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Editorial Note

The first issue of the first volume of SAJMR received good response from the readers. The feedback received from the readers made us to improve the present issue.

The present issue has broader scope than the earlier, yet we have kept the true spirit of the journal. In this issue we have included articles from the Computer Studies and Environmental Management field as well. As we have stated earlier, the objective of the journal is to provide a common platform for the practicing managers and academicians to share their research knowledge through this journal.

In future, we also welcome articles related to different pedagogical approach in management teaching. Many courses including management discipline everywhere use more of a traditional approach of lecturing to share the knowledge. Lecturing method is more passive in nature. Case study comes next to lecturing method in imparting knowledge. But not much has been done in developing experiential approach as a pedagogy of teaching in management field, particularly in India.

Experiential learning is more active rather than passive. The readers can contribute case studies and teaching material in experiential learning approach in different management fields such as marketing, human resources, organization behaviour, organizational change and development, strategic management, etc.

I am grateful to all the authors, reviewers and editorial members of the journal for their contribution and support in bringing out the second issue of first volume of the journal successfully.

Dr. Babu Thomas
Editor

Impacts of Watershed Development Projects Management Through Labour and Machines: A Comparative Study of Two Villages In Maharashtra

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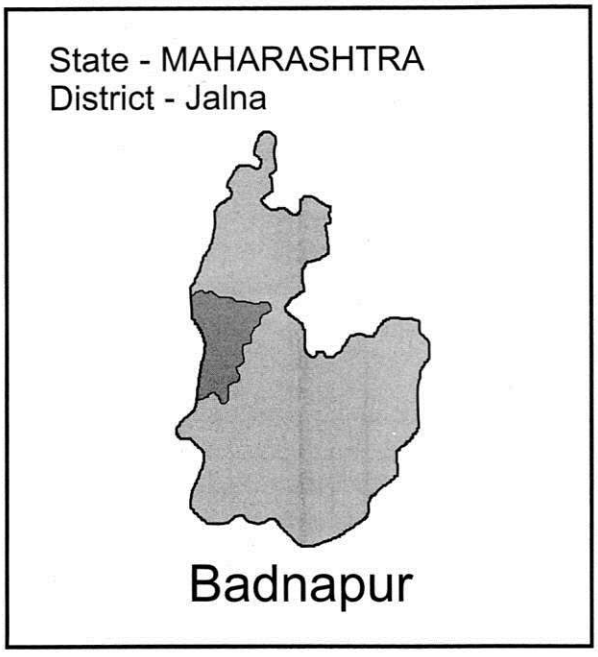
Abstract

Sustainable management of watersheds through soil and water conservation and conservation of other natural resources have been given high priority in many countries in the world for the last several decades. Especially in countries like India, where there is shortage of water for irrigation and the overall irrigation potential cannot irrigate a good amount of agricultural land, the policies like integrated watershed management have been regarded as a suitable approach to address issues of agriculture productivity, poverty and food security of populations. In India the available irrigation potential cannot help irrigate more than 40 per cent of India's agriculture, the programmes like watershed development through the soil and water conservation are significant for Indian agriculture. The encouraging experience from the ongoing watershed development programmes for drought proofing of rain-fed agriculture by conserving land and water resources underlines its significance. The Eleventh Five Year Plan targeting 8.5 per cent of annual growth with 10 per cent for the last two years plus 4 per cent of growth of agriculture with inclusion of all, particularly the rural masses, also expects watershed programmes to become one of the instruments of achievement. The present economic plan making provision of expenditure for 24 lack crore on various programmes for achievement of targeted growth sees, according to the recent guidelines, the watershed development programme as one of the instruments for inclusiveness of community with decentralized implementation for generating rural employment and removal of poverty by way of increasing levels of income of rural people. The single most important factor accounting for positive impact of this programme is community participation and decentralization of programme administration made possible under the new guidelines. The coverage needs to expand through increased outlays, as only about 25 per cent of degraded land and less than that of the dry land in the country is estimated to have been treated so far. As far as the mode of implementation of the watershed development programme is concerned, there seems much controversy between the advocacy of machine and manual labour. This needs adequate and unbiased research, which exactly is the area that has been lacking in the Indian context. The existing public outlay on agricultural research and education stagnating around 0.5 per cent of agricultural GDP in the country is too meager and needs to be stepped up substantially. The controversies arising out of the mode of implementation are certainly in contrast with the objectives and philosophy of the programme and it can mislead the policy domain. The present paper attempts to address the controversy by comparing the outcomes of the watershed programmes implemented through machine in one and manual labour in the other village. The study advocates that the pre-project situation, level of community awareness and development vision of the village must be the basis for deciding mode of implementation of watershed project rather than merely availability of labour in the village.

Keywords: Groundwater, Water Charges, Water Conservation, Water Depletion, Water Percolation, Water Resources, Water Table, Water Users, Watershed, Watershed Intervention, Well-irrigation

1. Introduction

Watersheds in the Indian context have come to be acknowledged as key and discrete units in rural development. Integrated Watershed Development Programmes have clearly established that they are the important vehicle to achieve the objectives of: 1) increases in production and availability of food, fodder and fuel, 2) restoration of agro ecological balance and, 3) in improving the livelihood status of the village communities. The intensification and diversification of production systems in watersheds has to be viewed from a livelihood perspective. For sustainable livelihoods, the trade off between productivity, equity and sustainability is critical.



Various collaborative watershed development projects have been implemented in India, involving Government and NGO partners in many states, Maharashtra being a pioneer in the sector. Watershed interventions are mainly soil conservation measures, forestry and horticulture plantations, agronomic practices and water harvesting structures.

The entire area of the watershed is treated with soil and stone structures. Largely, watershed development comprises of land-based activities such as bunding, trenching, stone and earthen plugging. All these activities require manual labour and/ or machines to actualize.

1.1. Research Question

The research problem arises from the two contradictory situations as mentioned below existing at the same time in rural development sector in Maharashtra state.

Situation A:

- Prime Minister announced Vidarbha Package to control the farmers' suicides in the region. Under the package, GoM and NABARD undertake watershed works to provide employment to people, to increase the crop productivity and thus incomes of the farmers in the region.
- Under NREGS, Government decided to undertake mostly the soil and water conservation works so as to provide employment to people.

Situation B:

- Gramsabha of one of the watershed villages in Aurangabad district in Maharashtra state passed a resolution in suggesting use of JCB machine in place of labourers to undertake watershed works.
- NABARD suggests that machines might be used for implementation of watershed works if Gramsabha (Village parliament) resolves so due to non- availability of labourer in the village.
- GoM Watershed Mission guidelines promote use of eco-friendly machineries in case people don't come as manual labour for certain soil and water conservation works in watershed.

Several questions arise in mind when one understands the dynamics of the above situations. Few of them are mentioned below.

- What are policies/ opinions of government and non- government agencies with regard to use of machines in watershed? What does the community and CBOs in general and poor section in particular say about the issue?
  - Is it true that labour availability in villages for undertaking watershed works is drastically reduced? If yes,
  - Is it linked with the wages they get for such hard works?
  - Is it related to the work environment/ situation provided to labourer such as baby care, drinking water availability, tools availability, toughness of works, working time and other factors?
  - Is the community sufficiently mobilized to undertake watershed works as their own development? Are they aware about the possible benefits of the watershed development?
  - Is it true that labour unavailability is the only reason for promoting machinery? Are there other factors influencing the use of machinery such as spending targeted budget?
- What are the benefits and drawbacks of using machinery for watershed works experienced by the community? (Also bullock drawn machines)

- What about distribution of benefits within the community? Is it equitably distributed among poor and better-off sections?

The key research question therefore emerges as:

In what way and to what extent do, the impacts/ benefits differ when manual labour and machines are used to execute watershed works?

2. Methodology

The research has focused on a comparative study of processes and impacts of watersheds implemented with the help of labour force on the one hand and machinery on the other. Thus two different watershed villages were required to be selected to undertake the present study. There are a large number of watersheds implemented though labour force, but not many watersheds programmes have been implemented by using machinery in Maharashtra. There are a few watersheds in Beed, Osmanabad and Latur districts under government monitoring and three watersheds in Jalna district under NGO supervision that are implemented largely by using machinery. In these districts, there also exist a number of watersheds implemented by government and NGOs. The sample watershed villages are identified based on following criteria:

- Two separate watershed villages are selected; one implemented by using labour force while another by using machinery.
- Both the watershed villages must have maximum similarity in socio-technical and cultural aspects/ situation so that these factors affect equally on research variables.
- Both the watersheds must have been implemented under the similar programme guidelines and institutional framework. That means both of them are supported either by government alone or NGO so that there is no difference in implementation style/ philosophy. But within these two types, watershed implemented either by two different government agencies or by two different NGOs can be selected.
- Selected watersheds must have similar recognition in the taluka/district in terms of its success or impacts. That means we may not select one watershed with excellent impacts and other with negligible impacts.

Secondary data collected on name, type, programme, implementation status and success rating was scrutinized to identify the following two watershed villages that fulfill above mentioned criteria.

(i) Nandkheda, Taluka Badnapur Dist. Jalna implemented by Nirman Gramin Vikas Sanstha based at Aurangabad under IGWDP-Maharashtra. All the area treatments in this village are done completely by using manual labour from the village. Tractor was used to transport materials required for certain structures, especially drainage line treatments.

