# Watershed Development, Water Management and the Millennium Development Goals

*Marcella D'Souza & Crispino Lobo,*

*Watershed Organization Trust (WOTR), Ahmednagar Maharashtra*

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*This paper argues that in rural semi-arid and resources fragile regions, watershed based environmental regeneration through community mobilization is a promising and proven approach to poverty reduction and to building up social capital and capacities. These latter are crucial to ensuring that people who escape poverty continue to stay out of it.*

*Based on over a decade of field experience and several completed (treated)watershed projects, the authors marshal evidence that indicate that if done right, with people in the driver's seat and an enabling administrative and policy environment, watershed development can contribute significantly in meeting at least four of the eight Millennium Development Goals.*

## Introduction:

The year 2015 was envisaged by the international community to be the year by which the proportion of people living in extreme poverty and hunger[1] and having no access to clean drinking water[2], would be halved; environmental resources protected and sustainable developmental approaches followed[3]; women empowered and enjoying

[1]Reference: Millennium Indicators Database: MDG Goal 1 states: "Eradicate extreme poverty and hunger". As part of this objective, Target 1 stipulates, "Halve, between 1990 and 2015, the proportion of people whose income is less than $1 a day"; Indicator 1: proportion of population below 1$ per day. Target 2 stipulates, "Halve, between 1990 and 2015, the proportion of people who suffer from hunger." Indicator 4: Prevalence of underweight children below 5 years of age.

[2] MDG-7: Target 10: "Halve by 2015 the proportion of people without sustainable access to safe drinking water."

[3] MDG Goal 7: "Ensure environment sustainability" and sets the following target- Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. Indicator 25: proportion of land covered by forests. Indicator 29: Proportion of population using solid fuels.

equality of opportunities[4] and "children everywhere, boys and girls alike, will be able to complete a full course of primary schooling"[5]. These are some of the hopes that were enshrined in the Declaration called the Millennium Development Goals (MDGs) that were adopted by the international community in September 2000.

With only a decade to go, and most of these goals unlikely to be reached, even modestly so in many countries, the UN has declared the intervening period as the "International Decade of Action". In relation to the water and environment-related MDGs, it has launched the "**Water for Life 2005-2015**" and "Year of Planet Earth: Earth Sciences for Society 2005-07" campaigns.

This paper argues that particularly in resource fragile and rainfall deficient rural areas, watershed development, when undertaken in an integrated manner and when implemented by the inhabitants and stakeholders themselves, is a proven strategy for poverty reduction, augmentation of water resources, livelihoods diversification, enhancing well-being levels, building social capital, and widening the decision-making and opportunity space for women[6] - the very objective of four of the eight MDGs.

## The Context

Maharashtra, which is the second largest state of western peninsular India, has over 80% of its arable land dependent on rainfall for agriculture, livestock, agro and natural resources based livelihoods. With a third of its area lying in the rain shadow zone (rainfall in this dry zone in western Maharashtra averages 450mm pa), rain is a precious commodity and the onset of the monsoons anxiously and eagerly awaited. In the worst hit Ahmednagar district, the average rainfall ranges from 150-450mm (there are on an average, 15 days of harvestable rain during the 3-4 month monsoon season) and drought is a recurrent phenomenon. Generally, in this area, in a 5 year cycle, there would be 3 years of drought and 2 years of "good" rainfall. During the last three years (2001 -2003),

[4] MDG Goal 3: "Promote gender equality and empower women" and sets the following target - Target 4 - Eliminate gender disparity in primary and secondary education, preferably by 2005 and in all levels of education no later than 2015.

[5] MDG Goal 2: "Achieve universal primary education" and sets the following indicator- Indicator 1- . Net enrollment ratio in primary education

[6] Provided, in this case, gender issues and women are specifically targeted at the very beginning of the process.

this drought prone region experienced prolonged and severe water stress while in the other parts of Maharashtra, the incidence ranged from moderate to severe. For at least 3-4 months in the year, drinking water had to be carried to approximately 10,000 villages (out of a total of 42,000) by road tankers. In the Ahmednagar district alone[7] from November 2002 to June 2004, over 1000 villages out of 1576 villages had to have drinking water trucked in daily.

