TARBELA WATERSHED MANAGEMENT PROJECT HISTORICAL PROSPECTIVE, IMPACT, LESSONS LEARNT

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Introduction

Pakistan's major mountain systems – the Himalayas, Karakoram, Hindukush, Suleman, Kirthar, central Balochistan, and Mekran ranges, form the important watersheds in the country. However, the dependable watersheds are located in the northern parts of the country and are regular source of the water supply to the Indus River system. These include watersheds of Northern Areas, NWFP, the mountain areas of Punjab, and AJK covering about 24.5 million hectares of upper Indus River and its tributaries. The watersheds of Indus water basin are the life-line for people of Pakistan. The rivers and streams sprung from these watersheds irrigate farmlands in the plains and provide drinking water to the millions of people.

The majority of upland watersheds suffer from varying degrees of soil erosion and land degradation mainly due to high rate of deforestation, inadequate soil conservation measures, poor agriculture terracing, intensive agricultural activities, over-grazing, complex land tenure, and prevailing poverty in the mountain regions. As a result of water erosion top soil is being washed away into rivers, streams and water reservoirs, which are the main source of irrigation water and hydropower. The consequences of degradation of upland watersheds are severe, including annual loss of million tones of fertile soil due to soil erosion, sedimentation of Tarbela and Mangla reservoirs, reduced hydropower generation, devastation floods, desertification, decline in agriculture productivity, loss of biodiversity and increase in environmental pollution. Reduced supply of irrigation water coupled with inadequate ground water recharge in dry and semi-arid regions is threatening agriculture productions and food security of Pakistan.

Integrated watershed management is recognized as an important holistic approach to natural resources conservation, which seeks to promote the concept of sustainable development. The National conservation Strategy (NCS) adopted in 1990 also identifies it as one of the priority areas. Watershed management falls at number three among the 14 core programme areas recommended by the NCS.

The goal set by the NCS is "protection, management and maintenance of

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24.5 mha of upland watershed through an integrated approach by year 2060. It was expected that 10% of the total watershed area or more specifically 33% of Tarbela and Mangla watersheds will be brought under the integrated management programme from 1992-2001. The NCS calls for creating multi-disciplinary teams of foresters, agronomists, civil engineers and community representatives. It was envisaged that these teams will help in preparing and implementing provincial, district and local level action plans.

To implement recommendations of the NCS and protect some of the important catchments, the federal and provincial governments have implemented two major projects. Tarbela and Mangla Watershed Management Projects. These projects have focused on conservation and protection of the catchment areas through soil conservation and afforestation activities carried out with the participation of local communities. There has been a considerable success in achieving objectives of these projects. These projects have largely focused on micro-watershed management interventions and have not been able to adopt integrated natural resource management approach. Nevertheless, the success of these projects provide valuable lessons for developing a National Strategy and Action Plan for promoting integrated watershed management at the macro level.

Roles and functions of forests

The forests play key role to maintain the watershed, soil and water conservation values. According to a German biochemist, a single mature tree contributes US $ 3,700 a year to national economy. Besides direct functions, there are series of indirect ones. The forests/trees have high protective function against wind and water erosion in mountain regions, to prevent landslides and avalanches. Trees work as "mini-reservoir", delay surface run off, facilitate infiltration and percolation to sustainable maintain water regime. Trees also prevent basis of perennials/dry nullahs, streams, rivers and lakes from being washed away. (Mughal, 1993).

The ground water table and the drinking water supply for numerous communities are dependent on the amount of rain, which penetrate the soil in the course of a year. The forest soils account for the largest proportion. The main system for the supply of irrigation and drinking water would cost about US $ 3,500 per hectare. Approximately, US $ 1,000 would have to be invested in equipment to prevent the immediate runoff, or evaporation of the rainwater (Mughal, 1993).

Tree's protective functions against wind and water erosion are evaluated at US $ 2 a year. If the protective woodlands in the mountainous regions had to be

replaced by technical constructions to prevent landslides, avalanches, etc. the annual cost would be in the region of US $ 145 for each tree. Trees also prevent the banks of rivers and lakes from being washed away, at a saving of US $ 1 per tree per year. (Mughal, 1993).

In general, without forest's protective function against poisons, radiation, wind noise, about 80 species of birds and 4,000 types of fungi would not be able to survive in Central Europe. Each tree's contribution to the survival of birds can be valued at US $ 7 a year. A zoo-sized artificial enclosure, resembling as near a natural habitat as possible, would cost some US $ 60,000 to build and yet, it functions on half as good. This, together with the corresponding maintenance costs, gives an annual contribution of US $ 610 per tree. (Mughal, 1993).

