Intervention:	**Mankadamundi Watershed** by AGRAGAMEE
Country:	India
Date:	1999 - 2004
Challenge:	The major problem the people from Mankadamundi had to face was that about 80% of the monsoon rains were lost as runoff. The farmers had only one crop a year (either up-land rice or millet or maize) and no water for irrigation. Especially at the time of flowering and grain setting stage of up-land rice there is no water for a period of one week to 3 weeks. That led to high yield losses, sometimes between 50-60%. When there was no rain at all during the critical period, the farmers even had total crop losses and could not earn enough income to make an adequate living. More over the eco-system is fragile and degraded due to massive shifting cultivation. Due to high slope percentage (30%), inadequate land use and intensive rainfall the soil erosion and degradation of arable land are very high (80% of the arable land of the watershed is in the upland category). So when there was nothing to do on the field, mainly the working force (men and youth) migrated to urban areas to earn some money. Sometimes more than half of the village population migrate to neighbouring towns in search of livelihood in search of livelihood, except the cropping season (June- Nov).
Approach of the Intervention:	To implement small-scale irrigation schemes and conservation activities Agragamee wanted to use the existing local knowledge of the villagers. Traditionally the people from the village used the run-off from the hillsides to grow wetland rice in the valley bottom land. But only less than 10% of that cultivated land was used for irrigation in the traditional way. Staff from Agragamee said that it is possible to implement the technique in a bigger area in the up-lands and medium lands to provide water to crop field covering more area and more farmers. They did so and now after the project additional 63 ha of land used for up-land rice, millets and vegetable cultivation (in medium lands) with protective *kharif* irrigation. The techniques Agragamee implemented together with the villagers in the (hilly) very sloppy area of the watershed were contour stone bunds and staggered trenches to harvest rainwater. In between the contour bunds the villagers planted cashews and Jafra to conserve the soil and have additional harvests. Sometimes they plant Arhar in between the bunds. Due to the high speed of rainwater that is coming down in the stream, the villagers additionally built a check dam with the support of Agragamee mainly to reduce the speed of water and harvest it for the crop fields. But, due to height difference (nearly 30 ft.) between the check dam in the stream and the land to be irrigated, they use a diesel pump to lift the water for the crop fields. The water is distributed through a graded channel with a gentle safe slope of 0.5% at highest possible contour to the uplands, medium lands and allowing to flow from field to field. As a result a longer flow path created for the runoff (water), which increases the time that it takes to finally go out of the watershed. The longer it stays within the watershed, the greater is the infiltration and the better is subsurface storage, surface water flow and distribution also. Ultimately it resulted in raising the soil moisture level both in up and medium lands along with recharging dug wells and ponds in the lower ridge. The farmers regulate water distribution by using wooden planks. In case of excess water let it flow down to the stream again. This process increases infiltration and seepage, which leads to increase soil moisture in the fields. **Watershed Users Society (WUS)** One of the important and initial things that emerged out of Agragamee´s activities was the establishment of a Watershed Users´ Society (WUS) in the village, which governs the watershed development activities. The WUS is self-governed and registered watershed under society registration act 1860

	having an executive body. These types of institutions are built upon the social structure and culture within the region earlier and work well, which is a tested and trusted method of watershed governance. The watershed users´ society in the Mankadamundi watershed used to collect money from the beneficiaries who are using the pump and water, which goes to the maintenance fund. The amount of money depends upon the crop, e.g. aprox. Rs 400 to 500 for 1 ha of rice and approx. Rs 100 for 1 ha of millet. WUS controls the irrigation water, repairs and maintains the dam and the pump house. During the project period Agragamee has created trained barefoot engineers to maintain & repair the pump and the canals voluntarily because they are beneficiaries. In case of complex repair, WUS takes the help of outside pump mechanic with payment from the watershed users´ society fund. A part of the money from the sale of Jafra (seeds of this plant used for natural colour dye) and Cashews goes to the maintenance fund of the WUS. The villagers run a nursery for mangos, litchis and papaya, drumstick. The land was given to the WUS by the Government. The watershed users society registered in the year 2004 under societies registration act 1860. The WUS has a training centre in the village for training and capacity building of the watershed users society members, women folk and barefoot engineers for different watershed activities. Here watershed and community meetings are held and the children are taught. The training centre was built by Agragamee during the project period and after the project handed over to the community. The WUS have an account with a cash deposit of Rs 60, 000. A portion of the money uses for drinking water project in the year 2004 in collaboration with the district administration of state Government. The WUS electrified their village with the state Govt. support in the year 2005 by meeting the villages' share (in shape of cash) from the wus account.
Benefits and Impacts:	Through the watershed activities the yields on the fields increased. That led to an improved nutrition status, especially for children. The land is now protected from drought with assured irrigation. The people do not have to migrate anymore. Shifting cultivation was given up. Larger farmers rent out the land to the landless for sharecropping. That is a traditional habit of the tribal population. But before the project the farmers did not rent out land because of low productivity and no irrigation facilities and less attention to the crop field. Now the farmers can irrigate their lands and are thus more productive and needs intensive cultivation practice and time to look after their lands. So they rent out the rest of the land to the landless farmers with a mutual understanding in the WUS. Thus in the process 6 landless people got the chance to earn income within the village and do not have to migrate anymore. The farmers now have higher income. They improved their houses (from Kacha to Stone houses); they bought bicycles, radio, clothing (now they can buy winter cloth and spending money for better heath) and cooking utensils. Market access increased due to sale of their agriculture produced in the near market. Thus the interaction with other people from other areas improved. (Communication, information).