Since 1993, the Watershed Organisation Trust (WOTR)[8] and its partner organisations have been mobilising people in the drought prone regions of the state to undertake regeneration of the environment in which they live, on a watershed basis.

The data, reports and studies cited in this paper are from projects implemented by WOTR and by other NGOs under the Indo-German Watershed Development Program (IGWDP), Maharashtra.

The Indo-German Watershed Development Program (IGWDP), Maharashtra:

This bilateral programme[9], which was launched by Fr. Hermann Bacher [10] in 1989, was operationalised in late 1992. The partners in the implementation of this project are, on the German side, the German Agency for Technical Cooperation (GTZ) and the German Bank for Reconstruction (KfW) who fund WOTR and NABARD[11] respectively, on the Indian side. WOTR and NABARD jointly manage the Program.

WOTR builds up the capacities of the implementing NGOs and the village implementers – the Village Watershed Committee (VWC)[12]- while NABARD funds the completion of such "capacitated" projects. As on today, this programme has an outlay, since its inception, of approx. US 44 M. It covers a total area of 165,439.42 ha. across 145 projects in 24 districts of the state and reaches approximately 190,000 inhabitants. Overall, as of today, a total of 70 projects have been completed.

[7] Ahmednagar lies at the heart of the drought prone region and has a rural population of 3.2 million people
[8] Information on WOTR can be obtained at: www.wotr.org .

[9] Official Development Assistance (ODA)
[10] Fr. H. Bacher is Chairman of WOTR.
[11] National Bank for Agriculture and Rural Development.
[12] WOTR is the Capacity Building Agency of the IGWDP-Maharashtra. Upto 2001, it also served as the institutional base of the Program Coordinator (of the IGWDP) who was also the Executive Director of WOTR.

Besides this, WOTR is also directly implementing projects funded by sources other than the IGWDP. 39 projects are being implemented by WOTR covering an area of 34,830.77 ha and reaching out to approx. 41,000 inhabitants. WOTR is also implementing 17 watershed projects in the Narayanpet Mandal of Mahabubnagar district, AP covering an area of 8,429 ha. and a population of 31,333.

## The Focus

In this paper we will not focus on the technical treatment (area and drainage line treatments) of watershed development that are fairly well known, but will address the issue from the perspective of the approach, activities and measures that contribute towards the MDGs. While there have been several impacts in the various watershed projects that have been completed, we shall focus largely on those having direct relevance to the MDGs. The four of relevance, to which WSD may contribute directly and indirectly, are Goals 1, 2, 3 and 7.

**The Approach, Activities and Measures Undertaken**:

Primary catchments were initially chosen and treatments implemented from a ridge to valley perspective, involving mechanical, vegetative and husbandry practices (agricultural and animal/ livestock) across the catchment lands and drainage systems were undertaken. They encompassed private, community and public (government owned forest lands). The approach taken was site-specific with a view to land husbandry (conservation, appropriate land use and sustainable production activities) as well as catching as much rainwater wherever it fell.

In these areas, scanty and variable rainfall as well as poor soils, having low organic content, make rainwater harvesting as well as erosion control, critical inputs, if food, livelihood and income security is to be obtained.

In addition, the villagers agree to the following disciplines – enforcing a ban on tree-felling (loppings permitted), on free-grazing (on treated areas only, at least till the vegetation gets established) and contribution through voluntary labour (at least 20% of total labour costs).

The results of watershed development are best observed when the hydrological cycle is respected. Hence the 'ridge-to-valley' approach is followed. This necessarily requires that the forest lands usually on the ridges, are also treated. Various Government Resolutions (GRs) have been passed to this effect and they are being followed. The lands of the marginal farmers are usually on the ridges and/or on the degraded upper reaches. Following the "ridge-to-valley" principle ensures that these degraded lands are treated first; thus the poorer marginal farmers are benefited earlier.

The ban on tree-felling forces the PIAs (Project Implementing Agencies), the VWCs and the men and women of the project villages to look for alternatives to the traditional fuel wood used for cooking. The ban on free-grazing and the availability of grass (fodder) now encourage the villagers to opt for improved cattle and stall feeding practices. This, in turn, gives them the option of setting up bio-gas plants.

