lit/day)	113		433	
Fodder production	**Area (ha)**	**Total Annual Production**	**Area (ha)**	**Total Annual Production**
From agricultural crops				
Kharif	268.18	867.6	315.05	1103
Rabi	167.91	60.73	163.8	298
From grazing land				
From forest land	-	-	56.14	38.04
From horti-pasture	-	-	67	178.89
From grass and trees	237.82	178.37	126.61	406.5

The ridge to valley approach and the resultant increase in the water table has improved agricultural productivity, and enabled more land to be brought under cultivation

Even though WOTR had no specific project component to promote livestock development (for example, the introduction of more productive breeds), the increase in income from agriculture and availability of water brought in many changes. The survey as well as FGD with farmers conducted during this study revealed that the livestock population per HH has decreased with the increase in landholding, and a mixed crop livestock farming system is now being practised. However, the total livestock population in the watershed has increased. This is due to the increase in the number of HHs in the watershed. The rearing of livestock has become a key secondary source of income for many as seen in Table 9 below.[17]

Table 9	**0–1 ha**	**1–2 ha**	**2–4 ha**	**4–8 ha**	**Total %**
Wanjulshet (pre-watershed)					
Primary	6	2	0	0	7.60%
Secondary	4	8	11	3	25.70%
Wanjulshet (post-watershed)					
Primary	3	1	0	0	3.80%
Secondary	4	12	12	9	31.80%

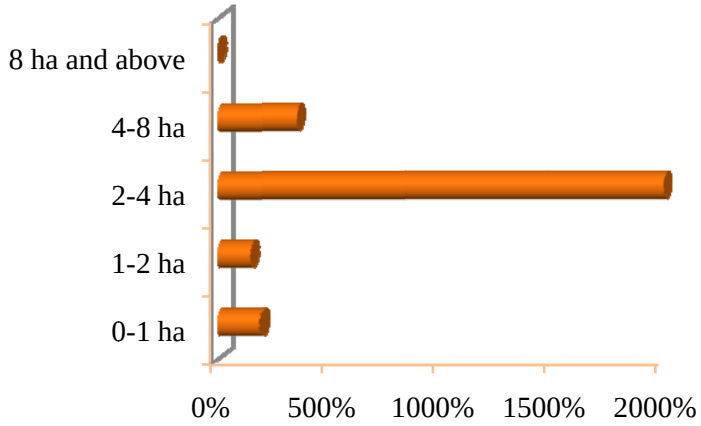
[17] The sample size for *Wanjulshet* as mentioned in Table 9, Section 4 was 115 HHs and comprised HHs whose land category did not change post-watershed.

Note: In this table, '*Primary*' indicates those HHs that were getting constant income from livestock, to sustain their livelihoods with income from other sources as secondary to this. '*Secondary*' indicates those HHs for *w*hom income from livestock is a key income source but is not the main source of income. HHs that kept livestock for farming (for example, bullocks for draft purpose) or for minor supplementary income once in a while are not included.

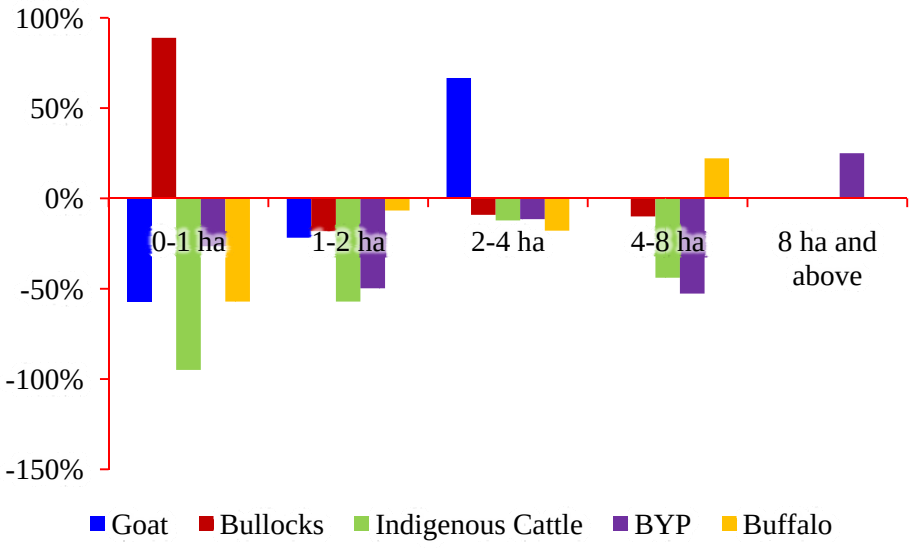
Conservation measures in the ridge area of the Wanjulshet watershed

Taking into consideration HHs that have not witnessed a change in the landholding category (the sample for this study), a clear shift from an average herd size of 10–15 *Danghi* cattle to two low-grade Jersey cows per HH is observed This major shift is seen with regard to farmers in the 2–4 ha category (Graph 12). These HHs also raise goats primarily as a source of milk for home consumption as well as to meet emergency and immediate credit needs. The main source of fodder is from grazing in the CPRs and fallow agricultural lands. Apart from this, agriculture crop residue, oil cake and green fodder is also being fed as top feed for pregnant goats and fast weight gain of animals. Green fodder and oil cake are purchased from the towns of Igatpuri, Ghoti and Thane.

Graph 12: % Increase in Cross-bred Cows with Farmers in Different Landholding Categories



Graph 13: Percentage Change in Livestock Holding in Different Landholding categories in *Wanjulshet*



Graph 13[18] shows the percentage change in livestock holding among farmers in different landholding categories. FGDs and specific interviews with farmers belonging to all landholding categories revealed that the main reason for decrease in livestock per HH was less availability of person power for taking care of livestock because most families are now nuclear families with smaller landholdings than before. They shared that the ban on grazing in forests was the main reason for a reduction in livestock, particularly cattle. This was further aggravated when CPRs other than forest areas were brought under the IGWDP grazing restriction for five years. However due to tremendous increase in water availability and agricultural production post-watershed, they can now rear cross-bred cows. They also added that the climate is unsuitable for cross-breds and, hence, rearing is restricted to low-grade *Jersey* cows (25% cross) instead of a higher percentage of Jersey or Holstein Friesian. The farmers added that there is no fodder scarcity as in the past since post-harvest agriculture lands, uncultivable agriculture lands and CPRs other than forests are available for grazing, together with fodder generated during the *kharif* season. Due to this, migration for fodder has stopped completely for those who still rear indigenous cows, in particular. Farmers with goats shared that due to the availability of different kinds of fodder, the animals gain weight faster and disease incidence is also low. As per field observations, factors like decrease in water availability, signs of over grazing, degradation of environment, etc., were not seen or reported even after several years of completion of the WDP.

The study tries to understand the impact of watershed development on livestock-based livelihoods; the change in farm economics of farmers' pre- and post-watershed development in land holding categories 0–1 and 2–4 ha, has therefore been illustrated in Tables 3a and 3b in Annexure 2. This is because the maximum change in livestock holding is seen in these categories.

Contour trenches and other soil and water conservation measures across common lands regenerated and improved the vegetation cover on these lands

[18] It is to be noted that field surveys of livestock holding were carried out in the summer season and, therefore, the number of goats and BYP reported are generally much lower than the usual numbers kept.

6. Key Lessons and Elements for Success

As demonstrated in the preceding watershed-specific case studies, there are many external factors that have led to significant changes in livestock rearing practices and not just watershed development. In fact, successful watershed development has resulted in a stronger agricultural base and continuous water availability, enabling HHs (even those with small and marginal land-holdings) to shift to a high-input, high-output livestock production system. The study also indicates that there is now an increased variability in livestock production systems within a district and documents how livestock supports other livelihood occupations.

