J. Micro-Catchment Planning and the Master Plan

CONTENTS

J.1 BASIC CONCEPT OF MICRO-CATCHMENT PLANNING

J.1.1 Introduction

The Micro-Catchment (MC) Plans outline some feasible measures for the rehabilitation and sustainable management of the natural resources in the MCs, and propose activities which should improve villager livelihoods in selected Forest Villages within the MCs. It should be noted that in this plan, any Normal Villages within the MCs have not been studied. Five Forest Villages have been studied in detail and the Plans prepared among these villages are further expanded into MC level.

Other important points about the Plans include:

1. The Plans will serve as a basis for outlining appropriate activities for development and rehabilitation, and estimating input requirements, in the particular MCs and in similar MCs.

2. The Plans will guide the preparation of the detailed Project Implementation Plans which will in due course undertake appropriate actions in relation to natural resources and villages in the MCs.

3. The Plans will contribute to further development of the integrated and participatory planning models for the whole catchment.

The Plans had been prepared by the Study Team with the participation of counterpart staff of the MEF (AGM, OGM, ORKOY and MPG) of Erzurum, Artvin and Bayburt Provinces. The villagers of the MC participated enthusiastically. The Department of Agricultural Economics of the Ataturk University in Erzurum provided valuable contributions, particularly by undertaking rural socio-economic surveys in the villages. The Agricultural Research Institute in Erzurum undertook range resources assessments in the MCs. Other Government agencies (MARA, GDRS, DSI and others) also contributed by providing relevant data and information.

The main planning stages included: (i) socio-economic surveys in the selected forest villages in the MCs; (ii) field reconnaissance and surveys of the natural resources and village conditions; and (iii) participatory identification of the major problems, possible solutions to the problems, the development potentials and the required development activities. Preliminary plans for village development and rehabilitation of local natural resources were discussed in several villages in the MCs, and the preliminary MC Plans amended in the light of the villagers' suggestions.

The level of reliability of field information about the natural resources (topography, climate, geology, hydrology, soils, soil erosion, discharge of suspended sediments and coarse rocky debris, land capability, land use, forests, rangeland pastures, grazing intensities, biodiversity, Protected Areas and wildlife) varies according to the quantity and quality of the data gained from available sources and the limited time available for the field surveys.

The quantities and costs of the activities proposed in the MC plans had been derived from preliminary discussions in villages. They are indicative only, and are subject to revision during detailed planning and costing. Some of the proposed activities may be changed in both scope and cost.

Each MC Plan contains two maps (Physical Planning, and Topography and Land Use) and two Figures (Figure 1: Typical Transects across the MC; Figure 2: A Digital Elevation Model).

J.1.2 Classification of Problems and Identification of Priority Issues Falling Within the Mandate of the MC Planning

The Master Plan for Participatory Watershed Rehabilitation in Coruh River aims at preventing the further progression of the vicious spiral consisting of poverty through Strategies of natural resource rehabilitation and management, livelihood improvement, and human resource development. Regarding that the MC Plans outline the basic activities for the achieving the goal of the Master Plan, and that the Ministry of Environment and Forestry is the main agency responsible for the implementation of the Master Plan, the mandate of the MC Plans are defined as in the following.