In order to ensure that harvested water is optimally used and resources conserved, water intensive crops such as sugarcane are discouraged and appropriate cropping patterns and cultural practices are introduced. Furthermore, in order to diversify risk, supplement incomes as well as ensure that raised plantations survive, it is necessary to match the carrying capacity of the catchment to the livestock holdings. Measures like reducing and replacing low-yield animals with better stock (such as cross bred and /or improved varieties of cows, sheep and goats) and controlled grazing are also introduced. Water bodies, created by the various inventions, offer new income sources, such as fish rearing, particularly for the landless.

The key to undertaking all these measures is the people themselves living within the watershed. Unless they share a common perspective and will to better their lot through community-wide action, such a challenging and complex initiative cannot possibly be undertaken.

In order to facilitate the building up of social capital, the capacities of villagers as well as the accompanying facilitators (NGOs, PIAs), WOTR has developed, over the years, a step-by-step approach called the "Participatory Operational Pedagogy", popularly known as, the POP[13]. At the field level, in order to familiarise villagers with newer advances in

[13] This method has been used with great success in the Indo-German Watershed Development Program, Maharashtra and has been cited in the Common Approach for Watershed Development of the Ministry of Agriculture, Govt. of India (Pg. No. 14).

agricultural practices as well as include women's perspectives and needs into planning of intervention measures, WOTR has also formulated the "Participatory Net Planning Method", also know as PNP, wherein the farmer (or land owning) couple are involved in planning, in specific terms, what is to be done on their lands, how it is to be done and how much they are to contribute towards the measures. This greatly builds up stakes and a sense of ownership and contributes towards the evolving of a shared perspective and consensus. The creation of such an atmosphere is necessary if difficulties and conflicts are to be amicably resolved and compromises reached.

A systematic effort has been made to prepare women to involve themselves actively in the entire process as well as to use this opportunity to mainstream their concerns and issues. There is a mandatory 1/3 representation of women in the VWC. Women are encouraged to be involved in their SHGs and their Samyukt Mahila Samiti which prepares them for active involvement in the village. Besides saving and credit operations, a fund is available to be used at the discretion of the organized women for addressing their needs and concerns. Over the years, we have found that drinking water is one of the first needs expressed. After drinking water, fuel for cooking purposes is the next priority.

**Impacts (related to the MDG)**

We shall present in this paper the impacts of different watersheds.

***Goal 7*** talks of "environmental sustainability" and its focus is environmental regeneration and afforestation, influencing national policies towards sustainable development, increasing sustainable access to safe drinking water and reducing the proportion of people using solid fuels.

Target 9: "Proportion of land area covered by forest".

The impacts that environmental restoration and appropriate land use are cited of the following three villages – Chincholi[14], Talavli[15] and Darewadi[16]. Two of these villages, namely, Chincholi and Darewadi lie in the semi-arid region of the Ahmednagar District and the other, Talavli, while not from the semi-arid region (it lies in the Konkan belt) is nevertheless selected because it lies in a remote, degraded forest area and is peopled by very poor tribals. Moreover, it also illustrates the fact that even in areas having a "high rainfall", in monsoonic regimes[17], unless environmental regeneration and soil and water conservation measures are undertaken, people dependent on local resources will likely remain poor.

In Chincholi, over 400 hectares were planted with local varieties of trees and grasses with a survival rate of 60%. In the year 2000 which was a year of delayed and poor rainfall, fodder from these forests increased by 168% and from agricultural residues by 39%. In Talavli, over 240 hectares were afforested and grassed. The village became self-sufficient in fodder. In Darewadi, 395 ha of barren hills and wasteland were planted with trees and grasses with over 65% survival. Fodder availability has increased 170% (1054 to 2848 tones/year).

[14]Watershed work began in 1993 and was completed in 2000, the data presented below was collected in 2000, a year of poor rainfall, and compared with the baseline survey. The watershed comprises 1319 ha and had a population of over 1200 in 1993. Average rainfall is 285mm.