1. The impact of IGWDP on the concept and practice of watershed development in India and its expansion to other states through government and NGO programmes is evidence of the sustainability of this approach, particularly the adoption of its successful practices, such as CBP and Participatory Net Planning (PNP) in other major programmes being implemented in the country. With the success in Maharashtra, WOTR has now spread this concept to four other states (Andhra Pradesh, Madhya Pradesh, Rajasthan and Gujarat). IGWDP has, in fact, provided the 'blue-print' for the National Watershed Development Fund, which is carrying the experience and learning of over a decade-and-a-half to several states in the country. It has been widely studied and referred to as a prime example of successful public-private-civil society partnership, involving multi-sectoral interventions and extending from the local to the regional, national and international levels. The key to its success has been its development philosophy, a robust partnership amongst key actors, an enabling policy environment, firm political and government support on both the Indian and German sides, an innovative and path-breaking capacity building pedagogy, unique institutional arrangements and secure funding. (Lobo, 2001)
(See Annexure 4 for policy impacts of IGWDP).

Critical to the success of IGWDP was the time investment in capacity building, with a distinct phase and institutional agency to implement the CBP. Another key element for success was the issuance of a GR that facilitated collaboration between line departments and the watershed implementing agency. These learnings and institutional arrangements have however not been taken forward in other KfW-financed WDPs being implemented through NABARD or the rural development departments in other states of India.

2. **The overall picture**: Changes in livestock preference and production systems primarily depended on the increased availability of water for agriculture and livestock rearing; climatic conditions; improved access to agriculture markets and dairy cooperatives; and price fluctuations of agricultural produce. A general reduction in livestock numbers per HH for all livestock species is observed but there is an overall increase in livestock population in the watershed. This is mainly due to an increase in the number of HHs in the watershed village because many joint families have split into nuclear families over this 15-year period. This change has also resulted in reduction in person power to manage livestock as well as landholdings per HH. Both factors have had a major impact on livestock numbers/change in species at the HH level. In addition to this, restricted grazing in forest areas, increase in agriculture work-load, as a result of more land being brought under cultivation, shift to cash crop cultivation and improved access/availability of water have also impacted livestock rearing at the HH level. As incomes improved, HHs invested in better education, which resulted in increased migration of youth to cities for better jobs.[19] A limited number of 'work-hands' at the HH level also impacted livestock numbers, resulting in a reduction in livestock at the HH level.

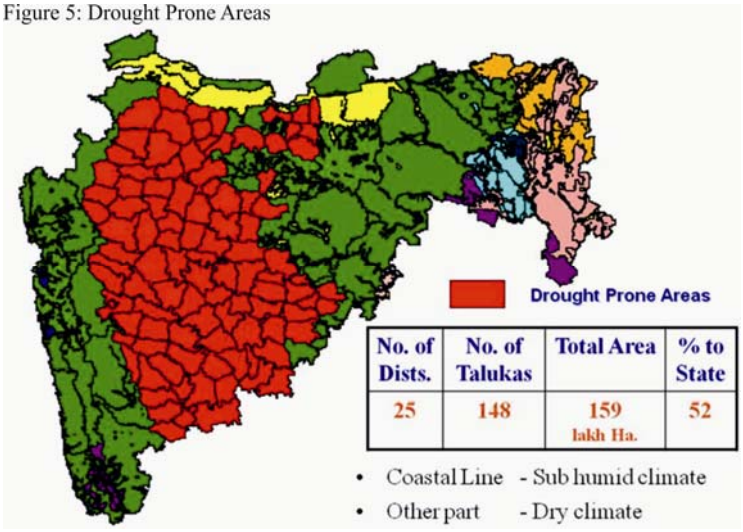
As informed by communities, the main reason for rearing indigenous cattle earlier was to earn income from the sale of farm animals rather than the sale of milk. The lack of access to grazing resources, particularly forests, followed by the ban on grazing in treated areas under IGWDP were stated as the key reasons for reduction in the rearing of indigenous cattle. This has, over time, led to a severe shortage of bullocks for ploughing agricultural lands, and a significant increase in the price of a pair of bullocks, making this an unaffordable and unmanageable asset for small and marginal farmers. This change has had a negative impact on agriculture. Currently, even though adequate fodder is available from the

[19] With an increase in income and access to better education, youth aspire for higher paying jobs in towns and cities.

regenerated commons, farmers have not increased the number of animals, especially of goats and indigenous cattle. The priority has now shifted to agriculture further reducing the person power required for grazing animals at the HH level.

3. **Investment, protection and management of CPRs is critical for livelihood sustainability**: In the context of securing crop-livestock-based livelihoods, the technical principle of treating a watershed from ridge to valley, thereby undertaking required soil and moisture conservation works on all types of land and not only agricultural lands, or lands below the ridge proved highly beneficial. Annexure 3 provides details of treatment carried out in all four watersheds. Treating more CPR lands, together with the strategy of enclosing the high-potential recharge zones continuously for five years (still being protected in some watersheds) has proved highly rewarding. This is evident from the fact that even after 15 years and three major droughts during this period, the watersheds are still able to provide continuous environmental services and support the water intensive crop-livestock production systems despite being a drought-prone zone (see Figure 5).[20] In addition, temporary closure allows the flora of the region to reach flowering and seed dispersal stage and facilitates regeneration in other parts of the watershed thereby maintaining productivity of the watershed landscape. *Hence, it can be concluded that enclosed protection of the high-potential recharge zones in the watershed ensures sustainability and continued environmental services offered by the watershed. It can also support extensive livestock production systems as only a small part of the watershed is protected at a time whereas the rest is available for grazing.*

Figure 5: Drought Prone Areas



4. **Changing livestock production systems and vulnerability in rain-fed areas:** External drivers, improved access to markets and increase in water availability for extended parts of the year have led to farmers adopting water-intensive, crop-livestock production systems. The study shows, that until now, on account of the impact of IGWDP, the ecosystem is still able to provide adequate water resources supporting the shift to intensive production systems. The key question, however, is how long can the eco-system continue to sustain these water-intensive, livelihood strategies?

In three watersheds, except for *Mandwa*, changes in livestock composition and rearing systems contribute towards much higher incomes than earlier; on the flip side, however, one can conclude that the vulnerability of both communities and the surrounding ecosystems has increased. Vulnerable groups are identified as landless, small and marginal farmers and women, the elderly and children in particular. The reasons for increased vulnerability are:

a) Increased dependence on high-grade, cross-bred cows, which is a water-intensive livestock-production system.
b) Significant reduction in the rearing of small livestock that can act as a buffer in times of distress
c) Loss of multiple advantages provided by indigenous cattle (manure, bullock power, etc.)
d) Loss of financial and nutritional security for women and children due to a reduction in small livestock- BYP and goats in particular.
e) Absence of any norms and regulation for excessive use and extraction of water.

The availability of CPRs and the continued practice of traditional livestock rearing systems, maintaining low-grade cross-breds and goat farming, make the farmers of *Mandwa* less vulnerable than the rest.

[20] Except for the *Mandwa* watershed, the other three watersheds under study are located in the red zone which comprises the drought-prone regions of the state.

Hence, it is essential to integrate extensive production systems, to reduce the vulnerability of both communities and the watershed (systems suitable to the agro-ecological zone) and focus on sustainability rather than a sole focus on higher economic returns. In addition, water budgeting and regulation of water use is a critical requirement in post-project WDPs to support water- intensive and high-value, crop-livestock production systems in a sustainable way.

5. **Multi-stakeholder platforms help in managing resources equitably and in a sustainable way**: With high input costs in terms of feed, fodder and medical care, it is often difficult for small and marginal farmers to raise and maintain high-grade cross-breds. However, as demonstrated in the *Mhaswandi* watershed, even small farmers in the 0–1 ha landholding category are able to rear high-grade cross-bred cows and earn a substantial income. This is largely on account of the community led CPR leasing system. Bringing different village-level institutions to work together (Wasundhara Approach[21]) is another key element of the programme that not only assured post project continuity but helped communities develop their own unique livelihood system.

Whereas the complete enclosure of over 500 ha of forest land and extracting fodder only through the cut-and-carry system has a positive impact on controlling soil erosion, a view that is gaining ground in recent years is that a complete ban on livestock grazing adversely affects grass bio-diversity and ultimately soil health.[22] A cut-and-carry system is also more labour-intensive and does not support small ruminant or indigenous cattle-based livelihoods. Therefore, a mix of both grazing and the cut-and-carry system is essential so that the watershed can continue to provide equitable environmental services.