Table: Benefits of the project

Benefits	Before the project (in the year 1999)	After the project (in the year 2004)
Availability of Irrigation water in Rabi (winter) and summer	2 ha	15 ha
Yield of upland rice	7.5 quintal/ha	20 quintal/ha
Number of families growing Rabi crops	9	32
Winter and summer season net income per family (8monts)	Rs 2000-3000	Rs 10,000-15,000
Vegetable consumption	very less	perceptible
Summer rice (dry season)	nil	3 ha

Crop diversification: Now the farmers are growing vegetables both in rainy and winter seasons, e.g. onion, chilli, cauliflower, tomato. They consume them and sell the rest.

Enhancement in food security

Before watershed in the year 1999	After watershed in the year 2004
Only 30% of people were getting food for year round No sufficient employment was available for wage earning due to drought. Wage employment was available only for about 50 days in a year. No grain bank was available for food security – 30% of families were getting food all round year, 40%getting food for 6 months and balance 30% getting for 4 months only. Soil erosion and water stress was severe in 60% of land. Due to low water table during summer months drinking water wells were dried up and people were depending up on the adjoining streams.	70% of families get food all round the year and balance 30% get for at least 7 months. Now the wage employment increased to 200 days in a year Because of formation of grain bank food security was ensured – Soil erosion and water stress was reduced to 20%. Due to raise in water table drinking water is available in the wells during summer months.

Environmental Benefits:

30% of the families were engaged in shifting cultivation. This is a traditional custom of the tribal population within the area. Because of more intensive cultivation people abandoned the shifting cultivation – reduced to 5% of families. Thus the protection of the forest area increased due to stop of shifting cultivation and cut and selling forest timber.

40% of the families depended on (unauthorized) felling of trees for timber and firewood. Dependence on forest was reduced due to increased income from agriculture, which indirectly leads to forest protection and regeneration.

Moisture retention was limited to a maximum of 20% precipitation. Retention of moisture has been increased to 40% of precipitation. Moisture regime improved in the watershed areas - thereby greenness in adjacent forest area is noticed.

Other Impacts

The Society has a bank account with a balance of around Rs (Indian Rupees) 60,000. It used some of its savings to pay for a drinking water project in 2004 in collaboration with the district government. The Society also used funds from the account to pay the villagers' share of the cost of bringing electricity to the village in 2005.

Lessons learned:	The overall investments that were made in the irrigation scheme were Rs 358,000 (for water provision to 63 ha). The costs per hectare have been Rs 5,700. Those costs are much less than the typical minor irrigation schemes of state government because the technique is simple. The big and minor irrigation schemes (mainly implemented by the Government) are very expensive per hectare which is more than Rs100,000. Many indigenous technologies (like described here above) have potentials for scaling up. But it needs to be documented, validated and fine tuned looking to the need of people, cost involved and effectiveness. Regarding the more ecological characteristics those projects could be implemented in all hilly areas of India. Agragamee has so far implemented projects like this in 4 watersheds in different agro-climatic zones of Orissa State and working well. It can be recommended that those small-scale schemes should be replicated in hilly regions both for irrigation and soil moisture conservation and subsurface storage because it is simple and cheap. The government should pay more attention to those cost-effective and efficient small-scale schemes.
Wider Application:	Many indigenous technologies like the one used in Mankadamundi have potential for scaling up. But they have to be documented, validated and fine-tuned so they fulfil local people's needs, and to ensure that they are both cheap and effective. Such small-scale schemes have major potential for hilly areas all across India. Agragamee has so far implemented similar projects three watersheds in different parts of Orissa. All are working well. The government should pay more attention to such schemes.
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