(ii) Asarkheda, Taluka Badnapur Dist. Jalna implemented by Marathwada Sheti Sahayya Mandal (MSSM), Aurangabad (Marathwada Agriculture Assistance Group) under IGWDP-Maharashtra. About 70% of the area treatments in this village are done by using machine such as bulldozer, scraper and tractor. Thus Asarkheda is considered as machine watershed for the purpose of the present study.

2.1. Household Sampling

Within the selected watershed villages, a minimum 10 % of total households are selected for household level interviews. Random sampling method was used to select the households to be interviewed. The total number of households in Nandkheda is 185 (census 2001) out of which 22 households (almost 12%) participated in the study. In case of Asarkheda out of 260 (census 2001), 24 households (little less than 10%) participated in the study.

2.2. Key Stakeholders Sampling

Concerned community organizations in the selected watershed villages such as GramPanchayat, Watershed Committee, Women's SHGs and Samyukt Mahila Samittee (SMS) (Combine women's committee) were interviewed separately or collectively as per the site situation.

- A few officials and head of the implementing organizations concerned with the selected watershed villages were interviewed separately and collectively as per the site situation. The study used data and information from both secondary and primary sources. Data was collected at the level of the watershed/

village level (also in-turn at the household level) and state level. The following tools were used to collect the data required and to facilitate the discussions.

- Focus Group Discussions with members of Gram-Panchayat, Watershed Committees and other community organizations
- Key Stakeholder Interviews with watershed experts and concerned project level officers
- Household Questionnaire for carrying out field surveys
- Observational field monitoring to assess quantity and quality of technical treatments.
- Relevant data/information was also obtained from secondary sources such as NGO records, past research studies, project completion and evaluation reports, watershed guidelines, schemes, etc.

Both the watershed projects were completed by two separate NGOs having varied experience in development sector. MSSM has been in this field since the 1960s while Nirman is relatively a new NGO that started its operations 13 years back. As a part of IGWDP, both the projects were having feasibility study reports (FSR) prepared during the first year of implementation. FSR provided very detailed baseline data with regard to population, area, crops, irrigation facilities and livestock along with proposed watershed treatments with the budget. The project completion report (PCR) was another document used for secondary data collection and it provided authorized data (accepted by NABARD) on interventions, investments, preliminary impacts and details of project activities, institutions and maintenance fund.

3. Discussion

3.1. Background of study villages

The study villages are major villages involved in their respective watershed projects implemented under IGWDP. Both the villages are situated in Badnapur taluka of Jalna district. The study is limited to Nandkheda and Asarkheda villages as these are the major villages in their respective watershed projects. The project investment data is not available separately for Nandkheda and Asarkheda and hence it indicates the watershed as a whole.

Nandkheda watershed consists of Nandkheda, Rajewadi, Bhakarwadi and part of Marsavali village. Nandkheda village is situated about 60 km from Jalna and 55 km from Aurangabad. The village has primary school till seventh standard. The school is well maintained by the villagers in terms of facilities for children and quality of education. Most students go to Bhakarwadi which is 2 km away for education up to 10th standard. After 10th, they have to go to Takali village for 11-12 standards, about 6 km away. University education facilities are available only at Fulambri (35km) and Aurangabad (55 km). A sub-center of primary health centre (PHC) is based in the village itself while PHC is at Dabhadi- 15 km away. It is linked with the banking facilities either to Dabhadi or Gevrai (60km by tar road). Water supply scheme provides drinking water to the villagers. A separate Gram Panchayat exists in the village and is currently led by a woman sarpanch. The village is also represented in taluka panchayat samittee by a woman. Village watershed committee of 27 members is registered in the name of Savaleshwar Krishi va Gram Vikas sanstha under Society's act. A temple committee and 15 women SHGs led by Samyukt Mahila Samittee (SMS) are also functional in the village. SMS and SHGs deal with credit business with banks and other MFIs.

Asarkheda watershed consists of three villages namely Asarkheda, Dongaon and small part of Tupewadi. Asarkheda village is situated at 22 km from Jalna- the district place. The education facility till seventh standard is available in the village itself. Thereafter the students go to Dongaon, which is merely 1.5 km away. PHC sub-center is situated in the village. Banking facilities are accessed from Jalna city. The villagers have drinking water supply scheme functional since 1989. Many village institutions exist in the village. Gram Panchayat (7 member), Rushi maharaj Sansthan (8 member), Jai yogeshwar library, Asarkheda watershed committee, 6 women SHGs, 2 mahila mandals, 3 men SHGs and a bhajani mandal are worth mentioning. Bawane pangri based multi-purpose credit cooperative society has 175 members from Asarkheda with one elected representative on director board out of total 9 members.

The following tables indicate the various data

collected by the project implementing agencies during the year 1995-96 and sourced from Feasibility Study Reports of respective projects sanctioned by NABARD under IGWDP.

Table 1 reveals the demographic details of both the watersheds in terms of caste and gender compositions as well as education status at the time of the start of the project. The majority of community members, 60-70% in both the watersheds, are Maratha while rest of the population belongs to SC, ST and NT. Table 1 shows that the gender ratio in both the watersheds was unfavorable to women with Asarkheda (933) in quite better condition than Nandkheda (827).

Nandkheda while the SC population in Asarkheda was 45 and that of ST it was 16 (8%). The literacy rate was 52.4% and 59.2% in Nandkheda and Asarkheda, respectively.

Table 2 shows land details in terms of area of private and public land that is included in watershed project. The project total indicates area confined by watershed boundary while next column indicates area confined by revenue boundary of Nandkheda and Asarkheda villages. The project total is important to know because entire interventions/ investments are based on this data.

Proportion of public/community land to the total geographic area of watershed is 20% in

Table 1: Demographic and Educational Background of the Villages*

	Nandkheda	Percent	Asarkheda	Percent
Total Households	**256**	100%	**212**	100%
Scheduled Caste	21	8%	45	21%
Scheduled Tribes	18	7%	16	8%
Nomadic Tribes	57	22%		0%
Others (Maratha)	160	63%	151	71%
Total Population	**1619**		**1245**	
Male population	886		644	
Female population	733		601	
Gender ratio- Female/1000 Male		**827**		**933**
Education	**1201**	100%	**418**	100%
Read and write only	611	51%	37	9%
Primary	247	21%	270	65%
Secondary	234	19%	92	22%
Matriculate	64	5%	16	4%
Graduate and above	45	4%	3	1%

* Village Census 2001.

Jalna district is ranked lowest among the districts in Maharashtra in HDI due to lower educated population. Table no. 1 brings out the fact that even among the educated, about 73% could only know reading and writing, maximum 5% reach matriculation and merely 1-4% reaches for university level education. Asarkheda shows larger dropout rate after secondary schooling as compared to Nandkheda.

As per the Census of India 2001, the total number of households and population in Nandkheda village were 256 and 1619, respectively; and House of Asarkheda were 212 and 1245, respectively (Table 1). The population of SC and ST was 21 (8%) and 18 (7%) in

Nandkheda project and 10% in Asarkheda project. Though the Table 2 indicates that the forest land is completely absent in Nandkheda revenue boundary, people have access to this land shown in Marsavali village boundary. The percent of irrigated land to private land was less than 1 in Nandkheda while it was 4 in Asarkheda leading to culturable waste land of 13% and 4%, respectively.

Landless percent in Asarkheda watershed as depicted in Table 3 is three times more than that in Nandkheda watershed. It may be observed from table no. 3 that 50% households own more than 10 acres of land per household covering

Table 2: Distribution of the Geographical Area of Two Villages*

Description	Nandkheda Watershed		Asarkheda Watershed	
	Project Total	Nandkheda	Project Total	Asarkheda
Forest land	240.28		16.78	16.78
Revenue land	114.42	22	64.69	45.87
Panchayat land	2.72	1.22	3.79	3.79
Submerged land	7.25		2.02	2.02
Sub-total **Public Land**	**364.67**	**23.22**	**87.28**	**68.46**
Irrigated land	165.9	5.47	26	26
Un-irrigated cultivated land	1000.69	436.4	652.94	590.62
Culturable waste land	295.79	63.68	44.14	29.7
Un-culturable waste land	34.1	1.79	64.61	64.61
Sub-total **Private Land**	**1496.48**	**507.34**	**787.69**	**710.93**
Grand Total	**1861.15**	**530.56**	**874.97**	**779.39**

*Village Land Records

Table 3: Pattern of Landholding of the Watershed Villages Studied*

Category	Nandkheda		Asarkheda	
Number of Households	**HH nos.**	**% to total**	**HH nos.**	**% to total**
Landless	16	6%	40	19%
0-1 ha	19	7%	14	7%
1-2 ha	23	9%	41	19%
2-4 ha	71	28%	55	26%
4-8 ha	86	34%	49	23%
More than 8 ha	41	16%	13	6%
Total	**256**	100%	**212**	100%
Land Owned/ held in ha#	**Land ha**	**% to total**	**Land ha**	**%to total**
Landless	0	0%	0	0%
0-1 ha	17.48	1%	11.1	2%
1-2 ha	40.62	3%	68.9	10%
2-4 ha	247.08	17%	165	24%
4-8 ha	651.84	45%	283.3	41%
More than 8 ha	493.23	34%	155.4	23%
Total	**1450.25**	100%	**683.7**	100%
Average Landholding per HH	**5.7**		**3.2**	

*Village Land Records. # One Hector = 2.5 Acres.

