WATERSHED MANAGEMENT IN PAKISTAN

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Introduction

Pakistan depends entirely on precipitation received on the mountain watersheds of the upper Indus and upper Jhelum rivers to sustain irrigated agriculture and to produce hydroelectric power, (Raeder-Roitzsch 1968). To make the maximum use of the water resources of the country, a dam has been constructed on the River Jhelum at Mangla (project started in 1959/60) and another on the River Indus at Tarbela. A watershed management programme for the country has been launched to reduce soil erosion from these watersheds, to maintain and improve their productive capacity, and to reduce the rate of siltation of the Mangla and Tarbela reservoirs.

The period of productivity of the Mangla and Tarbela reservoirs are estimated at 60 to 80 and 30 to 40 years, respectively. One important cause of such heavy silt loads is soil erosion which has been accelerated by mismanagement of the watersheds through deforestation of steep mountain slopes, their cultivation without effective soil and water conservation measures, and the destruction of vegetation cover on grazed lands due to livestock pressure far in excess of the grazing capacity of mountain rangelands.

Watershed management dates back to the Forest Policy of 1894, which stressed the need to preserve the forests on climatic and physical grounds. The Agricultural Enquiry Committee Report of 1975, suggested extensive fruit tree planting and the construction and improvement of terracing in the hills.

Current watershed management programmes, with World Food Programme (WFP) commodities as incentives, are progressing well. The major concerns are with their long-term perpetuation after such assistance ceases, their narrow scope (mainly tree planting), and the relatively small areas to which they are confined.

In the watershed of the River Indus, of which 30 per cent is unproductive, land is used for grazing, cultivation, and forestry. Mountain agriculture is generally poor; most valleys can barely produce half their food requirements. Out of the 36 per cent under agriculture, 33 per cent is subject to soil erosion - 9.5 per cent moderate, and 23.5 per cent severe. In the Jhelum watershed area, human and livestock pressures on the land are also high. Only about 9 per cent is forest; out of the 52.3 per cent that is under cultivation, about 36 per cent is subject to moderate or severe erosion. Watershed operations in this area are showing results and at the current pace of work, it should be possible to cover the remaining area (about half is already under forest) by the year 2000.

However, since participation in the programme is voluntary, not all land owners participate, which leads to scattered work sites where trees have been planted or soil conservation works have been carried out, separated by areas that are left untreated. Therefore, the term "watershed management" as applied to the operations in progress is in itself a misnomer because it leaves out important practices which are essential components of a watershed management programme.

Therefore, no permanent solution to the problem of watershed deterioration is possible unless the income of the mountain farmer is raised considerably or he is provided with an alternative way of making a living. Watershed management programmes have eased the situation a little by providing job opportunities and distributing WFP food commodities, but a massive campaign for intensive management of all mountain resources is needed. Such a programme would have to include controlled road construction, timber harvesting, and forest planting. It should also make permanent employment of a significant proportion of the local labour force possible in skilled jobs that offer fairly high wages. A start has been made in the Kaghan Valley of the North West Frontier Province.

Rapid intensification of forest management in the mountains is an important means of ensuring more successful watershed management. The human population will continue to rise, necessitating continuous adjustment of land use. Though the task of watershed improvement may be completed in a few decades, the task of watershed management will remain, and must evolve towards the establishment of permanent, effective, multidisciplinary organisations. The urgent need is to incorporate expertise in range management, soil and water conservation, animal husbandry, horticulture, agronomy, and social sciences to enable a comprehensive programme of watershed management instead of continuing with tree planting alone.

The indigenous concept of watershed management (more accurately, watershed rehabilitation) requires the rectification of land use to conform to land capability, which will confine cultivation to less steep slopes. Soil and water conservation measures on agricultural land also need to be taken, and forest trees planted on steep mountain slopes (fruit and nut trees, wherever possible, that would provide an income for the local people, making them less dependent on cultivation and grazing). These would be closed to grazing until the trees are above the limit of trampling and browsing damage.

The two main agencies that have been involved in executing the watershed management programmes in these areas are the Water and Power Development Authority (WAPDA) and the Forest Department. WAPDA has been concerned with reducing the rate of siltation of the Mangla Reservoir using engineering structures and the Forest Department has taken a more holistic approach: the improvement of socioeconomic conditions of the mountain farmer, the correction of the current defective land use of the mountain watersheds, and the adoption of soil and water conservation measures where necessary. The 1962 directive on watershed management required the formation of a multidisciplinary organisation to undertake programmes on privately owned land, entrusting the Forest Department with the responsibility of managing government owned forests.

Programmes and Policies

The objective of the National Agricultural Policy of 1980 was to increase and sustain the development of all products and services in the wildlands (for example, clean water from watersheds is an important product of wildlands and output must continue). It therefore called for effective motivation of the local people linking their involvement in production with their involvement in mass tree planting and nature conservation. This Policy is illustrative of a gradual shift from the compulsive to the motivational approach in watershed management that has taken place between 1955 and 1980. In fact the watershed management programme in Pakistan only really began to show positive results when the compulsive approach was abandoned and was replaced by the introduction of incentives, and the emphasis on motivation. The Provincial Government has been empowered since 1900, under the Punjab Land Preservation Act of that year, to temporarily regulate, restrict, or prohibit the felling of trees,

cultivation of land, or the grazing of livestock in any area that has become subject to erosion. However these legal provisions have seldom been used because any interference with the full proprietary rights of the land owners is an anathema to them and they would have nothing to do with any programme which uses compulsion in any form. Actually watershed management programmes in Pakistan did not emanate from formally stated policies; rather their recommendations included practices being adopted in various regions at the time of their formulation.