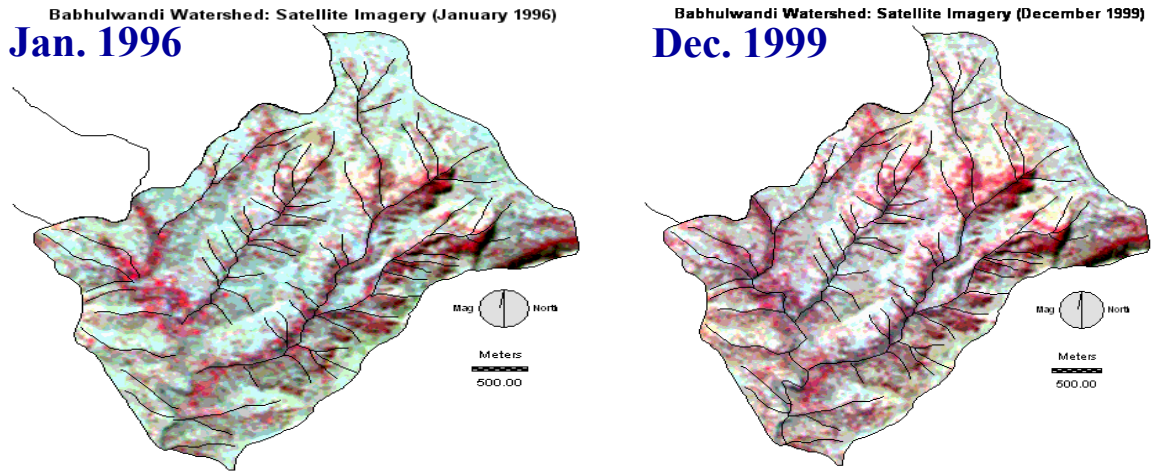
[15] Watershed work began in 1992 and was completed in 1997; the data presented below was collected in 2003, a year of poor rainfall, and compared with the baseline survey. The watershed comprises 740 ha and had a population of 1383 in 1992. Average rainfall is 2000mm.

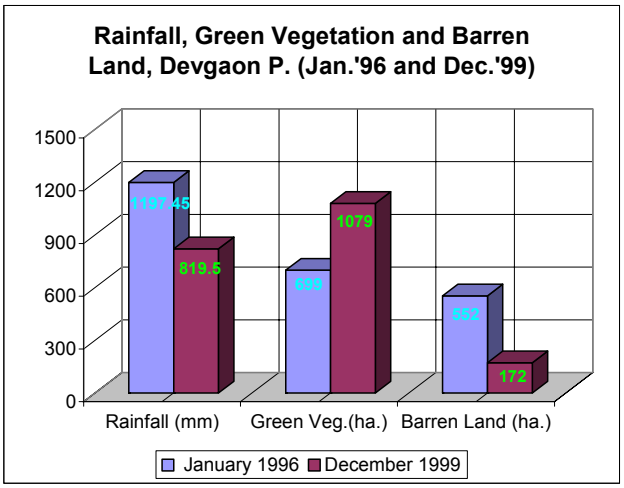
[16] Watershed work began towards end 1995 and was completed in 2001; the data presented below was collected in 2001, a year of poor rainfall, and compared with the baseline survey. The watershed comprises 1535 ha and had a population of 921 in 1996. Average rainfall is around 450mm.

[17] In monsoonic regimes, rainfall is seasonal and that too falling in maximally 40 rainy days in a year of "normal" rainfall.

In the comparative study of the satellite images (remote sensing) of the Devgaon-Pabulwandi watershed (given below) of the years 1996 (January) and 1999 (December) one notes the increase in the green cover area and the reduction in the barren lands within a span of 4 years. And this was despite the rainfall being less by 378mm in 1999 as compared to 1996.

**Satellite Image of the Devgaon – Pabulwandi[18] watershed.**




[18] Devgaon Pabulwandi WS has a total area of 1,311.21 ha of which 95.31 ha is forestland. The project was started in the year 1996 and was completed in 2002. It is located in the hills of the Akole taluka of Ahmednagar district. Source :Data available with WOTR.