6. **Traditional livestock systems can help manage watersheds better**: The case of *Mandwa* also demonstrates effective watershed management, without compromising in terms of reducing livestock numbers or banning grazing completely to maintain the green cover. The traditional system of jointly employing a grazer/village herder called the *charaiya*, which has completely disappeared in other places, has been effective in maintaining the productivity of the watershed and also in controlling over-grazing and livestock numbers since only 2–3 people are responsible for grazing the entire livestock of the village. This has also become a good livelihood source for landless people/ youth in the villages.

The ***charaiya system*** also provides an opportunity for implementing agencies to develop specialized training, management and service delivery plans not only for NRM but also for animal health-care services and breed conservation and development, contributing to a more robust system. *This case also demonstrates the importance of CPRs for grazing and how ecologically suitable livestock production systems can co-exist with effective management of common lands.*

7. In spite of the considerable focus on conflict resolution, shepherd communities in watershed areas were, in the short term, adversely affected by the ban on grazing on common lands. In *Darewadi*, this was resolved by treating the area in a phased manner and by enforcing the grazing ban only in areas that were treated. This helped achieve both objectives of CPR regeneration and meeting the fodder needs of the shepherd community. However, there is also recognition of the inability of the shepherd community to negotiate better terms on account of being smaller in number. In the other two cases, *Mhaswandi* and *Wanjulshet*, communities with small ruminants willingly reduced their flock size and adhered to the grazing ban in the expectation of receiving benefits of water, which was perceived as a much greater need. In *Mandwa*, due to the availability of CPRs in adjoining areas of the watershed, no

[21] Constant reflection on the part of WOTR throughout IGWDP with the objective of improving project impact and reach culminated in the Wasundhara Approach. It was initiated in 2005 and attempted to strengthen local participation and address equity issues. The approach aims to build community capacity to demand positive change and improved conditions. Here, participants are not treated as beneficiaries/recipients, but as protagonists of their own development. As the wealth ranking and village envisioning exercises are done by the villagers themselves, it resulted in strengthening the involvement of poor HHs and identifying their priority needs more effectively.

[22] http://www.feedingtheheadlines.com/2011/07/22/greener-pastures-how-cows-could-help-in-the-fight-against-climate-change/. In the watersheds visited, small ruminant rearers reported that enclosing the area and adoption of the cut-and-carry system has definitely increased biomass production but there is decrease in the species composition in the area. This is being studied further by WOTR through the preparation of people's biodiversity registers and other support studies in select Climate Change Adaptation project villages.

compromise was made by the communities and, in fact, they were not only able to treat the whole area but were also successful in keeping the high potential zones enclosed.

The key finding is that the livelihoods of livestock-dependent communities, particularly those dependent on common lands, can be secured; with CPRs being simultaneously regenerated and revived under WDPs with the development of alternative sites, a phased treatment plan and the protection and management of high potential recharge zones.

7. **Livestock is still a key source of income**: There is a clear shift to rearing cross-bred cows, and in some villages there is a shift from cross-bred cows to the rearing of indigenous buffaloes because regular income from milk is perceived as economic security. This is more prominent in watersheds where external factors such as assured water and fodder availability, market access and roads, and the presence of dairy cooperatives are in place. However, the 15-year time frame demonstrates the trend of a sudden increase in cross-bred cows immediately after the WDP, following which there is drop in animal numbers and, thereafter, stabilization at a certain level. (Seen in *Mhaswandi*, *Darewadi* and *Wanjulshet*. Source: WOTR database) The sudden drop was primarily on account of a lack of expertise in managing cross-bred cows, including feeding capacity, fertility problems and heat stress issues, resulting in high disease incidence, and often death/sale of the animals. Stabilization of numbers resulted from those who were able to successfully raise and build their cross-bred stock, maintaining numbers. The only exception to this trend is the *Mhaswandi* watershed, where even farmers falling in the 0–1 ha category successfully rear cross-bred cows. (See Case Study 3, for further details.)

Whereas the shift to cross-bred cows has increased incomes through milk production, it has led to a decline in the availability of bullocks and farm-yard manure. A pair of bullocks in these areas now costs between Rs 50,000 and Rs 70,000, as compared to the price of Rs 10–15,000 in 2000.

Goat farming in the *Mandwa* watershed has emerged as a key support system to input intensive cash cropping whereas, in *Mhaswandi*, it is cross-bred cows. Livestock rearing, in most cases, has moved from being the primary source of income to a secondary, yet key source of income.

Need for a special programme for BYP: The interest in rearing BYP is still found among tribal HHs but not with other communities, post watershed development. The increase in agricultural production[23] was the main reason stated by communities for reducing the rearing of birds. The absence of sustained programmes on promoting BYP is proving counter-productive to the nutritional and financial security of poor HHs. There is a lack of understanding on the value of BYP and the benefits it provides to poor HHs, being a zero-to-low input production system, with a significant contribution to income and food security. The focus of the local animal husbandry department is on promoting small-scale commercial poultry or the distribution of improved and exotic birds.

During discussions, many women and HHs with small landholdings and whose homes are located at a distance from agricultural fields expressed a keen interest to keep more birds. There are, however, no programmes/schemes that support basic requirements such as the provision of night shelters and preventive health care. The theft of poultry is also a major problem. Hence, there is a strong need to lobby for a separate programme for BYP because the demand for BYP (for both meat and eggs) has increased and traditional marketing systems are already in place. The price of meat, eggs and live birds (Rs 450 per kg; Rs 4 to Rs 8 per egg, and Rs 250 to Rs 500, respectively) is much higher than meat and

[23] Scavenging poultry are viewed as pests as they tend to eat seeds and seedlings in the fields.

eggs from commercial and improved poultry (Rs 120 per kg; Rs 1.50 to Rs 3 per egg, and there is no demand for live birds).

Small ruminant rearing: With regard to goats, it is difficult to conclude that there is a reduction in the number of animals per HH, even though data collection at three points of time shows a decreasing trend except in the case of the *Mandwa* watershed. This is because during the study period, high fluctuations were observed in goat populations at the HH level, as per needs/risks that the HH faced as also market demand (increasing during Bakr Id and tribal festivals in March each year). Continuous data collection over a period of time is required to draw proper conclusions in this regard.

In the case of sheep, the herd size has reduced, primarily on account of the shift from joint to nuclear families, and the adoption of settled agriculture and apparently not on account of a reduction of CPRs or the ban on grazing enforced by the watershed programme in high recharge zones. Despite inflation, the price of sheep meat has increased; returns, therefore, are high in spite of a reduction in the flock size. (See Case Study 1 and Table 1 in Annexure 2 for the economics of sheep rearing pre- and post-watershed for more details.)

8. **Increase in milk production is not contributing to HH nutrition:** It was clearly evident that the intake of animal products by HHs has decreased even though milk production has increased. This is because the milk of cross-bred cows is not preferred and is produced primarily for sale. However, goat milk is used if indigenous cows are not kept. Second, due to high demand for liquid milk, the sale of milk based products such as curd and ghee has stopped completely. The availability of readymade products in small towns has further reduced the market for homemade milk products.

To summarize, watershed development has immense scope to secure livestock-based livelihoods as well as the natural resource base. This is possible, provided key elements such as securing availability and access to CPRs; investments in CPR regeneration with ridge (largely comprising forest lands)-to-valley approach; integration of grazing-based livestock systems and water budgeting in watershed planning; protection of 'high potential recharge zones'; and utilizing traditional livestock systems to manage watersheds post-project are in place.

