Livelihoods Enhancement through Mechanisation in Watershed Development : Case Study of Farm bunds and Check weirs[1]

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Abstract

Watershed development is widely accepted as an approach to strengthen livelihoods of rural poor in drought prone areas the world over. Conventional practices of watershed development are largely based on labour intensive methods of soil and water conservation measures. Promotion of such practices is mostly prompted by the short term objective of generating employment, which is arguably a character of welfare state.

Sustainability in watershed management or natural resources management (NRM) context could be viewed at as continuing productivity of land and water for sustenance and growth of people dependent on these resources. Evidence shows that the employment generation from sustained use of regenerated land and water resources is far higher than that generated through the process of resource regeneration itself. In other words, a stable agricultural production system generated more employment than in the process of implementation of soil and water conservation activities. Therefore, it is prudent to speed up the process of resource regeneration in watershed development projects, which is possible through mechanisation, and reduce the delay in flow of sustained benefits to the community.

Watershed development in stress prone ecologies is often prompted by the need of generating short term employment opportunities. It is, therefore, necessary to strike a balance between labour oriented works to prevent seasonal migration and mechanisation for efficiency and speed. The paper presents the experience of Marathwada Sheti Sahayya Mandal, a voluntary organisation pioneering in community based natural resources management (CBNRM), in optimising the involvement of labour force vis-a-vis use of machinery in soils and water conservation works in watershed projects.

The paper argues that mechanisation has helped in employment generation in watershed development projects rather than reducing employment opportunities. It also points at the indicators of sustainability in view of the objective of strengthening rural livelihoods in drought prone areas.

Keywords : Watershed development, rural livelihoods, mechanisation, voluntary organisations

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1. Introduction : Rural Livelihoods and Watershed Development

In spite of the recent trend in urbanisation and corresponding migration towards urban areas, Indian villages would still have to support around 60% of her population in the coming decade. By definition, the economic enhancement of rural poor would centre around livelihood activities related to primary production, that is, agriculture and livestock, including value-addition avenues. The latter comprises of services for production, processing and marketing. Three components play a critical role in making any livelihood activity effective : inputs, process or technology, and markets. Land and water are the key inputs in agriculture and livestock sector. Watershed development using appropriate technology is widely accepted as an effective approach of regeneration of basic resources, namely, land and water, to increase their productivity.

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2. Components of Watershed Development

In a project context, the main components of watershed development could be classified into three broad categories as follows.

2.1 Resource regeneration : to increase the productivity of land and water, by reducing the runoff, and thereby, soil erosion.

- Contour trenching and plantation on marginal lands
- Farm bunding for in situ moisture conservation
- Gully plugs to reduce flow velocities and increase groundwater recharge
- Harvesting structures across streams for storage and recharge

2.2 Resource utilisation and management : to increase the production and incomes of poor families by judicious use of regenerated land and water resources

- Capability-based land use planning (forestry, grazing, food and fruit crops)
- Improved water use method
- Appropriate livestock development and management practices
- Promotion of business development services (off-farm and non-farm value addition activities)

2.3 Community mobilisation and institutional development : are key to sustainability.

- Awareness and orientation on natural resources management
- Capacity building, viz., identification of leaders, involving them in operational aspects, and formalising such involvement
- Formation of community based organisations (CBOs) and formalising institutional arrangements

3. Project Impacts

Most watershed management projects showed results in the form of increased crop productivity, employment generation, stimulated allied activities like livestock and horticulture and growth in service sector economy, along with improvement in health, education and living conditions of the community. The community also developed the ability and mechanism to seek and obtain new inputs on information and technology. Typical changes could be summarised in the following chart (Table 1).

Table 1 : Typical changes in watershed projects

Development Aspect	Observed Changes	Time Frame
1. Land Use	Net cultivated area increased by 30%-65%	Immediate increase due to double cropping
2. Irrigation	Irrigated area increased by 4 to 17 times	Higher increase in first 2-3 years, stabilised subsequently
3. Cropping pattern	Shift from cereal crops to horticulture (esp. vegetables)	Immediate increase in area under wheat, gradually shifted to vegetables in 2-5 years
4. Crop production	Increased by 3 to 10 times	Immediate increase in cereal and pulses, new crops within 2-3 years

Development Aspect	Observed Changes	Time Frame
5. Livestock and milk production	Substantial increase of 5 to 12 times	Within 2-3 years of project completion
6. Income from agriculture	Increased by 6 to 12 times	Immediate increase due to multiple cropping and higher production
7. Labour requirement in agriculture (including allied activities)	Increased by 3 to 10 times	Immediate increase due to increased cropping intensity. Further on due to new labour intensive crops.

(Source : Derived from Progress Reports and Impact Assessment Studies of various watershed development projects implemented by MSSM in districts Aurangabad and Jalna in last 30 years)

Analysis of trends in different projects indicated that there is a rapid increase in on-farm activities soon after completion of soil and water conservation works, followed by an increase in off-farm development. Newer crops and newer technologies came up in farm sector and this development prompted business development services (like plant protection, transport, post harvest) engaging local unemployed youth. Sudden rise in employment generation resulted in cessation of migration, and often, in import of labour. All these factors led to 3-7 folds increase in income levels across all families. It was sometimes as high as 12 folds in case of very poor families, indicating the inbuilt equity in the approach.