Target 9, Indicator 29: "Proportion of people using solid fuels is reduced"

WSD brings mixed outcomes regarding the use of solid fuels for household consumption. In areas where there is sufficient tree cover, the locals are reluctant to adopt cleaner fuels. Besides, many PIAs even promote the plantations of fuel wood trees. But when the tree and forest cover is depleted and every tree has to be saved, the PIA, Village watershed Committee, the women and even the men are willing to search for alternatives. They are even willing to change to cleaner fuels – kerosene, biogas and even LPG – the benefits of the ban on tree felling.

In the IGWDP as well as WOTR's projects, there is a ban on tree felling while lopping is permitted. From data collected by WOTR, it was found that on an average, during the 1st year of project implementation, 2.2% families used kerosene and 0.8 % used biogas/LPG. By the 3rd year of project implementation, an average of 4.7% used kerosene and 3.1% used biogas/LPG. But by the end of project implementation, approximately 17% used kerosene and 26.8% used biogas/LPG.

In Kalamkarwadi watershed [19], of 146 households, by the year 2000, 72 households had biogas plants constructed connected to toilets and 5 households were using LPG. While cleaner fuels are being used, many households still use solid fuels (traditional cooking stoves) mainly for heating water and as an alternative. It is the ban on tree felling that compels PIAs, village men and women to make the move towards cleaner fuels, while simultaneously, more dung is available from the stall-fed cross bred cattle thus making biogas possible.

Target 10: "Access to safe drinking water"

One of the immediate and visible results of WS treatments is the availability of water – surface and sub-surface. This is the key attraction that captures the interest and participation of the primary stakeholders. Chincholi (average rainfall 285 mm pa), earlier received water in tankers from March/April to June/July. In 2000, it became tanker free despite being a year of poor rainfall. Darewadi (a cluster of 12 hamlets besides the main village) has an average of 450mm of rainfall. Prior to WSD it

[19] Kalamkarwadi, a project located in Ahmednagar district was started in 1995 and was completed in 2000.

generally received water in tankers during the months of April to June/July and sometimes from February/ March onwards. In the years 2002 and 2003, Darewadi received 353 and 351 mm rain respectively. Despite this, the village was tanker free throughout the summer of 2004.

The question is: "Does water availability necessarily imply its easy accessibility for all households of the watershed and its safety for human consumption?"

While watershed development improves the water availability, it may not necessarily be easily accessible for household consumption unless, attention is given. In a recent study by the Development Support Center, an NGO based in Gujarat, out of 48 villages studied, water was available for domestic purposes in only 7 villages and in 29 villages it was available for drinking purposes only. Women in 30 villages had to spend more than 4 hours daily to fetch water and in only 3 villages, women spent less than 2 hours[20]. In the IGWDP, a fund is available at the discretion of the women's organization for the priority needs of women. To date WOTR has supported 62 villages address the drinking water scarcity.

***Goal 1*** seeks to eradicate extreme poverty and hunger through increasing incomes of the poor and achieving livelihood and food security.

Target 1: "Halve the proportion of people living in extreme poverty (income less than one dollar a day)."

*1. Food and Livelihood Security:*

1. In a WSD project, the incremental income accrues primarily due to better yields, increase in area under cultivation, changes in cropping pattern, switch to high yielding crops, changes in methods of cultivation. Besides this, fodder availability has led to an increase in cross-bred milch animals and thus an increase in milk production. The number of farm employment days also increases.

[20] "Drinking water Security in Watershed Villages" by Rushabh Hemani and Manju Ravi, Development Support Center, Ahmedabad, August 2004.

**Changes in the Crop Production and Income in the Rajani[21] Watershed**

| Crop | Area (ha) | | Yield per ha (quintals) | | Net Income (per ha) | |
|---|---|---|---|---|---|---|
| | Pre (1993) | Post (1998) | Pre (1993) | Post (1998) | Pre (1993) | Post (1998) |
| Cotton | **272** | 316 | 4.5 | 7.5 | 5950 | 11950 |
| Jowar | **169** | 173 | 5 | 10 | 1250 | 3750 |
| Tur | **50** | 50 | 3.5 | 5 | 3575 | 5675 |
| Paddy | **22** | 23 | 7 | 12 | 3050 | 7050 |
| Gram | **30** | 30 | 2 | 2.5 | 725 | 1125 |
| Soyabean | **-** | 5 | - | 9 | - | 6550 |
| Wheat | **-** | 6 | - | 10 | - | 4250 |

**Evaluation Study of Rajani watershed project in Yeotmal district. NABARD, Pune, 1999**

In the Rajani project, over the 6 years of project period, an additional 60 hectares was brought under cultivation. Soyabean and wheat were also introduced. The land productivity was also increased as noted in the table above. This was despite the fact that these tribals did not use chemical fertilizers. The overall income from agricultural production in 1993 was Rs20,97,250/- while in 1998 it increased to Rs 49,62,850, an increase of 137%.