Abbreviations

BMZ	German Ministry for Economic Co-operation
BYP	Backyard Poultry
CBP	Capacity Building Phase
CPRs	Common Property Resources
CRIDA	Central Research Institute for Dry-land Agriculture
CRTDP	Comprehensive Rural and Trial Development Project
FIP	Full Implementation Phase
FPC	Forest Protection Committee
FPR	Flood Prone Rivers
FSR	Feasibility Study Report
GP	Gram Panchayat
GR	Government Resolution
GT	Grassland and Trees
GTZ	German Agency for Technical Co-operation
HHs	Households
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IGWDP	Indo German Watershed Development Programme
KfW	Kreditanstalt fŸr Wiederaufbau
MoRD	Ministry of Rural Development
NABARD	National Bank for Agriculture and Rural Development
NGO	Non Government Organisation
NRM	Natural Resources Management
NWDPRA	National Watershed Development Programme for Rain-fed Areas
PNP	Participatory Net Planning
POP	Participatory Operational Pedagogy
RVP	River Valley Projects
SA PPLPP	South Asia Pro Poor Livestock Policy Programme
SHG	Self Help Group
VDC	Village Development Committee
VWC	Village Watershed Committee
WDP	Watershed Development Programme
WOTR	Watershed Organisation Trust

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Annexure 1a

Government of Maharashtra Resolution Regarding Political and Administrative Approval for IGWDP

GR of 27 August 1992: IGWDP through NGOs in Maharashtra.

This was a key GR issued by the Department of Water Conservation, with the concurrence of two other Departments, that is, Agriculture and Forests, which laid the basis for the programme in Maharashtra. Without this order, it would not have been possible to work on such a large scale in the area of watershed development in Maharashtra. This order, therefore, constitutes an approval by the state government of IGWDP.

GOVERNMENT OF MAHARASHTRA
Rural Development & Water Conservation Department
Resolution No. IGP-1091/ 43015/CR-36/JAL-7
Mantralaya, Bombay 400 032

Date: 27th August 1992

R E A D : i) Letter No. NB.OPD.FS/2949/RF(KFW)/1991-92, dated the 19th December, 1991 from Deputy Manager, NABARD, Bombay.

ii) Government Endorsement, Agriculture, Animal Husbandry, Dairy Development No.IGP-1091/1556/CR-35/6-A, dated the 15th January 1992

iii) Letter No. NB.DPD.FS/1403/RFKFW/92-93, dated the 31st July 1992 from Deputy Manager, NABARD, Bombay.

PREAMBLE: Having regard to the NGO activity in the field of Watershed Development in Maharashtra, negotiations on bilateral assistance between the Government of Germany and the Government of India were under process in the past. Now, the German Government has agreed to provide through the Kreditanstalt Fuer Weideraufbau (KfW) financial assistance of DM 12 million, i.e., Rs 174.09 M (E.R. DM-1 = Rs. 14.5) for the development of watershed projects by the NGOs in Maharashtra. National Bank for Agriculture and Rural Development (NABARD), in consultation with Government of India, agreed to help in the preparation of the project proposals and implementation of the projects. German assistance may be in the form of grant for the programme. The fund will flow from the KfW directly to the National Bank, i.e., NABARD, as per arrangements laid down by the Ministry of Finance, Government of India. NABARD shall institute similar measures for financing individual projects. On the basis of projects sanctioned, the phasing indicated in the project document and satisfactory work completion the National Bank will release the funds for direct project implementation (labour and material cost) through the local bank to a joint account of the Village Watershed Committee and the NGO concerned. Further, other than routing of funds, the National Bank shall seek to involve the local banker in financing the credit needs of the watershed community. Overhead cost of the NGO will be paid directly to the NGO.

This programme and the individual projects aim at integrated and comprehensive development of micro watershed. Inter-alia each individual project would comprise soil and water conservation treatments of non-arable land, arable lands and drainage lines within the micro watershed.

The treatments to be undertaken will be decided on the basis of due investigation of the resource potential of the area and preparation of a project feasibility study report in accordance with the terms of reference specified by the KfW and full participation of, and consultation with the watershed community. Inter-alia following treatments would be included e.g. Bunding and vegetative hedges, afforestation, development of grasslands with trees and shrubs, fuel wood plantations, alley cropping, check structures in upper reaches of drainage courses, bank protection for drainage lines and run-off management. Each individual

micro-watershed project is likely to be implemented in a passed manner over a period of five years. Considering that the first three-four years will be the induction phase where promotional work among NGOs and in villages will be undertaken and new NGOs and villages may join the programme, the programme will have a nine year phasing. The Project Sanctioning Committee and the National Bank will provide necessary policy decision and guidance to the NGOs subject to the Terms of Reference specified by the KFW. Project planning and implementation will be undertaken by the NGO with the involvement of the watershed community through its representative body viz. the Village Watershed Committee (VWC). The NGO and the VWC may draw upon the services of other technical support organisations when required. Monitoring and evaluation of this programme will be done by the National Bank.

RESOLUTION: National Bank for Agriculture and Rural Development has sought Government's approval for implementation of this programme and necessary support and guidance from the concerned department of the Government. Since the entire funding for the programme is being provided for under German assistance, no financial support is required from the Government. However, for successful implementation of this project Government's approval and support are essential. In view of this, Government is now pleased to accord approval for implementation of Indo-German Watershed Development Programme through NGOs in Maharashtra with active involvement of NABARD. An advisory and supportive role of different departments of the Government at different stages for implementation on of this programme will be as follows:

i) Project Preparation: Concerned local officers of the Water Conservation, Revenue, Agriculture, Forests and Rural Development, GSDA should provide necessary data and guidance for project preparation.

ii) Project Sanctioning: Secretaries of the Department of Agriculture, Water Conservation and Forests are nominated as members on Project Sanctioning Committee set up by the National Bank.

iii) Project Implementation: Concerned local officers of the above referred departments should provide necessary guidance to concerned NGO, etc. in overall project implementation and in relation to specific technical problems, if any. However, the concerned NGO or the Village Watershed Committee should make specific request in writing the concerned Government officers in this regard.

iv) Training: A few seats in the Soil Conservation Training Institute may be allotted for NGO personnel and the watershed community representatives likely to participate in the programme.

v) As regards deputation of skilled technical personnel for the execution of the programme Government may consider to depute skilled technical personnel, where such manpower supports is essentially required for any specific project, provided concerned NGO and the VWC should submit a formal request to the Government and the request to recommended by the Project Sanctioning Committee.

vi) As regards treatment of forest lands in the micro-watershed under Indo-German Project, Government is pleased to direct that treatments of forest land should be undertaken within the framework of the National Forest Policy and the State's Policy under the overall guidance and superintendence of the Forest Department. Planning of such treatments should be in consultation with the Forest Department. The material and labour component should be provided for by the VWC and the concerned NGO out of the project funds and no financial grants are provided for by the Forest Department. For undertaking the treatments of forest land, Forest Department would coordinate its activities with the implementation phasing of the projects.

Further, in recognition of the involvement of the watershed community in the programme and the community’s commitment to maintain and look after the treatments including forest plantation, through measures such as social fencing and voluntary ban on tree falling, Government and Forest Department will consider granting usufructory rights on forest produce from the project area to the watershed community in accordance with the State Government’s current policy.

Government is also pleased to permit to undertake necessary treatments of all non-private lands by the VWC & NGO under Indo-German Watershed project.

Necessary Quarterly/Six monthly progress reports in prescribed proforma should be sent by the National Bank to the Government of India with a copy to Government.

This Government Resolution is issued with the concurrence of Planning, Revenue and Forest, Agriculture and Rural Development Department.

