

# Watershed Management

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Bamyan Province, Afghanistan

## Introduction

The mountain watersheds, from which the bulk of Afghanistan's water resources derive, are some of the poorest, most physically degraded and agriculturally least productive areas in Afghanistan. They are characterised by steep slopes, of frequently biomass-deficient soils, shadowing tight, largely inaccessible valleys with extensive tracts of barren land, acute water shortages, small landholdings, and perennial food insecurity. Inadequate infrastructure and difficult terrain have combined to exclude many mountain populations from development opportunities in the lowlands.

## Rationale

The majority of mountain communities rely on agriculture for their survival. Harsh weather conditions and prolonged cyclical droughts, however, have depleted what little fertile land exists. Rain shadow

areas, snowmelt, and springs remain the only sources of water for most of the population. Rivers with inconsistent and low levels of water run for only short periods, forcing communities to work on marginal land and to rely on *lalmi* – rainfed agriculture. Because of the nature of the mountain area's soil, erosion is significant. This and extensive deforestation of pasturelands has meant that yearly flooding remains a serious impediment to agricultural productivity. With denuded rangelands, limited access to water, and diminished biomass cover, fodder levels have dropped, severely affecting livestock populations, reducing further possible income-generating activities.

There are indigenous soil and water conservation practices, but the inaccessibility and remoteness of many communities, and the social trauma of many years of conflict has meant that new and viable technologies and methodologies are often not transferred within and between communities. Migration, limited exposure to external innovations, and lack of finances at the household level have all contributed to inadequate resource management practices.

Watershed management, a holistic approach to natural resource management, provides a potential integrated framework for the creation of biological conditions whereby communities can realistically envisage the regeneration of degraded watersheds and increase yields through improvements in soil and biomass cover. Water and soil resources, well managed at the community level, can lead to improvements in forest cover and offer opportunities for livestock improvement and livelihood development.

A watershed is a natural hydro-geological unit ecologically linking people, the sun, soil, water, and biomass cover from which precipitation finds a common outlet (Figures 1a and 1b). It exists regardless of political boundaries and necessarily incorporates interactions between upper and lower catchments. Because it specifically acknowledges the natural physical space, watershed management is a uniquely appropriate approach for programme implementation, community planning, and technical interventions and monitoring.

Afghanistan is divided into five major river basins (Figure 2a), which are further subdivided into watersheds (Figure 2b) and sub-watersheds.

## **Benefits**

The advantages from a community-managed and planned watershed in Afghanistan could include the following possibilities.

- Improved water availability
- Improved water quality
- Reduced risks of natural disasters
- Higher yields
- Increased biomass cover
- Improved soil quality
- Increased income generation activities
- Improved habitats for flora and fauna and, therefore, improved biodiversity