Project history

In order to address soil erosion, land degradation issues in upland watersheds, to safeguard against sedimentation of major reservoirs, the Government of Pakistan embarked on Watershed Management Project in the area (HAZARA) on small scale as early as 1964-65 but the serious efforts were made in the year 1971-72 by launching World Food Programme (WFP) Assisted Project-385 (Pilot Phase) later expanded upto 1982-83, succeeded by the Phase-I of Tarbela Watershed Management project in Hazara and Malakand Civil Divisions from 1983-84 to 1992-93 (Project # 2451). Since 1993-94 Phase-II of the Project started and it continued upto 30th June 2003. The project played key role in resource base expansion and environmental rehabilitation. The concept of community participation at grass-root level has also been initiated through social mobilization, community organization and establishment of Community Based Organizations (CBOs) to sustain the development concept.

Major components/activities

The following are the major components of the project:

i. Nurseries

- Departmental nurseries
- Kissan nurseries
- Community nurseries

For the production of quality seedling to meet the afforestation/ plantation requirement according to social and ecological conditions in the project area. Nurseries have been raised over an area of 880 ha for large scale plantation.

ii. Afforestation

- Block plantations
- Community plantations
- Farm forestry
- Linear plantation.

An area of 1,66,397 ha has been planted up in different catchments and sub-catchments. The concept of Land Use-Planning, community participation and co-ordination is translated

iii. Social forestry

a). Community organization

Formulation of social institutions such as Village Development Committee/ Village Organization (VDC/VO) and to build capacity of all stake-holders i.e. owners, users, Forest Department employees to participate and share responsibilities. In total 157 VDCs have been constituted to sustain the project development approach.

b). Women in Development

Support to women groups to enhance their role in NRM and social welfare. 27 Women Organizations have been constituted in different areas.

c). Conservation of agricultural lands

Arrest of soil erosion through terracing and other relevant activities to secure soil productivity and crop production, 2,028 ha of land have been treated through terracing. Whereas rehabilitation of old terraces has been done over 4,089 ha.

d). Bad land stabilization

Treatment of high risk areas, through planting and engineering activities. This includes construction of check dams, gabion structure, cut off drains & live spurs.

e). Range and pasture management

Controlled grazing, grass cutting and establishment of demonstration plots were an important activities to improve grass-lands for improved water conservation measure.

f). Roads and paths

To increase accessibility for afforestation and other community works (through VDC). It also facilitated social welfare of local inhabitant.

g). Other community development schemes

- Women and school nurseries. } All these activities are
- Irrigation channels. } integral part of the project
- Water ponds. } programme to enhance
- Model farms. } socio-economic
- Small dams (silt trap). } situation and reduce
- Others on need basis. } poverty.

PROJECT EFFECTS

More than two decades of watershed management interventions focusing mainly on block afforestations, farm/agro forestry and soil conservation works, had positive socio-economic and ecological impact on target population, besides the environmental rehabilitation, water conservation and reduction in surface run off and sediment load. Summary of the different impact is given below:

Forest area expansion

Plantations of ecologically suitable and other important fast growing tree species on private, marginal and open grass lands in different catchments and sub-catchments (buffer zone) have increased production and availability of fuel-wood, fodder and timber, besides environmental rehabilitation. It thus, reduced the pressure on natural coniferous forests. The large scale plantations now in pole stage and young timber stages, play a key role in reduction of surface run off and increase in water infiltration and percolation, which improves water regime.

Socio-economic benefits to local community

i. The afforestation works/plantations raised during the project period were estimated to yield 3,50,000 cubic meters of fire-wood annually in addition to about 110,000 cubic meters of poles and small timber. In fact, it has generated a chain of economic activities at local level.

ii. Incremental grass yields obtained from afforested grass lands during early stages of canopy coverage together with multi-purpose tree species planting provided about 40,000 tons of animal feed and fodder for livestock. This reduced the pressure of free grazing, which is harmful for soil compactness. Increased grass-production improved water conservation value of grass-lands.

iii. Increase in agricultural production due to terracing and other soil conservation works of arable land may be marginal, but it has an important role in safe guarding of precious arable land and preserving land holders capital.

Poverty reduction

Project activities contributed a lot in poverty reduction in the project area by:

- Providing regular employments to 500 technical forest staff members.
- Directly assisted approximately 40,000 families majority of them are either land less or poor land owners.
- Created seasonal jobs for about 20,000 persons engaged in main project activities like nurseries raising and plantations for approximately 100 days a year.

Irrigation and power system

To evaluate the effect of watershed improvement, treatments on surface runoff and sediment, a study has been initiated in collaboration with Pakistan Forest Institute in Unhar Sub-catchment area of District Battagram (Hazara).