79% of total private land in Nandkheda. In case of Asarkheda 29% households own more than 10 acres per household covering 64% of total private land. The average landholding of Nandkheda household is almost double the landholding of Asarkheda.

The average landholding per household in Nandkheda and Asarkheda is 5.7 ha and 3.2 ha respectively. These figures indicate combined data of all the villages in the watershed project defined by project boundary. But this figure is quite misleading for the study purpose as it

considers only the selected villages and not whole watershed.

Hence the landholding per household needs to be calculated considering land and household data of selected villages only. In Nandkheda, the average landholding is 2.75 ha taking into consideration total private area of 507.34 ha (Table no. 2) and number of household as 185 (census 2001). Similar calculations show that the average landholding in Asarkheda is 2.74 ha. Thus it is very evident that there is no difference in landholding pattern between two villages.

Both the villages were selected for watershed interventions under IGWDP during the year of 1995. Two NGOs namely Nirman Sanstha and Marathwada Sheti Sahayya Mandal (MSSM) based at Aurangabad initiated awareness and capacity building activities in Nandkheda and Asarkheda respectively during 1995. Watershed Organization Trust (WOTR) Ahmednagar helped them in capacity building phase by way of technical, managerial and funding support. Both the projects entered Full Implementation Phase (FIP) in 1996 wherein NABARD provided funding and monitoring support to the projects. The watershed activities in Nandkheda were completed in February 2001 while Asarkheda watershed project was completed in August 2001.

Table 4 shows that both the projects completed their project measures activities within the sanctioned budget; in fact about 85% of the budget was utilized. Women development activities are provided maximum up to 5% of the total budget. At the time of closure of the project the activities were sanctioned but not yet completed. The activities were completed after the PCR. The maintenance fund figures in Table 4 show programme grant released to the projects. Both the projects received Rs. 90,000 from NABARD as an incentive for successful completion of watershed activities and this fund is also added to the maintenance fund but is not reflected in the table. Project management grant is released to the project implementing agencies as administrative charges for their services. These are delivery costs of the projects and are measured as percent of total project activity grant utilized excluding maintenance fund. The delivery/ administration cost in case of Nandkheda is 21.5% while in case of Asarkheda it is 26.1%.

It comes out from table no. 5 that Nandkheda has utilized most of the treatment funds (97% of total funds spent on treatments- row C in the table) for land treatment as compared to that of Asarkheda (68% of total funds spent on treatments- row C in the table). Land treatment work generates large amount of workdays for labourers as compared to drainage line treatment. In Nandkheda, about 70% of the total treatment cost i.e. Rs. 58.48 lakh* is spent on labour component and paid directly to the labourers from the villages which created employment of about 1,06,151 labour workdays during the entire project period.

In Asarkheda, the labour component is about 61% of total project measures investment. According to the VWC members of Asarkheda, approximately 30% of the labour component i.e. Rs. 6.86 lac is paid to labourers and rest of the amount of Rs. 1.6 million is paid as charges for machinery use in creating land treatments especially farm bunds. Thus only about 18% of the total treatment cost has reached the hands of labourers by way of employment of only about

Table 4: Financial Provisions: Sanctioned and Utilized for Different Components*

Project Component	Nandkheda		Asarkheda	
	Grant sanctioned	Grant utilized	Grant sanctioned	Grant utilized
As on date	**Jan-1996**	**Feb-2001**	**Jun-1996**	**Aug-2001**
Project Measures	9,746,880	8,364,367	4,256,960	3,753,250
Women Development	547,000	41,934	213,000	-
Maintenance Fund	560,000	557,300	266,000	286,392
Project Management	1,952,376	1,808,320	1,167,600	978,992
Total	**12,806,256**	**10,771,921**	**5,903,560**	**5,018,634**

* Watershed Implementation Records.

Table 5: Physical and Financial Details of The Treatment of Watershed Villages*

Sr. No.	Treatment/ Item of Expenditure	Nandkheda		Asarkheda	
		Completed Physical Units (ha/nos)	Grant utilized, Rs.	Completed Physical Units (ha/nos)	Grant utilized, Rs.
A	**Area Treatment, ha**				
1	Afforestation	354.70	2,186,744	35.90	421,949
2	Grassland with Trees	175.55	1,731,011		
3	Agro Forestry	-	-	18.40	86,753
4	Agro Horticulture	149.65	1,010,935	30.82	138,589
5	Crop cultivation	1,007.49	2,840,176	528.13	1,775,456
6	Supervision	-	374,331	-	140,924
	Sub Total (A)	**1687.39**	**8,143,197**	**613.25**	**2,563,671**
B	**Drainage Line Treatment, nos**				
1	Gully plug			316	56,426
2	Loose boulders	11	10,318		
3	Gabion structure, RM			69.77	63,915
4	Check weirs	16	207,702	11	270,315
5	Check dams			4	594,238
6	Earthen Nalla Bunds			5	170,567
7	Repair of Nalla Bunds			2	7,770
8	Supervision		3,150		26,348
	Sub Total (B)	**27**	**221,170**	**408**	**1,189,579**
C	**Treatment Total (A+B)**	**1,687.39**	**8,364,367**	**613.25**	**3,753,250**
	Per ha cost		**4,957**		**6,120**
D 1	**Unskilled Labour Component, Rs.**		**5,847,807**		**2,286,689**
2	Unskilled Labour Payment, Rs.	100% payment	5,847,807	70% machine use	686,007
3	Percent of labour payment to C		70%		18%
E	**Community Shramdan, Rs.**		1,139,795		504,172
	Shramdan percentage to D1		19%		22%
F	**Maintenance Fund**				
1	Collection from families		50,918		155,290
2	Fund with VWC at closure of project		682,253		500,082
G	Labour workdays generated		106,151		15,591

*Watershed Implementation Records.

15,591 labour workdays during the similar project period as that of Nandkheda. Rest 82% of the fund was spent on material and machinery.

Community contribution is required as a pre-condition in IGWDP projects. Both the villages have reached the expected level of Shramdaan as seen in table no. 5, Asarkheda having done 22% of total unskilled labour component. Nandkheda villagers have mostly contributed in terms of manual work i.e. Shramdaan while Asarkheda villagers have provided major component by way of providing cash, kind or machinery. Table 5 also clearly shows that Asarkheda people have collected "family cash collection" of Rs. 1,55,290 towards maintenance

Table 6: Social Structure of the Study Villages*

Respondents Profile	Nandkheda	Percent	Asarkheda	Percent
Total number	22		24	
Average age	51		53	
Caste				
Maratha	20	90.9%	22	91.7%
Christian	1	4.5%		
Navboudhha	1	4.5%		
Nathjogi			1	4.2%
Dhangar			1	4.2%
Illiterate	16	72.7%	9	37.5%
Literate	6	27.3%	15	62.5%
1-4	4	18.2%	3	12.5%
5-10	2	9.1%	11	45.8%
11-12	0	0.0%	1	4.2%

* Census 2001 and Village Records.

Table 7: Level of Skill Acquisition of Surveyed Families.*

Sample HH-Demographic		Nandkheda	Percent	Asarkheda	Percent
Population	Total	96		120	
	Male	53	55.2%	65	54.2%
	Female	43	44.8%	55	45.8%
Education	None	42	44%	47	39.2%
	Literate	54	56%	73	60.8%
	0-4	10	19%	15	21%
	5-10	40	74%	49	67%
	11-12	3	6%	7	10%
	>12	1	2%	2	3%
Skills	Weaving	1		4	
	Driving	1		3	
	Electrical			1	
	Other	2			
Training- Crop & WS		1		3	
Training- Livestock		0		3	

*From The Field Survey.

fund, which is triple, the collection of families of Nandkheda. Through addition of programme contribution into the maintenance fund, Nandkheda and Asarkheda have accumulated an amount of Rs. 6,82,253 and Rs. 5,00,082 respectively at the end of the project. Table 5 reveals the fact that watershed has generated more than 106,000 person-days of unskilled employment in Nandkheda which is 7 times of that Asarkheda.

3.2. Comparative impacts of watershed interventions

Seven years have passed since the completion of both the projects. The communities have experienced the impacts and outcomes of the watershed for a fairly long time. The study focused on collection of primary data on various impacts of watershed interventions that are seen, perceived and sustained by the community. Efforts were made to ensure that the respondents are head of the family.

Respondents for twenty-two households of Nandkheda and twenty-four households of Asarkheda villages were interviewed for the present study. The respondent's age profile indicates that they were quite in-charge of their family during watershed project period i.e. ten years back.

The respondents' level of illiteracy is high in Nandkheda and the literacy level is significantly lower compared to Asarkheda. In Asarkheda, the literacy level is slightly better, specifically with reference to respondents who are educated in the range between 5-10 standards. In both cases, as brought out by Table 6, about 91% respondents are from Maratha community with some representative respondents from other minority community in the villages.

In both the villages, amongst the number of sample households, male population is approximately 10% more than that of females.

Education level of the people is enhanced especially the number of High School going children is significantly increased as compared to the pre-watershed situation. There is not much improvement in college level education though the general literacy level shows improving trend. A few people have acquired vocational skills of livelihood such as weaving, electrician ship, driving etc. There are 6 persons in Asarkheda who are trained in watershed development and livestock management during the project period from the PIA itself.