Classification of the Problems Identified by MC villagers and the Study Team

	Description of problem	Within MC Plan mandate	Outside MC Plan mandate	Identified by
Natural resources	Insufficient fuelwood	+		Micro-catchment villagers
	Soil erosion	+		
	Flood	+		
	Low productivity of range areas	+		
	Lack of sufficient forest	+		
	Riverbed deterioration and its damage to farmlands	+		
	Landslide, avalanche	+		
	Under-utilization of range areas	+		
	Pesticide pollution	+		
Income generation and livelihoods	Insufficient irrigation system	+		
	Inadequate marketing of agriculture/animal products	+		
	Low income, insufficient income opportunities	+		
	Wild animal damage on agricultural lands/crops		+	
	Low livestock productivity	+		
	Low return of agricultural activities	+		
	Insufficient agricultural knowledge/extension services	+		
	Insufficient land to cultivate		+	
	Insufficient/expensive credit support for livestock/agriculture	+		
	Lack of employment, migration of young people	+		
	Lack of veterinary services	+		
	Low productivity of land	+		
	Lack of shepherds		+	
	Lack of agricultural machinery		+	
	High fertilizer prices		+	
	Low livestock productivity	+		
	Scattered small land parcels		+	
	Insufficient feed	+		
	Lack of manpower		+	
	Inadequate rural development policy/low meat prices		+	
	Lack of dairy processing unit	+		
	Fruit trees are old, their productivity is low	+		
	Greenhouses need improvement	+		
	Lack of employment, migration of young people	+		
	Inadequate number of animals/insufficient credit support	+		
	High feed prices/costs	+		
	Low meat prices		+	
	Low prices for agricultural products		+	
	Insufficient water and shelter in range areas	+		
	High fertilizer prices		+	

Description of problem		Within MC Plan mandate	Outside MC Plan mandate	Identified by
Infrastructure and social services	Insufficient quantity, poor quality of village roads		+	Micro-catchment villagers
	Insufficient drinking water		+	
	Inadequate health services		+	
	Inadequate sewage system		+	
	Inadequate education services		+	
	Lack of social activities		+	
	Electricity cut		+	
	Inadequate government investments in MC villages		+	
	Harsh winter conditions		+	
	Living in village is difficult		+	
	Migration/lack of young people		+	
	Inadequate village budget	+		
	Lack of and expensive insurance		+	
1.	Significant part of the forests are sparse and degraded	+		Study team
2.	Destructive grazing pressures on fragile slope lands	+		
3.	Forest degradation due to uncontrolled cutting	+		
4.	Inadequate silvicultural activities due to labor scarcity in villages and low payments for forest work	+		
5.	Inadequate biodiversity conservation and management	+		
6.	Insufficient management of wildlife resources	+		
7.	Insufficient management of wildlife resources	+		
8.	Soil erosion	+		
Total of 35 problems: (natural resource related,:6; income increase, 14; infrastructure/social services, 15)				

J.1.3 Key Issues, Goals, Objectives and Strategies

J.1.3.1 Key Issues

Several Key Issues require special attention during planning, implementation and assessment of the MC programs and activities.

1. The feasibility of undertaking effective, sustainable rehabilitation and management of degraded natural resources around Forest Villages in a participatory manner at appropriate scales (within the constraints of available land, labour, administrative inputs and capital) sufficient to bring about permanent improvements in both their condition and in village livelihoods.
2. The feasibility of undertaking these activities, especially those related to improving village livelihoods, within appropriate, cost-effective and cost-sharing frameworks in both Forest Villages and among Government and other development agencies.
3. The feasibility of ensuring that Forest Villagers and all relevant Government and other development agencies collaborate effectively in all aspects of project planning and implementation, and after project termination.
4. The feasibility of undertaking appropriate activities related to human resource development which will in due course bring about changes in administrative and farming systems such that the present unsatisfactory states of the natural resources and village livelihoods are permanently rehabilitated and alleviated.
5. The feasibility of developing appropriate techniques for rehabilitation and management of natural resources, and improvement of village livelihoods, which can be extended to other villages in the same MC, other MCs in the Coruh River catchment, and to similar environments elsewhere in Turkey.

J.1.3.2 Goals and Objectives

The Goals are:

1. *Natural resources in the MC will be rehabilitated, conserved and utilized in a sustainable way.*
2. *Livelihood conditions in the communities in the MC will be improved.*

The Objectives are:

Objectives for natural resource rehabilitation, management and utilization

i) Conservation of the existing forests and rehabilitation of the degraded forest areas to provide multiple benefits, including soil and water conservation, wood and non-wood forest products, and other environmental, social and cultural functions, on a sustainable basis, with particular attention to meeting the needs of local populations.

ii) Undertaking the required soil conservation measures on the critical non-forest lands, which are creating serious damage or which threaten the lower catchment lands, infrastructures and people.

iii) Improving conditions, productivity and sustainable utilization of the rangelands.

iv) Improving water resources utilization through development of irrigation systems and practices.