Figure 1a: **An overview of a watershed in Drah Takhat area, Afghanistan**



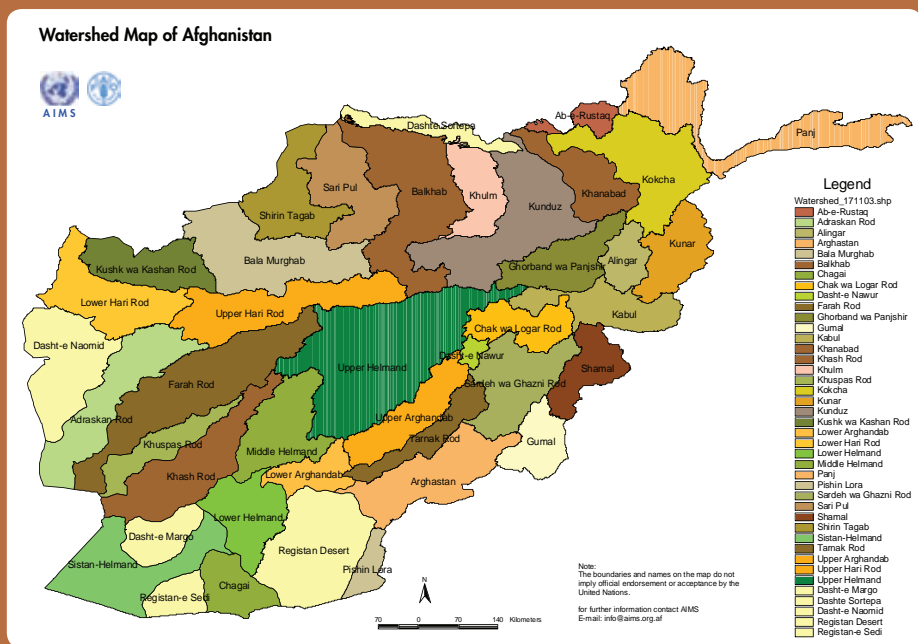
Figure 1b: **Sketch of a watershed**



Figure 2a: The five river basins of Afghanistan



Figure 2b: Watersheds of Afghanistan



Source: FAO



## Watershed Management Activities

Watershed management is inherently a community-driven process incorporating the ideas and knowledge of local communities and necessitating increased dialogue and exchange within and among social groups for natural resources planning and conflict resolution and mitigation (see Box 1).

Activities in a watershed management programme include the development of appropriate land-use planning and management for rainfed and irrigated lands in order to prevent soil erosion, increase biomass production, and improve the ecological balance. It could also potentially include promoting alternative income generating activities, developing the infrastructure and social services, and can reduce the effects of natural disasters related to poor natural resource management.

## Methods

In Afghanistan, the extensive degradation of the natural resource base makes soil and water conservation a significant component of watershed management, in order to enhance the conditions for biomass regeneration and erosion control. Based on a study of the World Overview of Conservation Approaches and Technologies (WOCAT 2003), five categories of soil and water conservation measures are found in Afghanistan (see box next page) (see Box 2)

Digging contour trenches (foreground) and eyebrow pits (background) in Kahmard, Bamyan



## Box 1: Case study from Bamyan

The watershed of Qonoq lies in the most southerly district of Bamyan province. With communities found ranging between 2,900 and 3,300 m, the region experiences prolonged winter conditions, has few cropping options, and relies on melt snow for most of its water requirements. The area is ethnically and religiously homogenous, with communities mostly belonging to the same ethnic and religious groups, but competition over diminishing resources and inter-familial rivalry have historically limited the possibilities of coordinated natural resource management at the community level.

In response to survey findings suggesting that Bamyan's southern provinces tended to be neglected by development programmes, the Aga Khan Foundation (AKF) started an integrated Micro Area Development Programme which focused on integrated and broad ranging activities in specific watersheds in order to demonstrate pilot technologies and possible approaches to ensure impact.

The programme's initial phase targeted four communities in one watershed. The area or 'manteqa' was characterised by highly denuded rangelands, limited access to water resources, extensive soil degradation, and widespread conflict over land ownership. The extent of the conflict was such that those in the lower catchment villages were unable to pass through the centrally located bazaar to the upper catchment villages. As a result, AKF's intervention focused initially on social mobilisation: working closely with community members on resolving issues of conflict, group formation, the election of community representatives, and building the capacity of individuals and newly formed institutions at the community level.

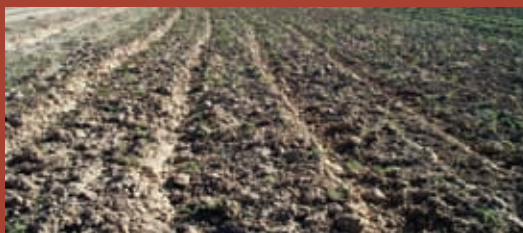
Once representative institutions were in place, planning for the watershed at the household, community, and cluster levels commenced. A broad range of integrated activities including literacy, self-help group formation, child-to-child education, crop and horticulture improvement, composting, and greenhouse projects commenced. However, it was the soil and water conservation work involving community planned structures such as bunds, terraces, trenches and pits in the upper catchment zones at the watershed level that ultimately facilitated community members to recognise the importance of working together. By planning within a given space, highlighting the interrelatedness of ecological connections and the inherent linkages between upper and lower catchment areas that the communities that compose the Qonoq watershed united in order to manage their own natural resources.

Three years into the programme, the communities in Qonoq have created non-grazing conservation areas, rehabilitated significantly large tracts of upper rangelands through both social management, biological and mechanical structures, reseeded extensive upper catchment areas, and planned further watershed management work in their area. One-third of salaries earned by communities are voluntarily paid to the cluster level watershed management committee for the further management of the area. The Qonoq watershed has become a model for soil and water conservation in the high mountains of Afghanistan.