Occupational Pattern at the current situation, in both the villages shows that they draw employment from growing crops in all seasons except Nandkheda drawing more from Agricultural labour in summer. If compared, the total number of persons engaged in other livelihood activities in all three seasons after watershed implementation, the situation is significantly better in Asarkheda as compared to Nandkheda. In Nandkheda the number of persons engaged in livelihood activities has remained the same, whereas in Asarkheda they have increased.

With respect to migratory labourers, there is no change in the situation in Nandkheda as the same number of persons continues to migrate in all the three seasons. In Asarkheda there is no incidence of migratory labourers observed in both periods. Significant number of persons in Nandkheda is engaged as agriculture labour during summer in both periods, whereas in Asarkheda negligible number persons is

Table 8: Pre and Post Watershed Occupational and Crop Diversification of the Study Villages*

Occupation	Nandkheda			Asarkheda		
Kharif	**Pre-WS**	**Post-WS**	**% change**	**Pre-WS**	**Post-WS**	**% change**
Crop	44	52	18%	42	47	12%
Livestock	1	2	100%	1	0	100%
Agri. Labour	5	0	100%	3	1	67%
Migration	5	5	0%	0	0	Nil
Other	42	33	21%	10	14	40%
Rabbi						
Crop	45	52	16%	39	47	21%
Livestock	2	2	0%	1	0	100%
Agri. Labour	1	2	100%	1	1	0%
Migration	4	4	0%	0	0	NA
Other	42	33	21%	5	14	180%
Summer						
Crop	0	0	NA	26	30	15%
Livestock	0	6	Infinite	1	0	100%
Agri. Labour	47	53	13%	0	1	Infinite
Migration	4	4	0%	0	0	Nil
Other	43	30	30%	5	13	160%

* From The Field Survay.

Table 9: Pre and Post Watershed Comparison of Family Assets of the Villagers*

Family Assets	Nandkheda			Asarkheda		
	Pre-WS	Post-WS	% Change	Pre-WS	Post-WS	% Change
House	20	22	10%	21	24	14%
Electricity	1	1	0%	10	11	10%
Own land	20	20	0%	21	23	10%
Lease land	1	1	0%	1	1	0%
Large Animals	18	19	6%	16	15	6%
Small Animals	9	11	22%	6	9	50%
Open well	15	16	7%	18	22	22%
Tank Irrigation	5	6	20%	0	0	NA
Water lifting devices	12	15	25%	9	19	111%
Tractor	0	0	Nil	1	1	0%
Bicycle	2	6	200%	4	8	100%
Motorbike	0	0	Nil	1	10	900%
Television	0	1	Infinite	2	14	600%

* From The Field Survey.

Table 10: Source of Funds for Building Family Assets of Two Villages*

Source of Funds	Nandkheda		Asarkheda	
Parental	41	61%	51	41%
Farm Income	20	30%	70	56%
Agri. Labour	4	6%	3	2%
Watershed labour	2	3%	1	1%
Total	67	100%	125	100%

* From The Field Survey.

Table 11: Sources of Irrigation and Average Water tables of Villages*

Wells and lifting devices	Nandkheda	Asarkheda
Wells	16	22
Electric Motors	16	22
Diesel Engines	4	9
Depth of water (feet)	9.5	6.2

* From The Field Survey.

involved in this activity throughout the year. This is probably because of land preparation activities done in summer so as to get ready for kharif crops. These works are done by manual labour and draft animals in Nandkheda while the farmers in Asarkheda mostly prefer tractor driven agriculture implements to do similar works.

Table 8 shows that there is an increase in the range of 12% to 21% in number of persons engaged in crop production activities in kharif and rabbi season respectively in Asarkheda. In the case of Nandkheda, it shows 18% increase in employment in crop production in kharif while 16% increase in employment during rabbi production. In both the villages, the livestock has not much developed much as livelihood alternative for people, possibly due to poor

accessibility to tarred road and credit from banks. Overall, there is no change in Nandkheda, in fact nominal negative change is discernible in the number of people employed in pre-watershed and current situation. The employment opportunities have been significantly increased within Asarkheda village by about 35%. Most of this increment is due to a rise in area (Table 18) and income (Table 23) under cash crops with higher labour requirement.

As far as family assets in post-watershed are concerned, it is depicted in Table 9. The increase in assets of Asarkheda is observed to be significantly higher as compared to Nandkheda. During the last 10 years, the people of Asarkheda have increased capital building assets such as irrigation facilities through well digging and water lifting schemes and communication facilities such as motorbike and television. Opposed to that, the people of Nandkheda could invest comparatively lesser capital or communication building assets and used the income mostly for the purpose of consumption and debt repayment.

As indicated in Table 10, in Asarkheda the main source of money for assets mentioned above is farm income. In Nandkheda, people mostly attribute the assets towards the parental income and it is evident from the table no. 10 that watershed labour has not helped much to build or increase the assets for the villagers. Table 11 shows the status of irrigation facilities such as wells and lifting devices in the study villages. The average depth of water in the open wells is better in Asarkheda than in Nandkheda.

Table 12 brings out that the average area owned per sample family is more than double in Asarkheda (12.7 acres) as compared to Nandkheda (5.7 acres). This is contrasts with the pre-watershed data mentioned in Table 3 because it reveals the situation of all 4 villages covered in the watershed project. Table 12 tells the figures of only the villages under study.

Table 12 also suggests that the percent of area irrigated to the total private land is similar in both the villages and increased by more than 25% as compared to the pre-watershed period. Out of this irrigated land, about 95% area is irrigated by groundwater in Asarkheda, which is 10% greater than in Nandkheda. Nandkheda has an additional option of tank water irrigation for 16% of irrigated land; almost 3 times more than Asarkheda.

As far as the land characteristics in the study villages are concerned, it is indicated in table no. 13 that most of the private land is moderately sloping (62%) in Nandkheda while it is evenly distributed among different slopes in Asarkheda having higher proportion of steep slope land (26%). Comparatively more lands in Asarkheda (37%) are flatter than Nandkheda (30%). Soils in both the villages are mostly black and red color having similar characteristics.

As is revealed in Table 14 that about 5% land is not treated at all in the project in Asarkheda, while all the farms are treated in Nandkheda. The reason for non-treatment is not clear. All these soil conservation treatments are carried out through watershed funding. The private lands in both watersheds are mostly treated with farm bunds and gully plugs wherever gully passes through the farm. It is clear from Table 15 that a little less than three times the number of households in Asarkheda than Nandkheda invested in water lifting facilities such as electric motor, pipeline, etc. for irrigation purpose. Table 9 brings out the similar fact that Asarkheda families have raised their water lifting assets by 111%. This helped them to bring more cropland under irrigation. Table 15 indicates that Nandkheda households prefer investing in wells

Table 12: Land Distribution As Per The Source of Irrigation of The Study Villages*

Land distribution, acre	Nandkheda		Asarkheda	
	Area	Per HH/ Percent	Area	Per HH/ Percent
Area owned, acre	119.5	5.7	291.5	12.7
Area Irrigated	37.5	31%	93.9	32%
Groundwater Irrigated	31.5	84%	88.9	95%
Tank water irrigated	6.0	16%	5.0	5%

* From The Field Survey.

Table 13: Land Characteristics and Soil Type in the Study Villages*

Land Characteristics	Nandkheda		Asarkheda	
Topography	**Acres**	**Percent**	**Acres**	**Percent**
Steep slope	11.0	9%	76.4	26%
Moderate slope	73.5	62%	106.6	37%
Slight slope	8.0	7%	42.0	14%
Flat	27.0	23%	66.5	23%
Total	119.5	100%	291.5	100%
Soil Type (acre)	**Acres**	**Percent**	**Acres**	**Percent**
Red	54.5	46%	139.1	48%
Black	60.0	50%	112.4	39%
Other	5.0	4%	40.0	14%
Total	119.5	100%	291.5	100%

* Watershed Implementation Records.

Table 14: Village and Category wise Investment on Soil and Water Conservation and Sources of funds in the Study Villages*

Item of Investment	Nandkheda		Asarkheda	
	Acres	**Percent**	**Acres**	**Percent**
Nil	0.0	0%	13.9	5%
Bunds	109.5	92%	255.6	88%
Gully plugs	10.0	8%	0.0	0%
Bund and Gully plugs	0.0	0%	22.0	8%
Total	119.5	100%	291.5	100%
Source of Funds	**Acres**	**Percent**	**Acres**	**Percent**
None	0.0	0%	14.4	5%
Watershed fund	119.5	100%	277.1	95%
Total	119.5	100%	291.5	100%

* Watershed Implementation Records.

Table 15: Category wise Investment on Irrigation and Sources of Funds in The study Villages*

Irrigation Investment	Nandkheda		Asarkheda	
	Household	**Percent**	**Household**	**Percent**
None	2	9%	2	8%
Lift irrigation	3	14%	9	38%
Tube well	2	9%	3	13%
Well	14	64%	9	38%
Other	1	5%	1	4%
Total	22	100%	24	100%
Source of Funds for Irrigation facilities				
Watershed earnings	10	50%	2	9%
Own	7	35%	15	68%
Loan	3	15%	5	23%
Total	20	100%	22	100%

* From The Field Survey.