By order and in the name of the
Governor of Maharashtra,
sd/-
(Ashok Basak)
Secretary to Government of Maharashtra
Rural Development and Water Conservation
Department

To,
The General Manager, National Bank for Agriculture and Rural Development, Sterling Centre, Shivsagar Estate, Dr. Annie Besant Road, Worli, Bombay–18. (By letter)
The Co-ordinator, Indo-German Watershed Development Programme, c/o Social Centre, Market Yard Road, Ahmednagar–414 001. (By letter)
The Secretary to the Government of India, Ministry of Finance, Department of Agriculture and cooperation, Krishi Bhavan, New Delhi. (By letter)
The Deputy Secretary to Government of India, Ministry of Finance, Department of Economic Affairs, New Delhi. (By letter)
The Assistant Commissioners (SC), Government of India, Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi. (By letter)
The Chief Secretary to the Government of Maharashtra
All Divisional Commissioners
All Collectors
The Director, Soil Conservation and Watershed Management, Maharashtra State, Pune
The Director of Agriculture, Maharashtra State, Pune
The Director of Horticulture, Maharashtra State, Pune
The Director, Social Forestry, Maharashtra State, Pune
The Director, G.S.D.A., Pune
The Principal Chief Conservator of Forests, Maharashtra State, Nagpur
All Superintending Agricultural Officers
All Principal Agricultural Officers
All Chief Executive Officers, Zilla Parishads
All Divisional Soil Conservation Officers
All District Deputy Directors of Social Forestry
All Divisional Forest Officers
All District Conservators of Forests
The Secretary, Planning Department, Mantralaya Bombay–32
The Secretary, Revenue and Forests Department, Mantralaya, Bombay–32
The Secretary, Rural Development Department, Mantralaya, Bombay–32
The Secretary, Forest Department, Mantralaya, Bombay–32
The Secretary, Agriculture Department, Mantralaya, Bombay–32
Under Secretary, (Jal-11) Water Conservation Department, Mantralaya, Bombay–32
All Vice Chancellors of Agriculture Universities. Select file. (JAL-7)

Annexure 1b

Government of Maharashtra Resolution on Extension of All Facilities and Benefits to the Capacity Building Phase under IGWDP

Government of Maharashtra
Rural Development and Water Conservation Department
Government Resolution No. IGP-1097/CR-111/Jal-8
Mantralaya, Mumbai 400 032

Dated: 6th December 1997

Read: 1. Government Resolution, Rural Development and Water Conservation Department No. IGP-1091/43015/CR-36/Jal-7 dated 27th August, 1992.
2. Government Resolution, Rural Development and Water Conservation Department No. IGP-1091/43015/CR-36/Jal-7 dated 10th July 1996.
3. Revenue and Forest Department's letter No. FDM 1092/CR75/R-8 dated 11th July, 1994
4. Revenue and Forest Department's letter No. FDM 1092/CR 75/R-8 dated 22nd January, 1996.
5. The Managing Trustee (WOTR)'s letter No. WOTR/GOM/cil/97/906 dated 24th July, 1997.

Preamble: Indo-German Watershed Development Project is being implemented in the state of Maharashtra. This project has been supported by Government of Maharashtra vide Government resolution dated 27th August, 1992 referred to above by this Department and also supported by the Revenue and Forest Department vide letters indicated above. The Indo-German Watershed Development Project is being implemented in Maharashtra to develop and sustain the economy of village community, using watershed approach with emphasis on self-help, environment protection, and poverty alleviation. The Government of Maharashtra has extended full cooperation for the implementation of this programme. The Coordinator, Watershed Organisation Trust (WOTR) Ahmednagar has requested Government of Maharashtra vide his letter dated 24th July 1997 to extend the facilities and benefits already given under Government Resolutions referred to above to the Capacity Building Phase of the Indo-German Watershed Development Programme (IGWDP) being implemented by Watershed Organisation Trust (WOTR).

Resolution: In view of the position explained in preamble, Government is pleased to accord approval to extend the facilities and benefits given under Government Resolutions referred to above to the Capacity Building Phase for efficient implementation of the Indo-German Watershed Development Programme in consultation with the Government in Water Conservation Department.

By order in the name of the Governor of Maharashtra

(B.S. Desai)
Deputy Secretary to the Government of Maharashtra
Rural Development and Water Conservation Department

Annexure 1c

Government of Maharashtra Resolution Regarding the Implementation of JFM in IGWDP

GOVERNMENT OF MAHARASHTRA
Rural Development and Water Conservation Department
G.R.NO.IJP - 1091/43015/CR-36/Jal-7
Mantralaya, Mumbai - 400 032
Dated the 10th July 1996

Read: Government Resolution No.IGP-1091/43015/CR-36/Jal-7, dated the 27th August, 1992.

RESOLUTION

1. Implementation of Indo-German Watershed Development Programme through NGOs in Maharashtra was approved by the Government vide G.R. dated the 27th August 1992 referred to above and accordingly, the treatment of forests land in the Micro-watershed is envisaged to be undertaken within the framework of National Forest Policy and the Policy of the State Government under the overall guidance and superintendance of Forest Department. Funds are being released by the NABARD directly through the local Bank to a joint account of village Watershed Committee and the NGO concerned.

2. Presently, NGOs, could be involved in joint forest management only as catalysts and they could not be allowed to actually implement Watershed Development Programme in forest areas. Government is, therefore, pleased to sanction implementation of Indo-German Watershed Development Programme forest areas through the Forest Protection Committee within the ambit of Revenue and Forest Department G.R. No. SLF-1091/P/K/119191/P/11, dated 16 March 1992.

3. The programme will be implemented in forest areas by Forest Protection Committee as per the watershed projects approved by project sanctioning committee. The requisite funds for this purpose will be provided from the joint account of NGO/VWC to the account of Forest Protection Committee. For this purpose, an account shall be opened in a nationalised Bank to be operated jointly by the Chairman and Member Secretary (Forest) of Forest Protection Committee. The Forest Protection Committee shall provide details of accounts physical and financial progress reports, etc., to VWC/NGO as per requirement of the latter. In exceptional cases, where Forest Protection Committees could not be formed due to non-availability of adequate and suitable forest areas or any other reason, the Forest Department may implement the approved programme directly. Funds for this purpose shall be provided by VWC/NGO to the Deputy Conservator of Forests who shall open a savings accounts in a nationalised bank for this purpose and maintain a separate accounts.

4. This G.R. issues with the concurrence of Revenue & Forest Department.

By order and in the name of Governor of Maharashtra,

sd/-
(B.S. Desai)
Deputy Secretary of Govt. of Maharashtra

To,
The General Manager, National Bank for Agriculture and Rural Development, Sterling Centre, Shivsagar Estate, Dr. Annie Besant Road, Worli, Bombay–18 (By letter)
The Co-ordinator, Indo-German Watershed Development Programme, C/o, Social Centre, Market Yard Road, Ahmednagar–414 001. (By Letter)
The Secretary to the Government of India, Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi. (By letter)
The Deputy Secretary to Government of India, Ministry of Finance, Department of Economic Affairs, New Delhi. (By letter)

The Assistant Commissioners (SC), Government of India, Ministry of Agriculture, Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi. (By letter)
The Chief Secretary to the Government of Maharashtra.
All Divisional Commissioners
All Collectors
The Director, Soil Conservation and Watershed Management, Maharashtra State, Pune
The Director of Agriculture, Maharashtra State, Pune
The Director of Horticulture, Maharashtra State, Pune
The Director, Social Forestry, Maharashtra State, Pune
The Director, G.S.D.A., Pune
The Principal Chief Conservator of Forest, Maharashtra State, Nagpur
All Superintending Agricultural Officers
All Principal Agricultural Officers
All Chief Executive Officers, Zilla Parishads
All Divisional Soil Conservation Officers
All District Deputy Directors of Social Forestry
All Divisional Forest Officers
All District Conservators of Forests
The Secretary, Planning Department, Mantralaya, Bombay–32
The Secretary, Revenue and Forests Department, Mantralaya, Bombay–32
The Secretary, Rural Development Department, Mantralaya, Bombay–400 032
The Secretary, Forest Department, Mantralaya, Bombay–32
The Secretary, Agriculture Department, Mantralaya, Bombay–32
Under-Secretary, Water Conservation Department, Mantralaya, Bombay–400 032 (JAL-11)
All Vice Chancellor of Agricultural Universities
Select file. (JAL-7)

Annexure 1d

Government of Maharashtra Resolution Regarding JFM in Capacity Building Phase

No. FDM.1092/1841/CR-75/F-2,
Revenue and Forests Department,
Mantralaya, Mumbai - 400 032

Dated: 2nd February 1998

To,

Mr. Crispino Lobo
Programme Coordinator
Indo-German Watershed Dev. Programme
Opp. Social Centre
Market Yard Road
AHMEDNAGAR–414001

Dear Sir,

I am directed to invite your attention to your letter No. IGWDP/GOM/tnk/98-107 dated 20th January 1998 regarding extension of facilities concerning treatment of forest lands to the Capacity Building Phase of the programme and to clarify that the provisions of Govt. letter No. FDM.1092/CR-75/F-2 dated 11th July 1994 are applicable for both Capacity Building Phase as well as Full Implementation Phase of the projects under Indo-German Watershed Development Programme.