In Chincholi, while the area under cultivation only marginally increased, the cropping pattern changed to include more cash crops (onions, groundnuts, green fodder, and bananas). Over 35 hectares of vegetables were grown in summer where none was, previously.

[21] The Rajani project is located in Yavatmal district and covers an area of 1121.5 hectares. 95% of the 195 households belong to the Gond and Kolam tribal communities. The project was started in 1993 under the IGWDP and was completed in March 1999.

In Talavli, the cropping pattern changed from 3 subsistence crops to 6, which included crops for the market. Vegetables and horticulture crops (40 acres) which were not cultivated previously are now being cultivated. Over 50 hectares of wasteland has been brought under the plough and 105 ha have been converted to rain-fed double cropping. Perennially irrigated area has increased from 0.8 ha owned by 2 households to 3.85ha owned by 12 families.

In Darewadi, land under cultivation increased from 197 ha to 342 ha of which 13 ha is perennially irrigated, previously nil. The cropping pattern too has diversified with the greater portion of the irrigated area being devoted to cash crops.

In the pre-watershed year in Chincholi village, none of the households that had children below 5 years had cross bred cows; in the year 2000, there were 42 milch cows owned by these households. In the village as a whole, milk production rose from 100 liters/day to 1100 liters/day. In Darewadi, cross-bred cows have increased from 14 in the pre-watershed year (1996) to 103 in the year 2000 and the milk production increased to 788 liters/day from an insignificant amount previously[22].

2. *Income, Wages:*

In Chincholi, Talavli and Darewadi, the agricultural wages have risen from an average of Rs. 20/day to Rs. 50/-; Rs 12/day to Rs 37/- per day; and from Rs20/day to Rs 40/day respectively.

Seasonally irrigated land prices in Darewadi have appreciated over 300% (Rs. 15,000/acre to Rs.65,000). In Darewadi, the overall village income increased 5.8 times from approx. Rs. 19.2 lakhs to Rs. 1.12 crores[23] within a span of less than 6 years.

Even though villages that have implemented WSD fare better than others during drought years, scarcity of rainfall does take its toll. However, one has to consider drought a normal phenomenon and make provisions for it. While WSD strengthens

[22] From data collected by WOTR.
[23] A lakh is 100,000 and a crore is 10,000,000.

the environmental and sustenance base, water management is essential to provision and provide for water requirements during the drought years.

3. *Quality of Life Enhancement:*

In Chincholi, agricultural implements have significantly increased – threshers have increased 38%, bullocks carts 62%, ploughs 95%. Talavli village saw an increase in electric pump sets from 2 to 11 and in bullock carts from 21 to 32, thus indicating an increase in agricultural productivity.

Consumer items like motorcycles, cycles, television sets, radios, cooking utensils have increased significantly across all strata of society, though the bigger or irrigated farmers have benefited disproportionately so. In Talavli, TV sets have gone up from 1 to 18, motorcycles from 1 to 8, cycles from 12 to 21 and radio sets from 12 to 27. In Darewadi, the TV sets have increased (from 3 to 76), cycles from 2 to 122, motorcycles 42 (nil previously) and tractors 2 (nil previously).

In all villages, surplus incomes were ploughed back into housing either by way of substantial improvements or replacement. Mud houses were upgraded to masonry or brick structures. Huts were upgraded to mud houses. In Chincholi, over 30 houses were upgraded, improved or re-built. In Talavli, mud houses came down from 208 to 178 and (these were also renovated) and masonry houses rose from 4 to 54.