Objectives for livelihood improvement

i) Development of agricultural practices, and increasing productivity and revenues from these activities through irrigation, improved technology and effective marketing.

ii) Development of livestock activities, and increasing productivity and revenues from these activities through improved livestock practices, veterinary care and effective marketing. Combining livestock development, forage production and sustainable pasture management.

iii) Diversification of other income generation activities, such as beekeeping.

Objectives for human resources development

Strengthening the capacities of the stakeholders to understand the linkages relating sustainable natural resource management to human livelihoods, and implementation of effective village-level activities which simultaneously improve both.

J.1.3.3 Strategies

General strategies

i) Participatory planning, implementation and assessment of the MC development activities.
The MC Plan should be prepared, implemented, monitored and evaluated with the participation of all relevant stakeholders, including local communities and different field units of MEF, as well as other local stakeholders (*e.g.* other government agencies, NGOs). The Plan should be prepared and implemented with the joint efforts of all stakeholders, and sharing of responsibilities by the local communities, MEF units and other stakeholders. The results of implementation should also be monitored and evaluated by the joint efforts of all stakeholders, and further planning and implementation should be based on the experiences gained and lessons learned.

ii) Integration of income generation and livelihood improvement activities with natural resource conservation and rehabilitation activities.
Project support for income generation and livelihood improvement activities should be provided only in the villages that show interest, and also participate in rehabilitating natural resources.

iii) Sustainability and expandability
The approaches, methodologies and support systems to be introduced and implemented for natural resource management and livelihood development have to be sustainable even after the termination of foreign project support. Expandability of the approaches and methodologies to other parts of the Coruh River catchment, or elsewhere with similar conditions, should also be given due attention.

Strategies for natural resources rehabilitation, management and utilization

i) Priority for the high damage and risk areas in erosion control and rehabilitation work.

Critical areas ("hotspots") which are causing severe damage or creating serious threats to lowland settlements, infrastructures and agricultural lands will be given priority in erosion control and rehabilitation during implementation of the MC plan.

ii) Due attention to the cost effectiveness, rehabilitation potential, and use of local species in erosion control.

Wherever possible and appropriate, natural rehabilitation by protection will be preferably implemented. Afforestation will be implemented only on the areas with suitable site and soil conditions. Non-active, natural erosion sites and severely degraded areas with no rehabilitation potential will be avoided. Rehabilitation interventions will be planned and implemented to adequately cover the catchments of problem streams in order to be effective. Work on very small and scattered areas with little significant potential beneficial impact on the catchment will be avoided. On suitable rehabilitation sites appropriate local and multipurpose plant species (e.g. *P. tremula*, *Ostrya carpinifolia*, *Capparis ovata*, *Rosa canina*, sainfoin, etc.) will be used in addition to local forest tree species.

iii) Contracting out erosion control, afforestation and forest conservation work to local village communities.

Wherever there are villagers who have interest and capacity, erosion control, afforestation establishment and maintenance-work will be given to local village communities on contract, in accordance with the existing regulations appropriate to these purposes. Besides creating significant revenue opportunities for villagers this will also serve to minimize villagers' opposition to expanding such activities to other sites, which might have been opposed by villagers previously. Protection of such areas or other forest lands within the MC should also be given to village community by contract.

iv) Controlled grazing and decreased grazing periods in range areas.

These will be the fundamental strategies for rehabilitation and management of range resources. Fertilization, re-seeding and water trough construction will be the other complementary activities to be implemented on suitable sites.

Strategies for livelihood improvement

i) Irrigation development

This will play a key role in contributing to livelihood development, not only through increasing the productivity of cash crops but also through reducing grazing pressure on rangelands by increasing forage production for winter and stall feeding.

ii) Development of agricultural productivity.

These activities will include expansion of irrigated agriculture, promoting crop diversification (e.g. introduction of cultivation of strawberries and other crops), improvement of horticultural varieties and practices, development of agricultural crop processing and marketing, and rehabilitation of suitable lands on colluvial fans for agricultural uses.

iii) Development of stall feeding and livestock productivity.