Yours sincerely,
sd/-
(SURESH GAIROLA)
Joint Secretary to Government,
Revenue & Forests Department

Copy to:- Principal Chief Conservator of Forests,
Maharashtra State, NGP, for information.

Annexure 2

This annexure details the economics of livestock rearing, based on information provided by farmers and livestock rearers during the field surveys and FGD. As livestock production systems are diverse, there could be a variation in the economics of the same system in different watersheds.

Table 1: Case Study 1—*Darewadi* Watershed: Economics of Shepherd Communities
Note: The calculations below are based on the logic that the sheep rearer maintains a constant flock size. This follows discussions with sheep rearers, who mentioned that maintaining a constant flock size was now the norm. The economics in the table below could vary considerably if the sheep rearer increases or decreases flock size.

Pre-watershed		Post-watershed	
Size of Flock (*as per field surveys the flock size ranged from 100 to 200 per HH*)	154	Size of Flock (*as per field surveys the flock size ranges from 50 to 80 per HH*)	77
Number of rams	4	Number of rams	2
Number of ewes	150 (*at 1.5 lambs per year*)	Number of ewes	75 (*at 1.5 lambs per year*)
Number of lambs produced in the flock	180	Number of lambs produced in the flock	90
Mortality rate of lambs (*range 15-20%*)	18%	Mortality rate of lambs (*cross-bred: 25%; mixed flock: 20%; indigenous flock: 10%*)	10%
Mortality rate of adult sheep	5%	Mortality rate of adult sheep	5%
Morbidity rate	10%	Morbidity rate	10%
Average selling price per lamb (range Rs 1000–1500)	Rs 1,250	Average selling price per lamb (range Rs 2,500–3,500)	Rs 3,000
Average selling price per spent animal	Rs 2,500	Average selling price per spent animal	Rs 4,500
Average selling price of a sick animal (range Rs 200–700)	Rs 450	Average selling price of a sick animal (range Rs 750–2,000)	Rs 1,375
Number of saleable animals sold per annum	171[24]	Number of saleable animals sold per annum [25]	66
Number of animals for wool shearing	148[26]	Number of animals for wool shearing	52
Wool quantity per animal (kg)[27]	0.5	Wool quantity per animal (kg)	0.5
Selling Price (Wool)	Rs 18	Selling Price (Wool)	Rs 15
Number of days when sheep flock is in agricultural fields	80	Number of days when sheep flock is in agricultural fields	60
Amount per day for sheep being in agricultural fields	Rs 100	Amount per day for sheep being in agricultural fields	Rs 200

[24] Saleable animals comprise spent/adult animals, sick animals, male lambs, and at times even young female lambs; therefore, the weighted average is taken into consideration. Young animals generally replace spent and sick animals in the flock. The composition of the flock cannot be fixed and changes as per real time decisions taken by the sheep rearer.
[25] 10% lamb mortality and 5% adult mortality is compensated by the twinning percentage in sheep which is approximately 4–6%.
[26] Lambing takes place throughout the year; therefore, the number of animals taken into consideration is based on the exact number sheared in the flock at the time of the survey.
[27] Shearing is done twice every year for adult animals.

Income and Expenditure Table			
Income	**In Rupees**	**Income**	**In Rupees**
Meat (Healthy animal)	304,750	Meat (Healthy animal)	214,500
Meat (Sick animal)	5,400	Meat (Sick animal)	8,250
Wool	1,332	Wool	390
Penning charges	8,000	Penning charges	12,000
Total Revenue	319,482	Total Revenue	235,140
Expenditure:	***In Rupees***	***Expenditure:***	***In Rupees***
Labour	15,000	Labour	0[28]
Medicine	10,000	Medicine	7,000
Fodder (top feed, leasing land for grazing, etc.)	18,000	Fodder (top feed, leasing land for grazing, etc.)	9,000
Wool shearing	2,000	Wool shearing	1,000
Transport	6,000	Transport	3,000
Total expenditure	51,000	Total expenditure	20,000
Net profit	**268,482**	**Net profit**	**215,140**
Profit margin	84%	Profit margin	91%
Miscellaneous expenditure[29]	18,000	Miscellaneous expenditure	10,000
Net profit after deducting Miscellaneous expenditure	250,482	Net profit after deducting miscellaneous expenditure	205,140
Profit margin	78%	Profit margin	87%
Net profit per HH under the *rakholi* system	Rs 16,000	Net profit under owned sheep rearing	Rs 205,140
Net profit per sheep	Rs 104	Net profit per sheep	Rs 2,664
	Net profit per sheep (6% inflation adjusted, 13 yrs)		Rs 1,249

Change in Agricultural Economics of Shepherd Communities: 2–4 ha Landholding Category

Pre-watershed period		**Post-watershed period**	
Land Area (hectares)	2.8	Land Area (hectares)	2.8
Single crop—Rain-fed	1 ha	Single crop	1.6 ha
Dual crop	Nil	Dual crop	1.2 ha
Total income	Rs 2,500	Total income	Rs 35,000
Cost of production	Rs 200	Cost of production	Rs 2,500
Net income	Rs 2,300	Net income	Rs 32,500
Profit per hectare	Rs 821	Profit per hectare	Rs 11,607
	Net profit per hectare (6% inflation adjusted, 13 yrs)		Rs 5,442

[28] With the reduction in herd size post-watershed, family members suffice to take the herd for grazing.

[29] Miscellaneous expenditure refers to occasional penalties, fines and bribes, which need to be paid in case the flock enters private agriculture or forest land while grazing. As the flock size goes down, the probability and, thereby, the amount of risk expenditure also goes down.

Table 2A: Case Study 3—*Mhaswandi* Watershed: Dairy Farming Economics 0–1 ha Landholding Category

	Pre-Watershed	**Post-Watershed**
Source of income	Sale of male calves for draft purposes	Milk sale
Number of cows	5 to 7	1
Cow breed	Indigenous	Cross-bred (HF 75%)
Number of goats	Not applicable	1
Cow milk output, in litres per day[30]	12[31]	15.5
Total milk output in a year, in litres	2,976	3,844
Selling price of milk, per litre	Rs 7	Rs 13
Milk sale	Rs 0	Rs 49,972
Yearly bonus	Rs 0	Rs 3,844
Selling price per bullock	Rs 1,000	Not applicable[32]
Selling price of cross-bred male calf	Not applicable	Rs 1,000[33]
Bullock sale (pre-watershed)/ sale of cross-bred male calf (post-watershed, at the time of the survey)	Rs 5,000	Rs 0
Yearly sales	**Rs 5,000**	**Rs 53,816**
Cost:		
Top feed	Rs 0	Rs 32,850
Medical/Health	Rs 200	Rs 2,400
Total cost	**Rs 200**	**Rs 35,250**
Net profit	**Rs 4,800**	**Rs 18,566**
Income through fodder sale from CPR	Rs 0	Rs 10,000
Cost of buying CPR plots	Rs 0	Rs 1,000
Net profit through fodder sale from CPR	**Rs 0**	**Rs 9,000**
Total net income Livestock and CPR	**Rs 4,800**	**Rs 27,566**
Net income per cow	***Rs 800***	***Rs 27,566***
6% inflation adjusted for 15 years		**Rs 11,502**

[30] Milk yields of indigenous cows and cross-bred cows showed wide variation. The calculations in this table are based on the milk output of the animal kept by the farmer at the time of survey rather than taking an average figure.

[31] Milk was used only for home consumption.

[32] The rearing of indigenous cows has been discontinued post-watershed and, therefore, there is no sale of bullocks.

[33] Cross-bred male calves are sold at Rs 1,000 each. However, at the time of the survey, no male calf was born and, therefore, no value has been imputed.