4. *Migration*

A gradual reduction in distress migration is noticed when watershed development begins. While prior to the watershed development project, 90% of able- bodied families in Chincholi would migrate in the summer months in search of work, only 5% did so in 2000. In Talavli, 60% of households would migrate in search of a livelihood. This has reduced to 5% which is mainly of individuals (not whole households) who have taken advance loans from the brick kilns. In Darewadi, over 64% of households migrated in search of livelihood; today reverse migration is being observed – people who had left earlier are returning and farm laborers from nearby villages have been brought into the village. About 12% of villagers still migrate but this is because they are sheep herders.

Target 2: "Halve the proportion of people who suffer from hunger."

The 2 indicators related to this target are (i) The weight for age in the under 5 years old and (ii) Food intake in the household.

*1. Nutrition*

Regarding the nutritional status of children, it was observed that the poor state of nutrition (around 51.4% weighing normal according to the National Family Health Survey for Maharashtra 1995) was comparable in villages in the early stages of WS project implementation. When the project is around 3-5 years in project implementation, it increases to 63-65% (children of normal weight). But in projects where the women's groups participate actively in the Anganwadi (day-care center), the percent of children weighing normal increases to 85-90%. The food intake also gradually increases with the increase and diversification in crop production and if vegetables are also grown.

***Goal 3*** seeks to promote gender equality and women's empowerment and has as its target the elimination of gender discrimination and bias in regard to access to all levels of education (target 4).

This has been particularly noticeable in all the villages.

Women were organized into self help groups, undertook saving and credit activities and were also mainstreamed in the decisions making bodies of the villages, especially the Village Watershed Committees, through which substantial funds were routed. This has resulted in their being a lot more vocal, having assets in their names and being able to participate in activities outside of their village, especially training and exposure programs. Previously, their men folk would not send them outside the village, on their own, for such activities and most definitely not, for days at a time.

This was achieved by (i) helping women get organized into SHGs and the Samyukt Mahila Samiti; (ii) promoting their active and vocal participation in the VWC, the Gram Sabha and other decision making bodies (iii) making mandatory 1/3$^{rd}$ representation in the VWC (50% is encouraged) (iv) encouraging the men-folk to accept the new role of

women and their involvement in decision making bodies. Besides these, women need an opportunity to find solutions to their problems and concerns, which are otherwise overlooked. A fund for the same (to be utilized at the discretion of the organized women's group) in allocated under the IGWDP.

Till date, WOTR has assisted in the formation of 2,717 SHGs consisting of 36,627 women, having a total savings of Rs. 14,409,777.

Through these groups, women have taken up 332 socio-development projects like non-formal education, hygiene, kitchen gardens, day care centers, toilets, soak pits, vermin compost pits, health camps etc. benefiting 16,629 women/families. 223 drudgery reduction activities like drinking water systems, biogas, cooking gas, hot water stoves etc. benefiting 35,886 women/families have also been taken up. Besides, 174 income generating projects like animal husbandry, dairy, nursery raising, grocery shop, fertilizer shop, gas agency etc. benefiting 4,200 women/families have been implemented.

***Goal 2, Target 3*** seeks to ensure that children every where, boys and girls alike would complete a full course of primary school (i.e., achieve universal primary education).

*Attendance in Schools*

In a study conducted by NABARD, it was found that even in the remote Rajani WS (in the tribal belt in Yavatmal district), the number of children attending the local primary school had increased. This included girl children. While Chincholi did have a relatively high, school attendance rate post watershed, nearly all families sent their children to school, even the poor and landless. In Talavli, school attendance has increased 85% with girl attendance increasing 86%. In Darewadi, all families send their children to school, at least upto the primary level. The distance of the upper Primary school and /or the Middle school is a factor that many times has to be overcome so that girl children can complete their higher education. In Gangewadi[24] watershed project, the women have taken a loan from their SHGs for purchase of cycles for their school going children. 7 cycles were purchased for the girl students.

[24] Gangewadi is located in Beed district, taluka Ashti. The project was started in November 2001. It is currently in the Full Implementation Phase of the IGWDP.