Table 16: Comparison of Pre and Post Watershed Livestock Composition and Income*

Livestock		Nandkheda			Asarkheda		
		Before	Present	% change	Before	Present	% change
Indigenous Bullocks	Number	36	39	8%	23	24	4%
	Income/yr				51,500	142,000	176%
Dairy Cattle	Number	28	29	4%	21	17	19%
	Income/yr				22,000	53,000	141%
Buffaloes	Number				6	7	17%
	Income/yr				25,000		100%
Goats	Number	43	43	0%	7	14	100%
	Income/yr		27,000		4,062	30, 000	639%

* From The Field Survey.

Table 17: Pre and Post Watershed Pattern of Livestock owning households*

LS owned Households	Nandkheda			Asarkheda		
	Before	Present	% change	Before	Present	% change
Bullocks	18	18	0%	12	11	-8%
Cattle	13	13	0%	11	9	-18%
Buffaloes				4	4	0%
Goats	12	13	8%	5	6	20%

* From The Field Survey.

for irrigation purposes. But table no. 9 shows very small increase in the number of wells during the last several years. That means the farmers have to put in their funds to repair and for the maintenance of already existing wells.

For the irrigation investment, 50% households of Nandkheda utilized their earnings from watershed labour (Table 21 indicates 7% of labour earnings going to irrigation) whereas in Asarkheda 68% used their own sources. Proportion of households opting for loan for this purpose is also greater in Asarkheda.

As shown in Table 16, a slight increase in bullock (8%) and indigenous dairy cattle (4%) is observed as far as Nandkheda is concerned. However the number of households owning livestock as per Table 17, has remained the same, except for households owning goats which have increased by 8%. Here the goats constitute the only animal source that provides income in post-watershed era. The number of households owning livestock in Asarkheda has declined, with the exception of households that own goats (increase noted). A decrease is noted in number of indigenous dairy cattle as per Table 16, whereas increase is observed in the number of goats.

However, Table 16 also shows that the livestock is an important source of income in case of Asarkheda and a significant increase in earnings is noted through bullocks, indigenous cattle and goats. An increase in fodder and water availability or modern livestock management practices could have contributed to this. However, buffaloes are the only exception that does not seem to provide any income in post-watershed period.

Table 18 brings out crop diversification as a result of the watershed projects in two the villages. The area under cotton crop has increased by 21% in Nandkheda. Productivity per acre in both the villages has increased by about 75% as compared to the pre-watershed period. The cotton price has gone up significantly as it falls under government monopoly procurement scheme. The area under wheat (a rabbi crop) has decreased by 67% in Asarkheda. Productivity per acre has increased by more than 60% in the post-watershed period.

The area under maize cultivation has almost doubled in Asarkheda resulting in the doubling of productivity per acre and about 70% rise in maize price. Nandkheda shows a minimum area under maize with very little change in the value

Table 18: Post Watershed Changes in cropping Pattern and Production of Study Villages#

Crop Pattern	Nandkheda			Asarkheda		
Cotton	**Before WS**	**Present**	**% change**	**Before WS**	**Present**	**% change**
Area,acre	56	68	21%	110	109	-1%
Prod/acre	9.21	15.95	73%	4.76	8.32	75%
Value	2000	2500	25%	1525	2239	47%
Bajra	**Before WS**	**Present**	**% change**			
Area,acre	38.00	30.50	-20%			
Prod/acre	7.52	11.29	50%			
Value	300	590	97%			
Wheat	**Before WS**	**Present**	**% change**	**Before WS**	**Present**	**% change**
Area,acre	25	22	-12%	3	1	-67%
Prod/acre	7.20	11.69	62%	5.50	10.00	82%
Value	700	1100	57%	550	1100	100%
Maize	**Before WS**	**Present**	**% change**	**Before WS**	**Present**	**% change**
Area,acre	1	1	0%	7	13	86%
Prod/acre	11	15	36%	10.60	22.30	110%
Value	600	700	17%	300	592	97%
Jawar				**Before WS**	**Present**	**% change**
Area,acre				41.20	35.00	-15%
Prod/acre				6.72	10.43	55%
Value				497	1,453	192%

* Column 'Present' depicts the data at the time of the study; # From The Field Survey.

Table 19: Availability of labour work in watershed*

Households	Nandkheda		Asarkheda	
Yes	22	100%	9	38%
No	0	0%	14	58%
No response			1	4%
Total	22	100%	24	100%
Population	**Number**	**Per HH**	**Number**	**Per HH**
No. of labourers	47	2.14	25	2.78
Workdays	11,150	507	2,235	248
Earnings, Rs.	674,000	30,636	100,400	11,156

* From the Field Survey.

of production even after a 36% rise in productivity. In case of Bajra, the area in Nandkheda has decreased slightly even though the production per acre shot up by 1.5 times and the price almost doubled during these years. Similarly area under Jowar has decreased in Asarkheda even after a 1.5 times rise in productivity and almost tripling of the price.

Table 18 overall indicates declining trend of food crops production like Wheat, Bajra and Jowar. This trend is in tandem with the general trend and possibly leading to the rise in prices of these crops. These staple food crops are being replaced by crops such as cotton and maize as well as vegetables and horticultural crops that provide cash income to the farmers. It may also be noted (from table 18) that the increase in productivity of food crops except wheat, is lesser than the increase in productivity of Cotton and Maize crops. That surely points towards farmer's inclination of more inputs/investment in cash crops.

Table 20: Promoter of Labour Work*

Labour Promoter	Nandkheda		Asarkheda	
Self (labourer)	9	41%	0	0%
Supervisor	13	59%	3	13%
Engineer	0	0%	6	25%
No response			15	63%
Total	22	100%	24	100%

* From The Field Survey.

Table 21: Expenditure Pattern of Labour Earnings*

Expenditure Pattern	Nandkheda	
	Amount Rs	Percent
Earnings, Rs.	**674,000**	100%
House	45,000	7%
Irrigation Facility	45,000	7%
Livestock	5,000	1%
Debt Recovery / Repayment	315,000	47%
Health	76,000	11%
Education	39,500	6%
Food/clothes	48,500	7%
Marriage/ festival	40,000	6%
Savings	60,000	9%

* From The Field Survey.

Table 22: Use of Machine in Own Farm*

Machine use in own farms	Nandkheda	Asarkheda
Yes	18	19
No response	4	5
Bunding work		1
Ploughing		14
Threshing	18	4

* From The Field Survey.

As depicted in Table 19, in Nandkheda 100% sample households (22) offered to work as labourers during the project period, whereas in Asarkheda, only 38% people said they were employed. Nandkheda project generated about 507 person days of labour work for each household while Asarkheda project generated 248 person days of labour work for each household during the entire project implementation period. The earning through labour per household is also substantially higher in Nandkheda (Rs. 30,636) than in Asarkheda (Rs. 11,156). This might be due to the use of machinery such as tractor and bulldozer to undertake watershed works in Asarkheda village in place of labourers.

As far as the motivation of villagers to work on the watershed project is concerned, it is clear that in Nandkheda, 41% households were self-motivated and watershed supervisor (trained local youth) mobilized 59% households to work as watershed labourers. Such self-motivation is completely absent in Asarkdea with 63% households not responding to the question (Table 20). It is clear that the people did not prefer that type of work in watershed even

Table 23: Pre and Post Watershed Average Income per Household- season-wise amount*

Average income per household-Amount Rs. Nandkheda		Nandkheda			Asarkheda		
		Pre-WS	Present	% change	Pre-WS	Present	% change
Food crops	Kharif	2,243	6,805	203%	6,206	16,022	158%
	Rabbi	4,993	11,344	127%	4,389	9,316	112%
Cash crops	Kharif	20,000	38,750	94%	16,778	45,933	174%
	Rabbi				8,571	32,900	284%
Wage labour in the village	Kharif	1,500	2,250	50%	2,333	13,000	457%
	Rabbi	-	1,000		2,667	15,500	481%
	Summer				2,500	16,000	540%

*From The Field Survey.

Table 24: Average Income per Household- Number of Household*

Average income per household- HH nos.	Nandkheda			Asarkheda		
Food crops- Kharif	**Before**	**Present**	**% change**	**Before**	**Present**	**% change**
Less than Rs. 2000	14	0	-100%	5.0	1.0	-80%
Between Rs. 2000-5000	6	12	100%	6.0	5.0	-17%
Between Rs. 5000-10000	1	5	400%	4.0	5.0	25%
Greater than Rs. 10000		4	infinite	2.0	7.0	250%
Food crops- Rabi						
Less than Rs. 2000				9.0	1.0	-89%
Between Rs. 2000-5000	6		-100%	6.0	6.0	0%
Between Rs. 5000-10000	6	6	0%	1.0	5.0	400%
Greater than Rs. 10000		10	infinite	2.0	7.0	250%
Cash crops- Kharif						
Less than Rs. 10000	1		-100%	8.0	3.0	-63%
Between Rs. 10000-25000	16	1	-94%	6.0	3.0	-50%
Between Rs. 25000-50000	2	16	700%	4.0	8.0	100%
Greater than Rs. 50000		1	infinite		7.0	infinite
Cash crops-Rabi						
Less than Rs. 10000				5.0	2.0	-60%
Between Rs. 10000-25000				2.0	5.0	150%
Between Rs. 25000-50000				-	1.0	infinite
Greater than Rs. 50000				-	2.0	infinite

* From The Field Survey.

though they had an opportunity to work as labourers. Whoever has worked as a labourer has been mobilized mostly by the engineer and then the watershed supervisor in Asarkheda.