Table 2b: Case Study 3–Mhaswandi Watershed: Dairy Farming Economics 1-2 Ha Landholding Category

	Pre-watershed	**Post-watershed**
Source of Income	Goat and cow sale	Milk sale, Agriculture, Manure sale, Goat sale
No. of cows	10 to 20	5
Cow breed	Indigenous	HF (75%)
Milk produced by all cows, per day (litres)	30	57
Milk produced (number of months in a year)	8	8
Annual milk production (litres)	7,440	14,136
Milk sale, in litres (after own consumption)	Nil	13,888
Selling price of milk per litre	Rs 7	Rs 13
Livestock economics		
Income		
Goat sale	Rs 1,500	Rs 0
Milk sale (cow milk)	Rs 0	Rs 180,544
Manure sale	Rs 0	Rs 13,600
Bullock sale, for draft purpose	Rs 3,500	Rs 0
Yearly bonus (from milk cooperative)	Rs 0	Rs 13,888
Total income	**Rs 5,000**	**Rs 208,032**
Cost		
Fodder/Top feed	Rs. 0	Rs. 73,913
Medicine	Rs. 100	Rs. 2,000
Miscellaneous expenditure[34]	Rs. 0	Rs. 15,800
Total cost	**Rs 100**	**Rs 91,713**
Net income	***Rs 4,900***	***Rs 116,320***
Income through fodder sale from CPR	Rs 0	Rs 0
Cost of buying CPR plots	Rs 0	Rs 800
Net income through fodder sale from CPR	Rs 0	– Rs 800
Total net income through livestock and fodder sale	***Rs 4,900***	***Rs 115,520***
Net income per cow	***Rs 327***	***Rs 23,104***
6% inflation adjusted for 15 years		***Rs 9,640***

[34] Cost of additional drinking water by tankers during summers for cross-breds, transportation costs incurred on hospital visits for treatment, veterinary fee, etc. This is, however, not a constant amount and would change per season and requirements.

Table 3a: Case Study 4: *Wanjulshet* Watershed: Mix Farm Economics 1–2 Ha Landholding Category

Sales	**Pre-watershed**	**Post-watershed**
Paddy	Rs 5,000	Rs 96,000
Groundnut	Rs 1,600	Rs 2,400
Wheat	0	Rs 24,000
Brinjal	0	Rs 1,000
Tomato	0	Rs 7,000
Harbara (Gram)	0	Rs 1,000
Onion	0	Rs 20,000
Total Sales	***Rs 6,600***	***Rs 151,400***
Cost		
Fertilizer	Rs 400	Rs 7,200
Labour	Rs 150	Rs 4,000
Seed	Rs 300	Rs 5,000
Pesticide	Rs 50	Rs 2,000
Transport	0	Rs 700
Electricity	0	Rs 2,000
Thresher machine	0	Rs 1,500
Total cost	***Rs 900***	***Rs 22,400***
Net income	**Rs 5,700**	**Rs 129,000**
Profit per hectare	**Rs 1,425**	**Rs 32,250**
Profit per hectare (6% inflation adjusted, 9 years)		***Rs 19,089***

Input Cost Saved Due to Internal Integration

Livestock to Agriculture		**Agriculture to Livestock**	
Bullock Cart Cost Saved		Fodder Production, kg	
Market rate per day	Rs 200	Rice	4,500
No. of days used	100	Green fodder	3,000
Total bullock cart cost	**Rs 20,000**	Groundnut	150
Manure Cost Saved		**Total Fodder**	**4,650**
Manure production (number of tractors)	5	**Current market price, Rs per kg**	
Market rate per tractor	Rs 1,200	Agriculture fodder	Rs 2
Value of manure	**Rs 6,000**	Fodder crop	Rs 5
Input Cost Saved		Input Cost Saved	
Bullock cart cost saved	Rs 20,000	Fodder from crop residue	Rs 9,300
Manure cost saved	Rs 6,000	Fodder crop cultivation	Rs 15,000
Agriculture input cost saved	**Rs 26,000**	**Livestock input cost saved**	**Rs 24,300**

Table 3b: Case Study 4: *Wanjulshet* Watershed: Mix Farm Economics 0–1 ha Landholding Category

Note: Pre-watershed, the HHs primarily depended on wage labour and there was no income from farming. HH income was based on the number of days of work per member, and has, therefore, not been tabulated. Livestock and agriculture economics post-watershed developments are detailed below.

Livestock Financials—Post-watershed					
Goat		**Cow**		**Hen**	
No. of animals	15–20	No. of animals	2	No. of animals	7
No. of animals sold per annum	5	No. of animals sold per annum	0	No. of animals sold per annum	2
Selling price per adult animal	Rs 2,000	Possible selling price that can be obtained per calf	Rs 2,000	Selling price per animal	Rs 200
				Eggs sold p.a.	520
				Selling price per egg	Rs 3
Sales	**Rs 10,000**	**Sales**	**Rs 0**	**Sales**	**Rs 1,960**
Cost		**Cost**		**Cost**	
Medicine	Rs 1,000	Medicine	Rs. 1,000	Medicine	Rs 0
Net Income	**Rs 9,000**	**Net income**	**– Rs 1,000**	**Net income**	Rs 1,960

Agriculture Financials—Post-watershed (subsistence farming)				
Land area (in acre)	2	Sales	0	* Since the family size is large, all the agriculture produce gets consumed at home.
Cultivable	1			
Waste	1	Cost		
		Seed	Rs 1,300	
Crop production	Quintals	Labour	Rs 1,000	
Rice	7	Fertilizer	Rs 1,000	
Wheat	4	Total cost	Rs 3,300	
Crop sold	Nil	Net income	– Rs 3,300	
Total agriculture and livestock income			**Rs 6,660**	
Labour income			**Rs 8,000**	
Total income			***Rs 14,660***	

Annexure 3

1. Watershed Treatment in *Darewadi*

Treatment Undertaken	**Area Covered (Ha/No.)**
Cultivable land treated	1,040.77 ha
Grassland with trees	117.92 ha
Reforestation and aftercare	86.8 ha
Horti-pasture	3 ha
Afforestation	191.53 ha
Loose boulder structures	4 numbers
Masonry weir	4 numbers
Check weir	1 number
Check dam	1 number
Repair of nala bunds	12 numbers
Total Expenditure	**Amount (Rs)**
Labour	5,344,942
Material	1,861,656
Supervision	359,167
Shramdan (*Voluntary labour contribution by the community*) (*17.34% of labour cost*)	1,121,558
Total Expenditure (Including Shramdan)	***8,687,323***

Contribution by the government for afforestation: Rs 621,513
Total CPR area treated: 396.25 ha; Total cultivable land treated: 1040.77 ha

2. Watershed Treatment in *Mandwa*

Land Use	**Treatment Undertaken**	**Area Covered (Ha./No.)**	**Total Expenditure (Rs.)**
A) *Area Treatments*			
Afforestation and Reforestation in forest lands	Continuous contour trench (CCT), Farm bund (FB), Contour bund (CB), Continuous staggered bunds (CSB), Gully plugs, plants, grass seeding, Water absorption trench (WAT)	400.97 ha	2,128,445
Grassland with trees (GT) in revenue lands	Refilling and plantation, weeding, mulching	116.92 ha	195,274
Soil conservation and Horti-pasture (private lands)	CCT and Plantation	16.44 ha	66,289
Bunding of cultivable lands	Farm bunds, rill plugs, grass seeding, stone bund	375.74 ha	730,614
Supervision			221,191
		Expenditure (a)	***3,341,813***
B) Drainage Line Treatment			
No. of loose boulder structures		23	44,295
No. of cement plugs		2	188,851
No. of check dams		3	1,053,669
No. of Gabion structures		38	365,504
		Expenditure (b)	***1,652,319***
		Total expenditure (a + b)	***4,994,132***

Total CPR area treated: 517.89 ha; Total cultivable land treated: 392.18 ha

3. Watershed Treatment in *Mhaswandi*

Treatment Undertaken	Area Covered (Ha/No.)	Total Expenditure (Rs)
A) *Area Treatment*		
Cultivable land treated	367 ha	1,440,134
Horti-pasture (private lands)	2 ha	7,813
GT	100 ha	276,121
Afforestation	171.45 ha	1,579,373
Reforestation	50 ha	432,472
Total (a)	**690.45 ha**	**3,735,913**
B) Drainage line treatment		
No. of nala bunds	7	268,979
No. of gabion structures	48	450,196
No. of check dams	2	656,710
Total (b)		**1,375,885**
	Total expenditure	***5,111,798***
Expenditure incurred on plantations in the village of *Mhaswandi*		
FD		Rs 278,108
IGWDP (Pvt. land)		Rs 314,212
Total		**Rs 592,320**

Contribution by various government departments

- Construction of 11 nala bunds and one check dam was undertaken by the Department of Agriculture.
- Afforestation and reforestation work (CCT, CST, WAT, NB) was done over 179 ha by the Forest Development Corporation of Maharashtra (FDCM)
- The Minor Irrigation Department assisted in the construction of a check dam and 3 percolation tanks.