## Box 2: Types of soil and water conservation measures

**Agronomic measures** such as mixed cropping, contour cultivation, mulching

- are usually associated with annual crops
- the measures can be repeated routinely each season, or in a rotational sequence
- are of short duration and do not lead to changes in slope profile



Contour planting of chickpea in Herat

**Vegetative measures** such as grass strips, hedge barriers, windbreaks, brushwood

- involve the use of perennial grasses, shrubs or trees
- are of long duration
- often lead to a change in slope profile
- are often aligned along the contour or against the prevailing wind direction, and
- are often spaced according to slope



Brushwood structures using willow in Punjab district

**Structural measures** such as terraces, banks, bunds, palisades, drip irrigation

- often lead to a change in slope profile
- are of long duration or permanent
- are carried out primarily to control runoff, wind velocity, and erosion, and to harvest rainwater
- are often aligned along the contour against prevailing wind direction
- are spaced according to slope



Earthen V-shaped and other bunds in Punjab district

**Management measures** such as land use change, area closure, rotational grazing

- involve a fundamental change in land use
- involve no agronomic and structural measures
- often improve vegetative cover, and
- reduce the intensity of land use



Grazing of sheep in Punjab district

**Combination of any of these measures** in conditions where different measures are complimentary and produce more effective results



Structural measures (in this case, contour bunds) with vegetative measures in Waras district

## Strategies for Sustainable Soil Conservation and Watershed Development

- Strengthen people's participation in watershed development. Make the beneficiary men and women active participants and not mere passive recipients of projects and interventions.
- Involve all possible stakeholders. Identify and involve them, consider their views, and implement their workable suggestions. This encourages participation and ownership. Stakeholders include people from the watershed communities such as landlords, small and marginal farmers, the landless; external institutions such as government and nongovernment organisations, research and financial institutions, and others.
- Focus on appropriate technologies for watersheds. Farmers' own innovations with low-cost technologies can also be valuable resources.
- Conduct action research for watershed technology and management to support programme work.
- Mobilise resources for watershed management. Apart from public funding, explore the possibility of funding watershed activities through community-based and private institutions. A much larger area of rural credit should flow into land development and land reclamation.
- Build capacities and develop human resources for watershed management. Provide training to the community of watershed users and bring them to exposure visits to successful watershed projects. Farmers learn best by observing success stories from other farmers.
- Ensure project financial sustainability. Self-help groups organised as part of the project activities can play a role in sustaining the activities.
- Conduct monitoring evaluation and impact assessment. Realistic performance indicators to assess the impact of the programme should be developed with the help of professionals and in consultation with the communities.

## For Further Reading

- FAO (2006) *The new generation of watershed management programmes and projects. A resource book for practitioners and local decision-makers based on the findings and recommendations of an FAO review.* FAO Forestry Paper 150. Rome: Italy
- Honore, Guy (ed) (2002) *Principles and practices of integrated watershed management in India.* New Delhi: Indo-German Bilateral Project on Watershed Management
- Sang-Arun, J; Mihara, M; Yamaji, E; Sombatpanit, S (2007) 'Monitoring and evaluation of soil conservation and watershed development projects: An approach to sustainable development.' In de Graff, J; Cameron, S; Sombatpanit, C; Piero Woodhill, J (eds.) *Monitoring and evaluation of soil conservation and watershed development projects.* New Hampshire (USA): Science Publishers
- Sithapit, KM (2000) *Participatory approach of NARMSAP.* Paper presented at the workshop on 'Integrated Conservation and Development: Lessons Learned and Challenges for the Future' organised by the Ministry of Foreign Affairs, Copenhagen, Denmark, on 1 September 2000 in Copenhagen, Denmark
- Tideman, EM (1996) *Watershed management: Guidelines for Indian conditions.* New Delhi: Omega scientific Publishers



WOCAT (2003) *A framework for documentation and evaluation of soil and water conservation technologies*. Revised WOCAT questionnaire February 2003, <http://www.wocat.org>

Sharif, S (1997) *Irrigation engineers*. Kabul: FAO