Before a major developmental activity can get underway in Pakistan, it is essential to provide for it in a five year plan. Watershed management as a separate item, appears for the first time in the Third Five Year Plan, 1965-70 which stated that a programme would be undertaken over an area of 200 square miles. The Fourth Five Year Plan, 1970-75, called for an evaluation and subsequently an extension of the programme. By the Fifth Plan, 1978-83, the watershed management programme covered a total net area of about 200,000ha, comprising of afforestation over 120,000ha, and soil conservation over 180,000ha, and the distribution of 3 million trees for planting. During the Sixth Plan (1984), a financial allocation of 297 million rupees has been made for the implementation of further watershed management schemes.

The current constraint is no longer a lack of financial resources, but an adequate infrastructure manned predominantly by foresters. Priority must now be given to the diversification of staffing so as to utilise all the funds provided in the most efficient and effective way. The organisations should include competent, innovative professionals from all related disciplines such as anthropology, agricultural engineering, soil conservation, horticulture, agronomy, range management, fodder production, and animal health nutrition.

Watershed management programmes in Pakistan are based on the assumption that accelerated soil erosion in the mountain watersheds and the resultant rapid siltation of water storage reservoirs is mainly caused by defective use of mountain land. The strategy is to create a new equilibrium between the productive capacity of the mountains and the people living on them: the mountain farmer is encouraged to discontinue cultivation on slopes steeper than 50 per cent, planting fruit and forest trees there instead. On less sloping land he is taught to protect his fields by adopting soil and water conservation measures, and to use improved methods of farming to increase his yield.

Until now, projects have been oriented towards the two main executive agencies. The forest departments have concentrated on forest and fruit tree planting. The trees are supplied free of charge and in addition, the farmers who plant them are given WFP food commodities and also a small cash payment. This has recently been introduced to tempt more able bodied workers to join watershed management works. WAPDA has concentrated on the construction of soil and water conservation structures, and, so far, all operations have been carried out without financial cost to the farmers, as far as tree planting is concerned. The projects include the protection of trees planted, for five years. The farmer only has to pay 30 per cent of the cost of terracing and other soil and water conservation measures on his agricultural land.

UN inter-agency evaluation and appraisal missions in 1982 and 1983 provided the following assessments:

- Progress is very good in afforestation, but slow in soil and water conservation on cultivated land. Range improvement has hardly been attempted.

- Work sites are widely scattered.

- Projects are mainly attempted by foresters, with little assistance from other relevant technical services.
- The socioeconomic aspects of the projects require immediate attention.

The employment of professionals from a wider cross-section of related fields is essential before the programme can achieve its objectives in a significant manner. The need is to increase the momentum of the programme and to make it more comprehensive, placing emphasis equally on all its components.

The Division of Watershed Management of the Pakistan Forest Institution conducts research and training and includes education in watershed management in MSc and BSc forestry courses. Research and education capability in this field was created by the FAO-assisted National Forestry Research and Training Programme, 1965-1969, which was followed, in 1983, by a UNDP- assisted project, "Development of Watershed Management and Research at the Pakistan Forest Institute". The Pakistan Forest Institute is under the Ministry of Agriculture of the Federal Government. Its research and education programmes are formulated in consultation with the Heads of the provincial forest departments. For education, the institute is affiliated to the University of Peshawar

Watershed management research was initiated in 1966, and investigations conducted during the FAO project included the evaluation of climatological and hydrological data, interception and stem flow studies in *Chir* pine, water consumption studies of some agricultural and forest crops, soil moisture observations, and a comparison of runoff and soil erosion from a catchment where soil and water conservation measures had been adopted with a similar untreated catchment Studies of the latter are still in progress, along with research on the effect of watershed management operations (mainly *Chir* pine planting) on runoff and sediment release in Hazara Civil Division, which began in 1979.

At present, watershed management is one of about 30 subjects being taught to students of MSc and BSc forestry courses, each of two year duration. A project was started in 1983 by the UNDP, at a cost of Rs 18.96 million, covering a period of 54 months, to develop watershed management education and research at the Pakistan Forest Institute. In 1984, a total of 35 forest officers were trained and work was also started on the establishment of an experimental work station at Faza Gat in Swat District.

There have been useful meetings for the exchange of information. The First West Pakistan Watershed Management Conference was held in November 1964, and was followed by a CENTO Seminar, held at the Pakistan Forest Institute, Peshawar, in 1977. Experts from Pakistan, Iran, Turkey, the UK, and the US were present.

Conclusions

Important steps that may be taken towards a solution to the problem are mainly based on continued development of research and training. Investigations need to be carried out into methods of harvesting timber, regenerating forests, and constructing roads, that would successfully conserve the watersheds. An integrated effort by professionals in all related fields, backed by coordinated institutions, will ensure effective implementation of flexible policies, followed by ongoing monitoring of the programmes.

A unit for planning and conducting research in all the socioeconomic, biological, and physical facets of watershed management should be established and the staff who implement the programmes should receive continued education and training in this subject. Priorities for research include the problems of maintaining the level of livestock productivity despite more limited grazing facilities, possibly through increased fodder production and the development of improved methods for its storage, and by refining the marketing of their products so as to maximise sales and therefore income for the farmers.

Finally, crucial to the success of the programmes is the education and deep involvement of the local people, so that the work becomes more meaningful to them.