Total CPR area treated: 321.45 ha; Total cultivable area treated: 369 ha

4. Watershed Treatment in Wanjulshet

Land Use	Treatment Undertaken	Area Covered (Ha/No.)	Total Expenditure (Rs)
A) *Area Treatment*			
Cultivable land treated	Farm bund/Contour bund	256.70 ha	752,414
GT	CCT/Water absorption trench Refilling and plantation, weeding, mulching	73.91 ha	884,153
Horti-pasture	CCT/Pits	67 ha	767,177
Forest (AF)	CCT / WAT / Plantation	52 ha	754,421
Aftercare of GT	Plantation, Weeding and mulching	52.70 ha	29,359
Supervision			127,392
		Total (a)	**3,314,916**
B) Drainage line treatment			
No. of loose boulder structures		69	170,707
No. of nala bunds repaired		1 number	112,194
		Total (b)	**2,82,901**
		Total Expenditure (a + b)	***3,597,817***

Total CPR area treated: 245.61 ha; Total cultivable land treated: 256.70 ha

Annexure 4

Policy impact of WOTR's Role in IGWDP

Watershed development is considered a strategic intervention for poverty reduction as over 70% of arable land in India is rain-fed and over 60% of rural India depends on these lands. In the late 1990s, after several years of implementation of the National Watershed Development Programme for Rainfed Areas (NWDPRA), under the Ministry of Agriculture, it was realized that without people's participation and involvement, such interventions would not result in lasting benefits to the target group. The entire programme has since been structurally and operationally recast to include the experience gained and insights achieved, including the development of common guidelines for watershed development. Some of the key approaches developed under IGWDP were incorporated in the common guidelines that were developed for watershed development programmes across the country.

1. The IGWDP was the first large-scale programme in the country, which made village self-help groups (VSHGs) responsible for *direct implementation* of watershed activities with NGOs as facilitators. It also established the precedent of *giving funds directly to these VSHGs* to plan, organize, implement and maintain watershed structures in their villages. This pattern has now been adopted by other mainstream development programmes in the country.

2. WOTR, through the Indo-German Watershed Development Programme (IGWDP), has been instrumental in influencing several of these structural and operational changes, as detailed below.

(i) WOTR designed and implemented a large-scale integrated Capacity Building Programme (known as the *Participatory Operational Pedagogy—POP*) as a prelude to and a necessary condition for large-scale project implementation. This practice of capacity building as a separate, prior and integral component of watershed development is now accepted and adopted by other programmes in the country as a pre-condition and an integral part of watershed programmes.

(ii) The capacity building approach designed by WOTR (as opposed to a training approach only) has been specifically mentioned in the 'Common Approach to Watershed Development Guidelines" (page 14) adopted by the Government of India. CAPART[35]-funded projects, as well as projects under DPAP (Drought Prone Area Program) have introduced a CBP. The National Watershed Development Program for Rainfed Areas (NWDPRA) has also adopted the practice of a separate and distinct CBP (called 'Community Mobilization') followed by an FIP in its programme.

(iii) The concept of capacity building and appointment of lead NGOs has been adopted by the Government of Maharashtra in its watershed programme under DPAP and is known as the 'Mother NGO' concept. As per this concept, selected NGOs are given lead responsibilities for participating NGOs within defined districts.

(iv) WOTR developed and operationalised a process called the Participatory Net Planning Method (PNPM), for involving the farmer couple in the development of their farms and lands. This is now common practice (with local variations) in all major watershed programs—DPAP in Maharashtra, Andhra Pradesh Rural Livelihoods Program—APRLP-DPAP—in Andhra Pradesh, and NABARD's National Watershed Development Fund, and is now increasingly seen as a tool not only for planning but also for community mobilisation. This has been a significant pedagogical and conceptual tool for participatory planning and building community ownership.

(v) Concepts and processes developed and adopted by WOTR and the IGWDP such as ridge-to-valley treatment, site-specific and community selected measures, people's ownership and civil society-public sector partnership have been incorporated in government-run watershed programmes across the country.

[35] Council for the Advancement of Peoples Action and Rural Technology (an institution under the Ministry of Rural Development, Government of India).

(vi) Permission to treat degraded forest land was also obtained by WOTR for the IGWDP. This was a singular achievement, as such lands come under the purview of the Forest Conservation Act.

(vii) A major structural initiative has been the setting up of the National Watershed Development Fund (NWDF) by the Government of India at NABARD. This idea was presented by the Executive Director of WOTR (Mr. Crispino Lobo) and the then Chairman of NABARD (Mr. Y.C. Nanda) to the Finance Minister (Mr. Yashwant Sinha) in February 1999 during the pre-budget consultations held in Delhi. The NWDF is intended to carry the experience of the IGWDP across 100 of the poorest rain-fed districts in the country. WOTR has supported NABARD in this role by conducting training and exposure visits for its officers, staff of government departments as well as participating NGOs from different states of the country.

(viii) Through its outreach interventions on training, extension support and capacity building, as well as implementation of successful projects (own and partner NGOs), WOTR has contributed in a singular way to building up the competencies, skills and knowledge of watershed practitioners (villagers, NGOs, government functionaries) across the country as well as internationally. A total of 175,157 partners (villagers and NGO personnel); 18,887 government officials, bankers, NGO decision-makers and personnel from 27 states of India and 452 persons from 33 countries have participated in and availed of WOTR's training and Exposure Dialogue Programmes as on December 2010.

(ix) Today, in several Indian states, especially where the IGWDP is now proposing to expand (Gujarat, Andhra Pradesh and Rajasthan), several NGOs that have participated in WOTR's training programmes have acquired a fair degree of competency to successfully implement large-scale watershed projects. Dozens of 'replicators' have been created, thus spreading the practice of watershed development across the country. In the Government of Maharashtra's Watershed Development Program, most IGWDP-related NGOs were invited to participate. A spin-off is that even in non-watershed programmes, the participation of these NGOs is now sought by the Government—a recognition of the capacity, competency and credibility they have acquired.

(x) In order to facilitate efficient management of information/data, and review the same as well as ensure timely and effective monitoring, WOTR has developed simple but comprehensive IT-based Management Information Systems (MIS), Decision Support Systems (DIS) and Diagnostic Expert Systems (DES) for both the IGWDP as well as its own work. Seeing its potential, the Government of Andhra Pradesh commissioned WOTR to develop a large-scale DIS to manage its watershed program (APRLP). The Swiss Development Cooperation (SDC) also asked WOTR to develop an MIS system for its partners in Karnataka.

(xi) WOTR's work on integrated watershed development is prominently mentioned and frequently referred to in the foreword of the prestigious National Report of the Government of India, "From *Hariyali* to *Neeranchal*—Report of the Technical Committee on Watershed Programmes in India", popularly referred to as the Parthasarthy Commission Report. (http://dolr.nic.in/ParthaCommittee/ParthaCommitteeReport.htm).

(xii) The World Resources Institute Report, 2005, "The wealth of the poor: Managing ecosystems to fight poverty" extensively featured the work of WOTR in Darewadi village (*More Water, More Wealth in Darewadi Village*, pp. 124–130) as a successful example of large-scale poverty reduction through community based environmental regeneration (www.wri.org).

(xiii) WOTR's work was also featured in the *National Geographic* magazine, November 2009, pp. 110–127 (http://ngm.nationalgeographic.com/2009/11/india-rain/corbett-text/5), and also in the "World Resources Report, 2008: Roots of Resilience" of the World Resources Institute, Washington (http://pdf.wri.org/world_resources_2008_roots_of_resilience_chapter2), p. 68.

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SOUTH ASIA Pro Poor Livestock Policy Programme

A joint initiative of NDDB and FAO

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