In the case of expenditure of earnings from labour work in watershed projects, the earnings of labourers in Asarkheda is minimal, hence there is no response to this question. Table 21 reveals that the households in Nandkheda spent a major portion (47%) of their labour earnings on repayment of debt to moneylenders and other non-institutional sources, mainly the traders and

Table 25: Debt Pattern of Pre and Post Watershed of The Villages*

Loan pattern	Nandkheda			Asarkheda		
	Before	Present	% change	Before	Present	% change
Number of HH	5	3	-40%	6	9	50%
Bank	1	1	0%	3	5	67%
Moneylender	4	2	-50%	3	4	33%
Agriculture purpose	2	1	-50%	5	8	60%
Marriage/Festivals	1	2	100%	1	1	0%
Housing purpose	2		-100%			

* From The Field Survey.

Table 26: Village wise Participation in Watershed Programme*

Household Participation in Watershed Programme	Nandkheda		Asarkheda	
No participation	0	0%	14	58%
Participated as VWC member	8	36%	4	17%
Participated in meetings	0	0%	1	4%
Participated through other means	14	64%	0	0%
Passively participated	0	0%	2	8%
No response			3	13%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 27: Involvement in Other Village Organization*

Involvement in other village organisation	Nandkheda		Asarkheda	
None	0		18	75%
SHG member	22	100%	3	13%
Gram Panchayat member	0		1	4%
No response			2	8%
Total respondants	22		24	100%

* From The Field Survey.

Table 28: Participation in Soil and Water Conservation Measures*

Household participation in SWC	Nandkheda		Asarkheda	
No participation	0	0%	2	8%
Voluntary Labour (Shramdan)	20	91%	3	13%
Private investment on own land	0	0%	6	25%
Contribution to overall cost (cash or kind)	0	0%	11	46%
Plantation on own land	1	5%	1	4%
Other	1	5%	1	4%
Total respondants	22	100%	24	100%

* From The Field Survey.

relatives. Rest of the expenditure is spread over health, house construction, consumption items like food and clothes, education of children and celebration of festivals and marriages. Only 7% of the income is invested on increasing irrigation facilities followed by notional investment on livestock development. Few households did save about 9% of their labour income.

Table 29: Value of Local Contribution*

Value of Local contribution (Rs.)	Nandkheda		Asarkheda	
Nil	0	0%	2	8%
Less than Rs. 1000	0	0%	12	50%
Between Rs. 1000 to Rs. 5000	14	64%	8	33%
Between Rs. 5000 to Rs. 10000	6	27%	1	4%
More than Rs. 10000	2	9%	0	0%
No response			1	4%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 30: Plan of Continuation of Soil and Water Conservation*

Plan for SWC continuation	Nandkheda		Asarkheda	
Not planned	8	36%	11	46%
Do not know		0%	1	4%
Use less water	2	9%	4	17%
More stall feeding of livestock	0	0%	3	13%
Maintenance of works on own land	10	45%	1	4%
Contribute to maintenance of common land	1	5%	0	0%
Combination of above	1	5%		0%
Other		0%	1	4%
No response			3	13%
Total respondants	22	100%	24	100%

* From The Field Survey.

As far as the use of machine in own farms is concerned, in Asarkheda, 19 out of 24 respondents (Table 22) said that they were consulted for, and agreed to, the decision of using machinery for watershed works. About thirteen households are satisfied with the quality of works implemented by using machinery. About 80% households in both the villages use machinery for farm operations on their farms. Asarkheda farmers use mostly tractor for ploughing of land while Nandkheda farmers use threshers for threshing the crop harvest.

In Asarkheda, there have been substantial increases in the average income of households with respect to cultivation of food crop as well as cash crops during the two seasons (Table 23). The same trend is observed with wage labour in watershed. In Nandkheda, the rise in income from food crops in both kharif and rabbi seasons are significantly higher than in Asarkheda. But the increase in income from cash crop is lower than in Asarkheda and is restricted only to kharif season. Although the increase in income from wage labour in Nandkheda village is noted, it is not as impressive as in Asarkheda. This might be attributed to the increased production of cash crops in Asarkheda leading to more availability of wage labour within the village. It is observed that labourers from Nandkheda are currently working in stone quarries in and nearby villages.

In both the villages the positive trend is observed as seen in table no. 24 with respects to shift in the number of households that earn more income (from food and cash crops) as well as increase in range of earning (for e.g. from range of Rs. 2000-5000 to the range of more than Rs. 10,000). This trend is observed to be better in Asarkheda as compared to Nandkheda.

As far as debt pattern in Nandkheda in post-watershed period is concerned, there has been decline in the number of persons that have taken loans, where as Asarkheda an increase is noted in the number of persons taking a loan and as larger number of persons approach banks for loans

Table 31: Extent of Interest of Villagers in Watershed Management*

Extent of interest in Watershed Management	Nandkheda		Asarkheda	
Not interested at all	2	9%	1	4%
Not very interested	0	0%	2	9%
Somewhat interested	15	68%	3	13%
Fairly interested	1	5%	0	0%
Very interested	4	18%	16	70%
No response			1	4%
Total respondants	22	100%	23	100%

* From The Field Survey.

Table 32: Level of Awareness of Villagers about Land Degradation of Common Land*

Extent of interest in Watershed Management	Nandkheda		Asarkheda	
Very degraded	1	5%	4	17%
Fairly degraded	4	18%	0	0%
Somewhat degraded	11	50%	10	42%
Not very degraded	1	5%	4	17%
Not degraded at all	5	23%	4	17%
No response			2	8%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 33: Reasons for Common Land Degradation*

Reasons for degradation of common land	Nandkheda		Asarkheda	
Overgrazing	5	23%		0%
Deforestation	11	50%	7	29%
Destruction by some people	4	18%	12	50%
Conflicts in the community	1	5%		0%
Lack of rules and regulations	1	5%	1	4%
No response			4	17%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 34: Suggested Means of Reducing Degradation*

Options to reduce degradation of common land	Nandkheda		Asarkheda	
Do not know	1	5%		0%
Reduce number of livestock	5	23%	2	8%
New rules and regulations	3	14%	10	42%
Fencing	1	5%	2	8%
Higher penalties for breaking rules		0%	6	25%
More watchmen	11	50%		0%
Other	1	5%		0%
No response			4	17%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 35: Level of Awareness of Villagers about Water Resource Depletion*

Extent of water resource depletion	Nandkheda		Asarkheda	
Almost depleted	4	18%	2	8%
Considerable depletion	4	18%	9	38%
Seasonal depletion	13	59%	6	25%
Irregular scarcity problem	1	5%	3	13%
No problem with water availability	0	0%	1	4%
No response			3	13%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 36: Reasons for Water Resource Depletion*

Reasons for water resource depletion	Nandkheda		Asarkheda	
Too many bore wells	5	23%	3	13%
Natural reasons like bad monsoon	13	59%	16	67%
Overpopulation	1	5%	1	0%
Over use by some people	3	14%	1	4%
Negligence by the government		0%	1	4%
Conflicts in the community		0%	1	4%
Lack of water storage and conservation		0%	1	4%
No response				4%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 37: Suggested Means of Reducing Water Depletion*

Options to reduce the water resource depletion	Nandkheda		Asarkheda	
Do not know	1	5%	2	8%
Increased water storage and conservation	11	50%	4	17%
Ruels and regulations	2	9%	1	4%
Ban on borewells	4	18%		0%
Ban on certain crops	1	5%	9	38%
Reforestation	3	14%	5	21%
No response			3	13%
Total respondants	22	100%	24	100%

* From The Field Survey.

particularly for agricultural purpose (Table 25). The following tables indicate the opinion and perceptions of the respondents with regard to participation, leadership, village institutions and resource status in their respective villages. These perceptions are important and indicate the level of awareness and participation of respondents with respect to different concepts and issues in natural resource management.

With respect to the level of participation (table no. 26), it is far better in Nandkheda than in Asarkheda. Nandkheda people have mostly participated by way of actual labour force and in VWC meetings. In Asarkheda almost 66% have not participated (no or passive participation).

With regard to the involvement in village organizations other than watershed committee, the situation is better in Nandkheda as 100%

Table 38: Perception about Benefits of Watershed Development by Households*

Household benefits of watershed development	Primary Benefits				Weighted ranking- all together			
	Nandkheda		Asarkheda		Nandkheda		Asarkheda	
No benefit	0	0%	3	13%	0	0%	15	10%
Employment	8	36%	10	42%	26	20%	30	21%
More water in wells/borewells	4	18%	3	13%	26	20%	9	6%
More soil moisture	1	5%		0%	4	3%	0	0%
Better availability of drinking water	1	5%	1	4%	3	2%	3	2%
Crop production increment	2	9%		0%	12	9%	9	6%
Water availability	5	23%		0%	37	28%	18	13%
Land improved	1	5%		0%	17	13%	0	0%
No response		0%	7	29%	6	5%	60	42%
Total respondants	22	100%	24	100%	131	100%	144	100%

* From the Field Survey.