In order to reduce the pressure on natural resources, the structure of livestock farming should be transformed, if possible, from pasture based grazing to stall feeding of feed from high yielding varieties of pasture and fodder species. Livestock products should be processed and marketed with value added if economically feasible. Mechanized hay cutting should be introduced on suitable lands.

iv) Development of other income generating activities.

Diversification of income-generating activities such as beekeeping, fish farming and handicrafts should be promoted where economically and technically feasible.

v) Strengthening of support systems.

Agricultural, livestock and other income generation programs and activities should be supported selectively by provision of adequate agricultural extension services and technical assistance; provision of livestock extension services, technical assistance and veterinary services; provision of credit support with suitable terms and under acceptable cost-sharing conditions, strengthened monitoring of appropriate utilization of credit assistance; and establishment of a small scale mechanization development-assistance center.

Strategies for human resource development

Strengthening awareness creation, capability raising, training, applied research, demonstration activities and technical assistance.

These will involve, among other activities, development and implementation of environmental education and awareness creation programs; training courses and on-the-job training for project staff and villagers involved in MEF activities; exchange of experiences between different villages and MCs; establishment of demonstration areas for different natural resource development and management problems and income generation activities; involvement of local research institutions in the project activities to undertake applied research together with the implementing units of MEF and the villagers to solve problems encountered during implementation; and undertaking publicity programs to inform the public and authorities about the achievements of the project in the MCs.

J.1.4 Spatial Arrangements

The project areas of the proposed activities for rehabilitation of local natural resources and village development have been determined, based on mainly Forest Management Plan, prioritized planning area of MEF regional office, experts' judgment from field reconnaissance and suggestions from forest villagers in participatory workshops. Main sources for determining project sites are as follows.

Soil Conservation, Afforestation and Rangeland Rehabilitation

(Legend of MC Plans: Soil Conservation, Afforestation, and Rangeland Rehabilitation)

MEF regional officers have affluent experiences in soil conservation and other rehabilitation measures based on their original management plans. When determining project sites, their priority areas have been amply examined and they have been delineated by MEF regional counterparts. At the same time, through field visits, the Study Team recognized the area where soil erosion is critical, but rather reversible. Moreover, in participatory workshops, forest villagers suggested the locations and their extent of these projects. Their requests are fully reflected into the Plans.

Rehabilitation of Degrade High Forest and Rehabilitation of Degraded Coppice Forest

(Legend of MC Plans: Rehabilitation of Degraded High Forest and Rehabilitation of Degraded Coppice Forest)

Forest Management Plan has been fully examined. Forest villagers have noticed degradation of surrounding forests, and the Study Team confirmed the importance of implementing rehabilitation projects.

Energy Forest Plantation and Riverside Plantation

(Legend of MC Plans: Energy Forest Plantation and Riverside Plantation)

The project areas have been suggested mainly by forest villagers in village workshops, and their locations have been investigated by the Study Team.

Improvement of Agricultural Productivity and Irrigation Improvement

(Legend of MC Plans: Agricultural Land Rehabilitation, Irrigation Pond, Lining of Existing Canal, New Canal, Replacement of Pipeline)

Strong requests on Agricultural Land Rehabilitation Project and Irrigation Improvement Project for Livelihood Improvement have also come up in participatory workshops in forest villages. To examine the possibility of irrigation construction, Irrigation Plans of GDRS have been considered. The Study Team and forest villagers had joint field reconnaissance on devastated arable lands and destroyed

irrigation canals and so on, and assured the necessity of these projects. The planning sites of these projects have been described in topographic maps by village headmen (Muhtars), with support of the Study Team.

Thus the delineation of the project areas has been prepared. Lastly, by digitizing them with GIS software, the planning maps in MC plans have completed.