### *Additional Related Impacts*

*Social Capital and Developmental Linkages.*

In all the watersheds, since at the very outset, the local governmental and political establishments were involved in various aspects of the effort, the villages were able to attract additional developmental investments and were effectively networked with the local agencies. This has supported the sustainability of works undertaken because it has opened up opportunities, alternative livelihood sources and markets.

People no longer hesitate to approach and demand services from public agencies. Darewadi was able to secure the building of a drinking water supply system. as well as a road and repairs to the village school building. Every project has its own story and linkages. The people now having been organized, they are a prepared group ready to address the other developmental needs. Banks are now able to make credit available to the women's groups whose capacities have now been developed to handle loans.

*Demonstration Effect:*

An interesting outcome of these successful watershed efforts was the increase in "prestige and standing" that these villagers have begun to experience in the local area. From being considered a "backward and barren area" these villagers became the "must see" projects of other villagers, even from outside the State, as well as officials and politicians. As one local youth put it, "watershed development has now brought us brides from villages who previously would not even consider our proposals!" A truly unintended outcome, indeed!

## From Water Harvesting to Water Budgeting: "Making Every Drop Count"

While water harvesting indeed is the necessity of the times, it is not sufficiently so- it must be accompanied by the adoption of water management practices. These practices must be focused on achieving two broad outcomes – ensuring that the greatest number of people share in the incremental water harvested and that water is used in a manner so as to get "maximum output per drop used" or, to put it colloquially, "getting the biggest bang per drop".

Today, water, or rather its scarcity, has become a social, political and economic issue in most states of the country, leading to conflicts and social tensions. With a growing population and economy, the demands on available water stocks are going to rise inexorably. The issues of equitable access, distribution and productivity of water are therefore major issues that must be addressed if development is to be sustained.

While these are issues that will have to be addressed at the institutional and policy levels in order to bring about effective regulations,[25] much can still be done at the community/ village level. And this must be done if the impacts achieved by the watershed efforts are to continue and benefit most of the watershed dwellers. Experience has shown that if water management is not undertaken, the situation of post watersheds villages can, in fact, revert to worse-than-before because of excessive water exploitation or water mining.

In all projects facilitated by WOTR, a pre-condition for support is the banning of water intensive crops like sugar cane, grapes, etc and spudding of bore wells (except for drinking water purposes). Open wells are encouraged. While this is adhered to faithfully during the years of project implementation, the strength of the prohibition does weaken over time with people trying to sink bore wells in search of additional water.

In order to strengthen the community-adopted restrictions on water guzzling crops and on the spudding of bore wells, while at the same time enhancing incomes, WOTR has now launched a campaign for water budgeting captioned, "Make Every Drop of Water Count" in collaboration with the Ground Water Survey and Development Agency (GSDA) of the Government of Maharashtra.

The focus of this campaign is to train villagers from the very outset of the watershed intervention, to measure the amount of rain that falls in their watershed, track ground water levels through the months and calculate the amount of water available through the year. Simultaneously, the people will be involved in crop planning and land use so as to bring about a match between water availability and those crops that have the highest cash value (after food security needs have been met). A theme that will permeate these discussions will be access to water for those who don't have it – the rain-fed farmers. It is proposed to introduce water sharing arrangements, new water distribution and saving

[25] For instance, in rural areas, can we continue to view water as an exclusive private resource where the owner of the well also has exclusive use of the water therein?

technologies, improved cultural practices and digging of common open wells to ensure that incremental water is accessible to the largest number of farmers, who in the regions WOTR works in, are small and poor. This pilot campaign has been launched this year (2004) in 7 villages in 3 districts and based on the experience gained, WOTR will upscale it across watershed projects in the state.

**Conclusion**

Watershed development and water management through community mobilization seeks to harvest every drop of rain and put it to its best possible use. It is a promising and proven approach to poverty reduction especially in rural semi-arid and resource fragile regions. Equally importantly, it helps build up social capital and capabilities. These latter are crucial to ensuring that people who escape poverty continue to stay out of it.

The experience of the Watershed Organisation Trust (WOTR) and that of other practitioners shows that, if some of the Millennium Development Goals – at least 4 of the 8 - are to be achieved in semi-arid regions, participatory environmental regeneration along watershed lines is a powerful and socially acceptable way of getting there.