For monitoring hydrologic response both the catchments were equipped with standard measuring devices both manual as well as automatic.

Data for the period June 2000 to October 2002 revealed that the untreated area produced 30% more surface runoff and 15% more suspended sediment as compared to the treated area. This clearly indicates the effectiveness of these treatments. More surface runoff means more floods and more sediments means more siltation down stream. (Anon, 2000).

Under a study in Siran Watershed (district Mansehra) it was found that highest sediment yield (11.5 tonnes/acre/year) was from the agriculture land and lowest (2.5 tonnes/ acre/year) was from the forest land.

The sediment production in case of range-land was 8 tonnes/acres/year (Shah 1985). This study very clearly indicated that, there is significant reduction in sediment load in the areas brought under plantation i.e. 11.5 – 2.5 = 9.0 tonnes/acre/annum.

The results of above studies indicated that biological measures adopted by Tarbela Watershed management Project in active catchment areas of the Tarbela and Mangla reservoirs have significant impact in the reduction of surface run off and suspended sediment load.

The WFP mission evaluated the project during April, 1992 and gave the following analysis, relevant to this aspect:

> "The environmental impact of the project outside the project area refers mainly to the reduction of the rate of siltation of the nationally important Mangla and Tarbela reservoirs. The effects of reduced sediment yield, and of land improvement and reforestation works over large watersheds such as Mangla and Tarbela can of course be

appreciated and measured only after several years or decades. In absolute terms, however, the impact appears much more significant. It is estimated that the storage capacity saved through project No. 2451 and the preceding projects has been about 665,000 cubic metres for Tarbela and approximately 180,000 cubic metres for Mangla reservoir".

The Government of Pakistan evaluation mission during August, 2000 reported that project contributed significantly towards increase in the life span of Tarbela and Mangla Reservoirs, as expressed by Chairman WAPDA during his Press Briefing on 4th May, 2000 (The Daily News 4th May, 2000).

LESSONS LEARNED

The following lessons were learned during the project life:

- The VOs/WOs, should be a representative, broad based organization and not just an assembly of people, all stakeholders such as owners, users, tenants and other Governmental Organizations and NGOs will have to be involved to ensure effective participation of all social actors.
- The selection of villages in participatory watershed management needs a series of dialogues with all the stakeholders. The formulation of a new VO should be actualized after having a complete understanding of the community and other related social aspects.
- The staff responsible for extension must ensure that a clear and understandable message is delivered and at the same time may be able to ascertain the level of participation (ownership, commitment) expected from all stakeholders.
- For strengthening VOs, some initiatives aimed to satisfy certain basic needs of target population will have to be kept into consideration. Experience with TWMP has shown that only forestry related activities can not ensure an effective participation unless some other non-forestry incentives such as improvement of drinking water facilities, family health and hygiene, growing fruit and vegetables in home gardens, primary education, community roads and income generating schemes are introduced and supported.
- The needs of the community at village or watershed level are very diverse and not confined to forestry activities. To promote participatory watershed management, a multi-sectoral approach with a close liaison among different sectors (agriculture, health, education, civil works etc.) is needed.
- Experience shows that staff and community level training initiated at the range (territorial unit) level has set a good direction to develop these centers into distinctive and viable institutions with easy access for the local communities. This will also pave way towards decentralization of decision-making processes. Since this arrangement of imparting training to the lower hierarchical tiers and

the target groups has given a good initiative for confidence building, therefore, it needs to be institutionalized and procedures clearly outlined.

- Staff capacity building and community motivation processes are at initial stages, if not continued as a process, this may lead to substantial damage to the assets created with huge of investments. A strategy has to be designed to ensure that some of the support services are available even if there were no projects.
- The process of social organization and VDC formulation, regardless of their relative effectiveness, is still weak and fragile. VDCs will have to be strengthened till the time they are able to function at their own. Moreover, the forum of VDCs has yet not emerged as a powerful institution that is fully anchored in the legal system. To some extent it has gained a little influence on line departments but still lacks legal and political footings to influence government and other institutions.
- In some areas political pressure still dominates and the field staff working in the project cannot be averse to these influences. In some watersheds owner-user relationships are week and need to be strengthened through continuous dialogues.
- With negligible employment opportunities within the project area, out-migration of the male members to towns and cities is a common feature. With only aged male and women left in the houses, it is difficult to develop a consensus for effective community participation.
- The present approach of watershed rehabilitation through afforestation is piecemeal and scattered over huge geographical area. The concept of integrated watershed management on sub-catchment basis needs to be promoted in areas where the communities are receptive.

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