J.1.5 Institutional Arrangements

J.1.5.1 Institutional Arrangements for Implementation

Institutional arrangements for implementation of MC plan will include the following.

i) MC Implementation Group (MCIG): This group will consist of the local AGM, ORKOY, DMPG and OGM engineers and the Muhtars of the MC villages. The MC engineer will coordinate the group.

ii) Village Committee (VC): This committee will comprise, under the Chairmanship of the Muhtar, the representatives of different interest groups in the village. These might include livestock owners, bee-keepers, irrigated land owners, village women, the head of village cooperative and others. The VC will be in charge of the active participation of the village community in planning, implementation, monitoring and assessment stages of the MC plan. Selected members of different interest groups will work as contact persons for their group activities.

iii) District Advisory Committee (DAC): This group will consist of the Muhtars of the MC villages, mayors, OGM District Director, representatives of NGOs, local government agencies (e.g. DSI, GDRS, MARA, *etc.*). The committee will be headed by the District Governor. The AGM engineer will provide secretarial services.

Provision of adequate numbers of staff from the required disciplines and the filling of vacant positions at the local MEF units is of key importance for successful implementation of the MC plan.

The **Provincial Project Management Group (PPMG)** and **Provincial Advisory Committee (PAC)** will provide necessary support and contributions to MCIG and VCs.

J.1.5.2 Participatory Monitoring and Evaluation

MC-level units of MEF will regularly collect and record relevant data and information and will assess the MC plan implementations twice a year, according to relevant performance criteria to be developed. Relevant data and assessment results will regularly be reported to PPMG.

Periodic (twice a year) assessment meetings will also be undertaken at the village level, by the initiative of MCIG and with participation of different activity groups in the village. Results will be provided to PPMG. If required, local MEF staff will participate in these meetings as facilitators.

Once a year, a Provincial level participatory assessment meeting will be organized under the coordination of PPMG, with the participation of the selected representatives from different MCs in the Province.

Relevant data and assessment results from all these activities will periodically be reported to the Project Management Group in Ankara as well as to the PAC.

Participation of representatives of the VCs and MCIG at the periodic and final evaluation missions from PMG will be provided.