Table 39: Distribution of Watershed Benefits*

Distribution of watershed benefits: Main beneficiaries	Nandkheda		Asarkheda	
Everybody gained equally	5	23%	2	8%
Landowners near nalla	12	55%	8	33%
Landowners downstream	2	9%	9	38%
Landowners with wells/ borewells	3	14%	3	13%
No response			2	8%
Total respondants	22	100%	24	100%

* From the Field Survey.

sample households have participated in SHGs and in Asarkheda, 75% are not involved in any of the village level organizations (Table 27).

About 91% of the households in Nandkheda, participated in soil and water conservation activities by way of Shramdaan through actual labour work (Table 28), while only 5% of the households undertook plantation on their farms. Contribution to overall cost by households in terms of cash or kind is highest at 46% in Asarkheda followed by private investment on own land whereas voluntary labour is only 13%. Nandkheda saw about 36% of the households contributing more than Rs. 5000, while 64% of the households contributed between Rs. 1,000 and Rs. 5,000. This came mostly by way of actual voluntary labour i.e. Shramdaan (Table 29).

The value of local contribution in Asarkheda in case of 58% of the households is very nominal i.e. less than Rs. 1000 and even nil. Only 4% of the households have made contributions worth between Rs. 5,000 and Rs. 10,000. This pattern leads to far lesser local contribution than required. Contrary to this, Asarkheda project has achieved (22%) and in fact exceeded the required amount (19%) of local contribution (Table 5) during the project period. This brings out the possibility that machinery owners', being the ones who are the sources of required value of local contribution, though this has not been verified.

As per Table 30, Nandkheda people insist mostly on maintenance of SWC works on their own land (45%) followed by use of less water (9%) and contribution to maintenance of common land (10%). In contrast to this, Asarkheda community is mostly (59%) found to be unaware about the need of maintenance though 17% and 13% of the households talk about use of less water and stall-feeding of livestock instead of free grazing respectively. About 8% of the households think of maintenance of private land treatments.

Asarkheda people indicate much higher interest (70%) in the watershed management and

Table 40: Attendance in the Village Meetings*

Do not attend meetings	Nandkheda		Asarkheda	
Do not attend meetings	4	18%	6	25%
Gram Panchayat meetings	18	82%	2	8%
Water user association meetings	0	0%	3	13%
Watershed committee meetings	0	0%	12	50%
No response			1	4%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 41: Capability to Influence the Decisions in the Meetings*

Capability to influence the decisions in the meetings	Nandkheda		Asarkheda	
Not at all	15	68%	8	33%
Sometimes, depends on issue	1	5%	10	42%
Can influence considerably	6	27%	4	17%
No response			2	8%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 42: Perceptions of Villagers about Functioning of Village Representatives*

Functioning of village representatives in interest of people	Nandkheda		Asarkheda	
Do not know		0%	1	4%
To a certain extent	2	9%	1	4%
In most cases	8	36%	14	58%
Improving the welfare of all	12	55%	7	29%
No response			1	4%
Total respondants	22	100%	24	100%

* From The Field Survey.

Table 43: Working with Employment Guarantee Scheme*

Worked under Employment Guaranttee Scheme in last year	Nandkheda		Asarkheda	
No	15	68%	20	83%
Less than 2 weeks	0	0%	1	4%
More than 2 weeks	7	32%	2	8%
No response			1	4%
Total respondants	22	100%	24	100%

* From The Field Survey.

at the same time showed no interest (17%). There exists bigger number of households showing extreme opinions in Asarkheda as against Nandkheda, wherein people show mid-position (73%) with regard to the interest. Following three tables (Table 32, 33 and 34) bring out the opinions of households with regard to the extent and reasons of degradation of common land in the villages and also the possible options to overcome the degradation. Nandkheda people accept some degradation with a large majority and believe deforestation to be the prime reason

for this, followed by overgrazing. They suggest appointing more watchmen and reducing the number of livestock to control further degradation than the self-control over it.

People in Asarkheda think of similar type of degradation but hold destruction by some people followed by deforestation as responsible for this state or affairs. They want to create new rules and regulations and mechanism to enforce them in order to reduce degradation. In this case the voluntary model of ban on various activities such as felling of trees and free grazing of cattle will be more useful than the introduction of new rules and appointing watchmen.

Following three Tables 35, 36 and 37 express the opinions of households with regard to the extent and reasons for depletion of water resources in the villages and also the possible options to stop further depletion of these resources. Nandkheda community opines that water resource depletion is mostly a seasonal phenomenon and happens due to natural reasons. Some people accept that depletion exists due to increased number of wells and tube-wells leading to overuse of water by some people. According to them, increasing the storage of rainwater and a ban on tube-wells/ wells would reduce the rate of depletion. Further the water use efficiency by way of shifting towards micro irrigation practices could be a proper solution on preventing the depletion of water resources in the vicinity.

Asarkheda community has rather mixed opinions about the water depletion with 46% accepting absolute depletion, 25% putting this as seasonal and 13% indicating irregular scarcity instead of depletion. They also link this water depletion with bad monsoons and to too many water extraction points ban on certain high water consuming crops and reforestation are main mechanisms thought out by them to control depletion followed by increased rainwater harvesting.

Table 38 and 39 indicate the benefits of watershed development projects and their distribution as perceived/ understood by the households. Both the villages perceive employment and water availability (including groundwater) as primary benefits of the project. The weighted average of data on primary, secondary and tertiary benefits as perceived by households confirm these benefits for Asarkheda but brings out water availability as the main benefit for Nandkheda villagers. Asarkheda people negating employment as prime benefit is surprising particularly in the light of the project records showing lesser employment generation for labourers. This probably is because of 29% of the households did not respond to the question at all. About 10% of the households mention that they have not felt that they have derived any benefit from the project.

With respect to the distribution of benefits, both the villagers mention that watershed benefits accrued largely to the downstream landowners with access to 'nalla'. About 23% of the households in Nandkheda feel that it benefited everybody equally. About 14% of the households in both the villages attribute the benefits to the well owning farmers.

The next tables indicate the outcome of the capacity building strategies followed during the project implementation and management. Nandkheda people usually attend most of the meetings called by the Gram Panchayat such as Gramsabha but only about 32% believed they could influence the discussions at these meetings. In Asarkheda, the watershed committee seems to be more active and 50% of the households participate in the meetings called by VWC (Table 40). Majority of the households feel that they can influence the issue-based discussions. About 18% from Nandkheda and 25% from Asarkheda do not attend any of the village meetings (Table 40).

In both villages, people believe that their leaders generally work in the interest and welfare of all the villagers (Table 42). About 32% of the households worked under EGS works for more than 2 weeks in Nandkheda as against the 12% of the households of Asarkheda during the last year (Table 43).

4. Policy implications

Applicability of policy framework provided for use of machine in watershed development programmes depends mainly on the condition of local community at the time of inception of the project. The pre-project situation of the village in consideration needs to be established by understanding; 1) socio-physical situation from

diverse perspectives such as socio-economic, political, cropping pattern, income and debt patterns, migration and infrastructure, communication and available extension facilities and 2) level of awareness and knowledge in the community about sustainable management of natural and human resources and long term goals of their own development. Also the situation analysis needs to be extended beyond the project villages to the whole cluster in the vicinity so that needy and poor are benefited from the watershed project.

Therefore, merely considering the availability of labourers as a basis for choice of machine-use in watershed would be disastrous. When the local community and the agencies involved in the project are crystal clear about this situational understanding then their decisions on implementing the watershed project through labour or machine will lead to cost effectiveness, appropriate employment opportunities, sustenance of the post-project benefits and more equitable distribution of the same.

5. Final remarks

Baseline situation of a village in pre-project period is determinant of the outcomes of the watershed interventions. Nandkheda initiated the watershed project in a situation of heavy debts largely from informal credit sources and people heavily dependent on the occupations other than agriculture. In the pre-watershed situation, agriculture in Nandkheda provided occupation for hardly 45% of the people even in kharif and rabbi seasons and nil in summer as against this more than 80% of the people in Asarkheda throughout the year. Nandkheda had cultivable wasteland up to 13% and irrigation potential of hardly 1% during 1995-96, while Asarkheda showed 4% cultivable waste land and 4% irrigation at that time. Water harvesting potential of Nandkheda seems to be lower than that of Asarkheda resulting in no check dam and earthen nalla bunds in Nandkheda as against 11 in Asarkheda. They were also involved in cottonseed plots that provide high-income opportunities to the farmers. This baseline situation of Asarkheda suggests that they were well equipped to undertake progressive farming even at the time of the beginning of the watershed project. Even today, Asarkheda village is in a better position than Nandkheda in terms of proximity and access to facilities like health, higher education, credit institutions, agriculture extension and political establishments. The forgoing analysis suggests that the pre-project situation influences the process of project implementation as well as the extent of impacts achieved.

The watershed intervention in Nandkheda generated about 1,06,151 labour days with total income of Rs. 58.48 lakh for the watershed labourers. The pattern of expenditure of income earned by these labourers brings out clearly that they have spent most of their income on debt repayment and consumption expenditures leaving a very meager amount for capital investment. This possibly has not led to the expected cascading effect on household income. It has brought the labourers back to the situation where they are still in need of labour employment from outside sources. People are working as labourers on stone quarries and road construction and the migration pattern is constant even after the watershed project is completed. Households have not been approaching banks or any other formal credit institutions for loans for capital goods or income generating activities. The committee mentioned that women SHGs are borrowing from banks, but this is not reflected in the household responses. The SHG loans are mainly for inputs for crops and consumption. The study reveals that providing wages to the watershed community does not automatically ensure the creation of employment or livelihood opportunities on the long-term basis. The project investment going in the hands of community needs to be deliberately mobilized towards capital investment for more sustainability.