Social Impacts : In all projects, increased incomes resulted in families providing attention to health, sanitation and education, especially of girl child. It was noted that the farmers invested in productive assets (livestock, implements, equipment) and in housing or household assets. Expenditure on self and family increased, including expenditure during marriages. Social mobility and social relations improved, as also an overall reduction in old feuds within the village. The village community learnt to use bargaining power vis-à-vis state administration and outsiders.

The trends in impact on labour market indicated a decline in labour availability in the project villages as the watershed development implementation progressed. There was a reduction of about 10%-25% after one year of project implementation, 20%-45% after two years and 40%-80% after three years. The labour availability and reduction therein depended on the land holding pattern at the time of project intervention and rainfall (quantum and distribution) in the particular year.

4. Use of Machinery

Mechanisation was used in implementation of various soil and water conservation activities in a watershed project. MSSM experimented with use of machines in bunding and trenching works using tractor mounted dozer blade, bulldozer and backhoe excavator, as well as in weir construction using plumb concrete technology in place of random rubble masonry.

MSSM started use of machinery for soil conservation works since 1995 in Jadgaon watershed project, initially to speed up implementation and subsequently for the reasons of efficiency and advancing results. Use of machinery gradually became popular among the watershed dwellers and in 2002, MSSM demonstrated completion of soil conservation works in Shivni (Dist Jalna) micro-watershed (nearly 550 ha) could be completed in less than 100 days. MSSM consistently advocated use of machinery for several reasons and the Government of Maharashtra has recently adopted it as a policy in its Fast-Track Watershed Development Programme (*Gatiman Panlot Vikas Karyakarm*).

Earthmoving machinery was used for trenching and bunding in watershed development. MSSM has experimented with bullock-drawn dozer blade and three types of power-driven equipment, namely, tractor mounted dozer, bulldozer and backhoe excavator. While all these machinery could be used for bund formation, trench excavation was possible only with back-hoe excavator. Since trenching is the method of getting soil for bund formation, backhoe excavator presented the advantage of producing trench and bund, which resulted in better soil and water conservation.

It was found that the bulldozer offered the fastest method of bund formation as compared to the tractor mounted dozer and backhoe excavator (Table 2). The variation in output was more due to the skill levels of operators and less due to site conditions. In terms of cost, the tractor mounted dozer worked out the cheapest followed by the bulldozer and the back-hoe excavator. It may be noted that the price data refers to years 1995-2002. In view of the recent trends in increased availability of earthmoving machinery for hire in Maharashtra, the cost variation is not significant. It was observed that the farmers preferred using backhoe excavator for forming farm bunds as it disturbed very small area of their farms and provided a trench for additional soil and water conservation in the process.

Table 2 : Work output of different machinery, metres per hour

Operation	Bullock-drawn Dozer blade	Tractor-drawn dozer blade	Bulldozer	Back-hoe excavator
Trenching in medium soils	X	X	X	35 - 40
Trenching in soft soils	X	X	X	50 - 70
Bunding in unploughed farms	X	30 - 40	40 - 50	50 - 60
Bunding in ploughed farms	20 – 25	50	40 - 60	50 - 60
Approximate equivalent manual labour (persondays)	10 -12	20 - 25	20 - 30	25 - 35

(Source : Various reports of MSSM) X = Not feasible

5. Social considerations in use of machinery

Employment generation is the aim of any development programme, and the focus must be on long-term generation of employment on sustained basis. In the drought-prone areas or stress-prone ecologies where local employment opportunities are limited, it is often necessary to ensure that the labourers get sufficient wage employment, especially in post-monsoon season. Planning of mechanical interventions should incorporate the provision for accommodating all available labour in watershed development works.

In all its watershed development projects, MSSM carried out systematic manpower planning to ensure adequate wage employment to entire local workforce and deploying machinery to speed up the work. Care was taken to reserve sufficient area in soft soil zones for manual labour in every work season and to deploy the machinery in hard or relatively difficult soils. The progress of work was reviewed towards the end of work season (around May 15 and May 31) and reallocation of remaining areas was done between manual labour and machinery. This way, distress migration was avoided in the short run without compromising on pace of implementation.

The experiences indicated that most of the marginal farmer, who sought wage employment as labourers on public works in the past, got engaged in farm labour as soon as the soil conservation works on their agricultural lands was completed. Those labourers not having any land of their own got wage employment on lands of other farmers not having adequate family members to cope with farm labour requirement. It was noted the watershed projects resulted in changing the situation of unemployment and migration into total engagement of local workforce and reverse migration of labour force from outside villages. Such result also brought in equity by providing year-round employment to those landless and poor farmers often at a much higher wage rate than in the past.

Conclusion

The experiences demonstrated that watershed development generated employment opportunities in agriculture and allied sectors. The farmers and labourers found that such opportunities are far more respectable than digging soil on public works or on other farmers' land. It is possible to speed up implementation of soil and water conservation works in watershed development projects through mechanisation, and thereby prevent the delay in the local community realising the benefits mentioned above. It was found that proper manpower planning could prevent any loss of employment or distress migration even during the early stages of implementation. The experiences clearly demonstrated that mechanisation did not reduce the employment opportunities even in the short run, but helped the work force to take up cleaner, socially respectable and more skilled work rather than continuing the tedious and demeaning tasks of digging soil year after year.

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