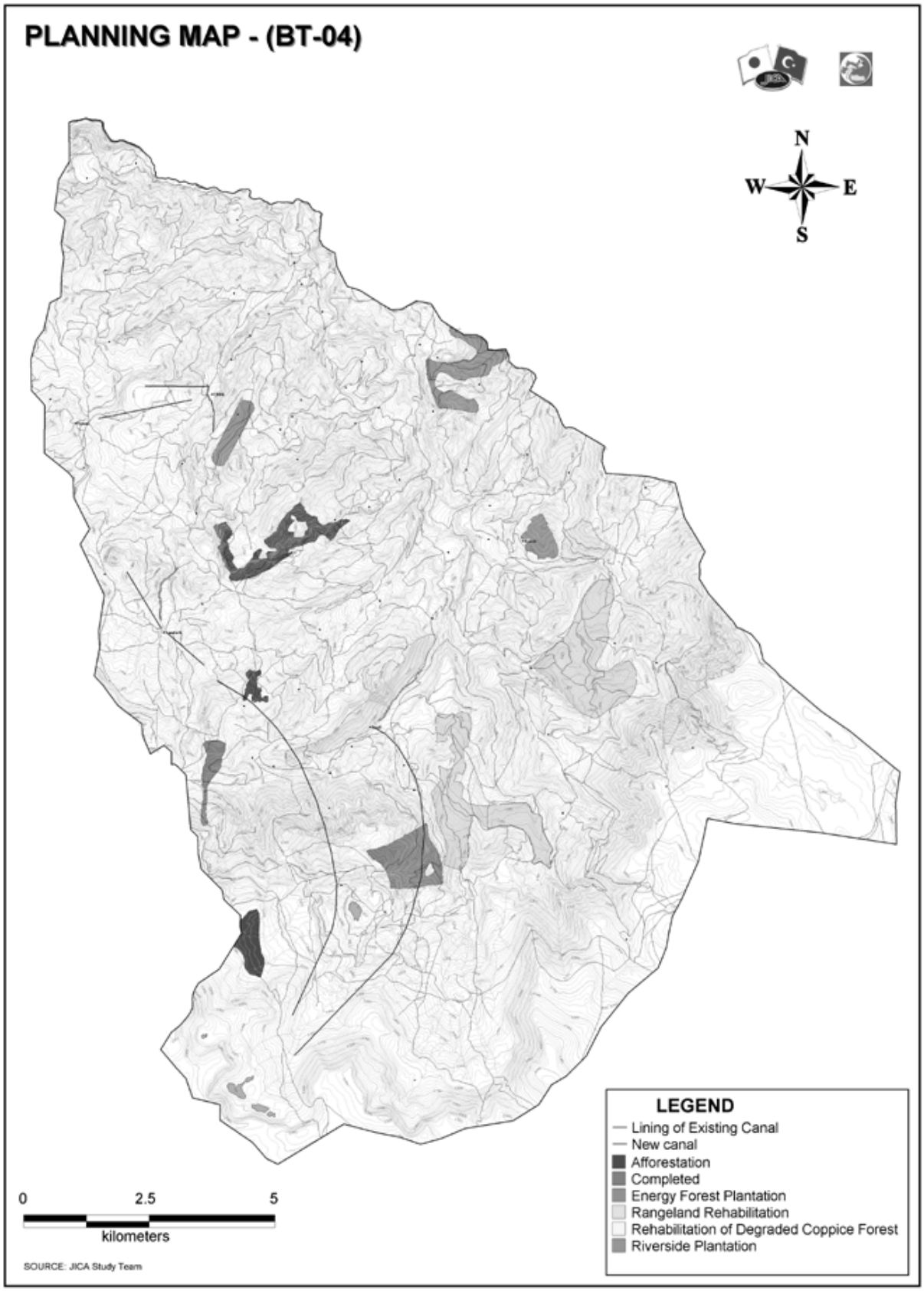
J.2 SAVSAT BT-04 MICRO-CATCHMENT PLAN

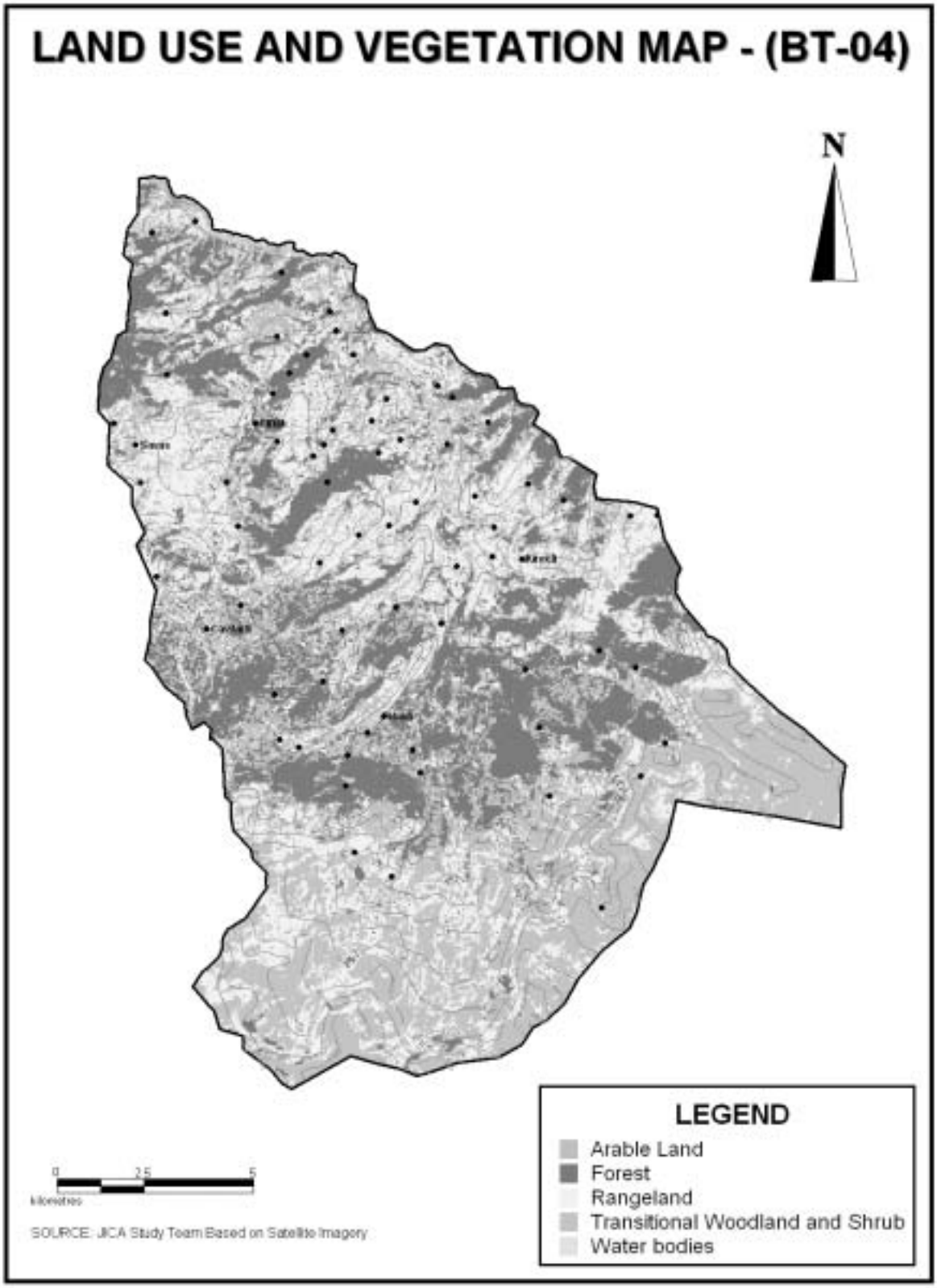
J.2.1 Overview of Savsat BT-04 Micro-Catchment Plan