In case of Asarkheda, about 70% of unskilled labour cost, that is, Rs. 16 lakh, is spent on use of machinery to create farm bunds combined with the farm roads. The machines are also used to carry stones for outlets. Rest of the work, such as continuous contour trenching (CCT), loose boulder structures, gabions and earthen nalla bunds were constructed with the help of labourers combined with machine for transportation of material. The technical quality of farm bunds erected in terms of cross-section, shape and alignment is slightly better where machines were used than in manual labour

works. According to VWC of Asarkheda, they decided to use machinery instead of labourers only after the experience of having very limited number of labourers on work during the first year of implementation of the project programme. The farmers have to go for dry seeding of crops in the month of May due to non-availability of labourers in the village. Only after offering the labourers the first chance of employment on watershed work, were machine used. Considering that no labour migrations incidence was noticed, and a comparatively better pre-project situation as well as capacity building of almost a quarter of the entire project period utilized towards labour mobilization. Asarkheda's decision of employing machine in the place of labourers seems justified. Given at the significant changes in the household income, crop productivity and water availability, the investment in watershed project even by way of machine use is feasible.

Cost per hectare is higher in Asarkheda as compared to that in Nandkheda. It is mentioned by the VWC of Asarkheda that machine work is cheaper than the labour cost with lesser management skills required. This does not seem to reflect from the cost per hectare incurred on area treatment. The analysis also clearly brings out the fact that the cost per hectare for crop cultivation in Asarkheda is Rs. 3,362 where mostly the machine were used as against Rs. 2,819 per ha for crop cultivation treatments in case of Nandkheda. The duration of project implementation is similar in both the cases even though Asarkheda got project investment of only about 45% of what Nandkheda has invested. The area treated is also only 36% of the total treated area in Nandkheda. The proportion of project management cost to the project measures cost is 21.5% in Nandkheda as against 26.1% in Asarkheda. Normally machine works are advocated to save cost and time of implementation saying that it is cheaper and faster to work with machine than with labourers. The study reveals that this assumption is not true in case of the study villages studied. Besides this, the cost of administering the project is higher in machine watershed than in labour watershed.

Most of the farming households make use of machinery for ploughing in Asarkheda and for threshing in Nandkheda. Nandkheda watershed committee has purchased a tractor along with farm equipments through bank loan by using its maintenance fund as guarantee of repayment. The committee hires out the tractor to the farmers for different farm operations. It maintains the watershed activities each by using the profits earned by the tractor. This is not reflect in the responses of the households and there is a question-mark on the successful functioning of the tractor hiring system even though the committee says it has repaid the loan completely. The reduced opportunity of work for agricultural labour in the kharif and rabbi season, a lower promotion of labour-intensive cropping pattern and at the same time increased farm mechanization in post watershed period have significant interrelationship. Labour intensive crops like onion, tomato etc. have the potential of creating more labour as compared to water-intensive cash crops like sugarcane, banana etc. Labour replacing technologies such as an increased number of tractors, threshing machines in the post-watershed phase are also playing a role in the reduced employment opportunities (Kerr *et. al.* 2000)

The participation and Ownership of the local community in any intervention is very crucial so as to sustain the outputs and outcomes of such interventions. In watersheds, this can be measured in terms of the level of awareness among the community with regard to concepts and issues in natural resource management. The watershed works continuously for 4-5 years, by involving the community as labourers, brought practically everybody in Nandkheda on-board in watershed project. Execution of technical treatments on ground, measurement and payment systems involving financial management by VWC and continuous churning of difficulties and issues in the meetings established and ensured a higher level of participation the people in Nandkheda in the project as compared to Asarkheda. The people also put in their labour as Shramdaan leading to more transparency in the project. Asarkheda shows a higher proportion of local contribution which does not reflect in the household-wise Shramdaan. People here have contributed very minimal in terms of their own source (labour) as against the larger value of household wise Shramdaan in Nandkheda. Hence it does it is not surprising to see lesser awareness in Asarkheda

with regards to contributing to the goal of maintaining the natural resources that are of common interest. Conflicting opinions among the people of Asarkheda about watershed may be the reason for this type of outcome as some villagers were in favour of programme whereas some were not. The reason for conflicting opinions of villagers might lie in their exclusion and/or inclusion in the process of implementation. It also reflects in lesser participation by Asarkheda people in the common meetings as compared to Nandkheda. Hence it is necessary to have all-inclusive policy for the overall success and sustainability of the project. The habit of thrashing out the developmental issues and problems through democratic processes and discussions in meetings is developed in a project like Nandkheda where human dynamics was a major part of implementation process.

Common pool resources (CPR) issues such as degradation of community land and depletion of water resources are part and parcel of community residing in the watershed areas. Asarkheda people sound instances of destruction by some people while Nandkheda brings out deforestation and overgrazing as major threats to the common land. With regard to water resource depletion, both the villagers attribute it to bad monsoon and believe it can be tackled by a ban on tube wells and high water requirement crops.

6. Scope for future research

The future line of research in the area demands undertaking policy research on the one hand and the project evaluation research on the other. Therefore, the areas of research in this direction may be; 1) Capacity assessment and utilization evaluation and the value of resources generated by watershed, 2) The impact of watershed on environmental and climate change, mitigation and adaptation, 3) Conflict between upstream and downstream villages of watershed, 4) Watershed and its linkages with rural poverty and 5) Watershed and the gap between rich and poor.

Abbreviations

CBO = Community Based Organization

FIP = Full Implementation Phase

FSR = Feasibility Study Report

GoM = Government of Maharashtra

HDI = Human Development Index

IGWDP = Indo German Watershed Development Programme

MSSM = Marathwada Sheti Sahaya Mandal

NABARD = National Bank for Agriculture & Rural Development

NGO = Non Government Organization

NREGS = National Rural Employment Guarantee Scheme

NT = Nomadic Tribes

PCR = Project Completion Report

PHC = Primary Health Centre

SC = Schedule Caste

SHG = Self Help Group

SMS = Samyukta Mahila Samittee

ST = Schedule Tribe

WOTR = Watershed Organization Trust

References

AFC-Agricultural Finance Corporation Study (1998-99).

Kharel, B.B. (1996) PWMTA-FARM Field Document No.7, Proceedings of Asian Regional Workshop Organized by the PWMTA, Netherlands/UNDP/FAO,GCP/RAS/161/NET.

D'Souzar, Marcella (1997) Gender and Watershed Development, Ag. Ren, p. 3/13.

Deshpande, R.S. and Reddy, V.R. (1991) Differential Impact of Watershed-Based Technology: Some Analytical Issues, *Indian Journal of Agricultural Economics*, 46(3): 261.

Gunawardena, E.R.N. and Jayatilake, H.W.K. (1996) PWMTA-FARM Field Document No.7, Proceedings of Asian Regional Workshop Organized by the PWMTA, Netherlands/UNDP/FAO,GCP/RAS/161/NET.

Ghulam, Habib (1996) PWMTA-FARM Field Document No.7, Proceedings of Asian Regional Workshop Organized by thePWMTA, Netherlands/UNDP/FAO,GCP/RAS/161/NET.

GoI, (2005) National Rural Employment Guarantee Act (NREGA) - A User's Guide.

GoM, Dept. of Rural Development and Water Conservation (Jul 2006) Government Resolution on Vidharbha Panlot Mission and Working guidelines of Marathwada Panlot Mission.

ICRISAT (2007) Guidelines for Planning and Implementation of Watershed Development Programme in India: A Review.

Kerr, *et al.* (2000) An evaluation of dry land watershed development projects in India, EPTD discussion paper No. 68, International Food Policy Research Institute.
Kovit Punyatrong,(1996), PWMTA-FARM Field Document No.7,Proceedings of Asian Regional Workshop Organized by the PWMTA,Netherlands/UNDP/FAO,GCP/RAS/161/NET
Lu, Shengli (1996) PWMTA-FARM Field Document No.7, Proceedings of Asian Regional Workshop Organized by the PWMTA, Netherlands/UNDP/FAO,GCP/RAS/161/NET.
Moujahed, Achouri (2003) Next Generation of Watershed Management Programes: Objectives and Expected Results,XII Forestry Congress, p. 2.
NABARD (1996) Feasibility study report of Asarkheda by MSSM.
NABARD (1996) Feasibility study report of Nandkheda by Nirman.
NABARD (2001) Project Completion Report (PCR) of Asarkheda, MSSM.
NABARD (2001) Project Completion Report (PCR) of Nandkheda, Nirman.
Sharma, R. (2002) Watershed Development: Adaptation Strategy for Climatic Change, South Asia Expert Workshop: Adaptation to Climate Change for Agricultural Productivity, Organized by UNEP, CGIAR & GoI.
Tin, U. SweLatt (1996) PWMTA-FARM Field Document No.7, Proceedings of Asian Regional Workshop Organized by the PWMTA, Netherlands/UNDP/FAO,GCP/RAS/161/NET.
WOTR, Operations Manual on Watershed Management.