The Savsat Micro-Catchment (MC) covers about 19,203 hectares in a roughly triangular area south of Savsat, the main administrative center for the MC. Its streams drain northwards into the Berta River, and thence to the Coruh River. The rainfall, at about 700 mm annually, is higher than in the other MCs selected for this Study. The MC has a large proportion (30%) of gentle slopes (<12%) and 49% of the MC has slopes between 12% and 30%. The altitudinal range within the MC is from 700 m to 3,000 m above sea level. About 46% of the MC exhibits severe soil erosion (Erosion Class 3), but most of the rest is in Class 2 (moderate erosion). About 80% of the MC is in Land Capability Classes VI, VII and VIII, unsuitable for cultivation, but 20% is within Classes I to IV, which are cultivable. The most common soils are Brown Forest Soils, with large areas of High Mountain Pasture Soils in the south of the MC. The main land uses in the MC are transitional woodland and scrub (36%), rangelands (30%), forests (26%) and arable land (only 7%). The MC has 15 villages with a total population of 3,509, and the five selected Forest Villages had a total population in 2000 of about 1,600 living in 730 households. The population of these villages has declined during the last decade at a rate averaging about –5% *per annum*. The average annual household income in the selected villages in 2002 was about TL 5,200 million (about US$ 3,500), derived from crops (including forage crops, potatoes and beans), livestock and pensions.

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are poor road systems, followed by inadequate health services, poor irrigation systems and lack of irrigation and drinking water, inadequate agricultural extension systems, insufficient fuelwood and low incomes. Harsh winter conditions, poor marketing systems for agricultural products and poor sewerage systems were also high priority problems for the villagers.

The proposed activities include: afforestation, rehabilitation of Degraded Coppice Forest, energy forest plantations, rangeland rehabilitation and riverside plantations (for natural resource management); irrigation, livestock improvement, crop production and forage crops, fruit orchard rehabilitation, agricultural mechanization, apiculture and improvement of marketing (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 2,038, 3,705 and 499 Billion Turkish Lira (BTL), for a total cost of 6,242 BTL for the five selected villages of the MC.


PLANNING MAP - (BT-04)
N
W
E
S
LEGEND
Lining of Existing Canal
New canal
Afforestation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Riverside Plantation
0
2.5
5
kilometers
SOURCE: JICA Study Team



TOPOGRAPHY AND LAND USE MAP

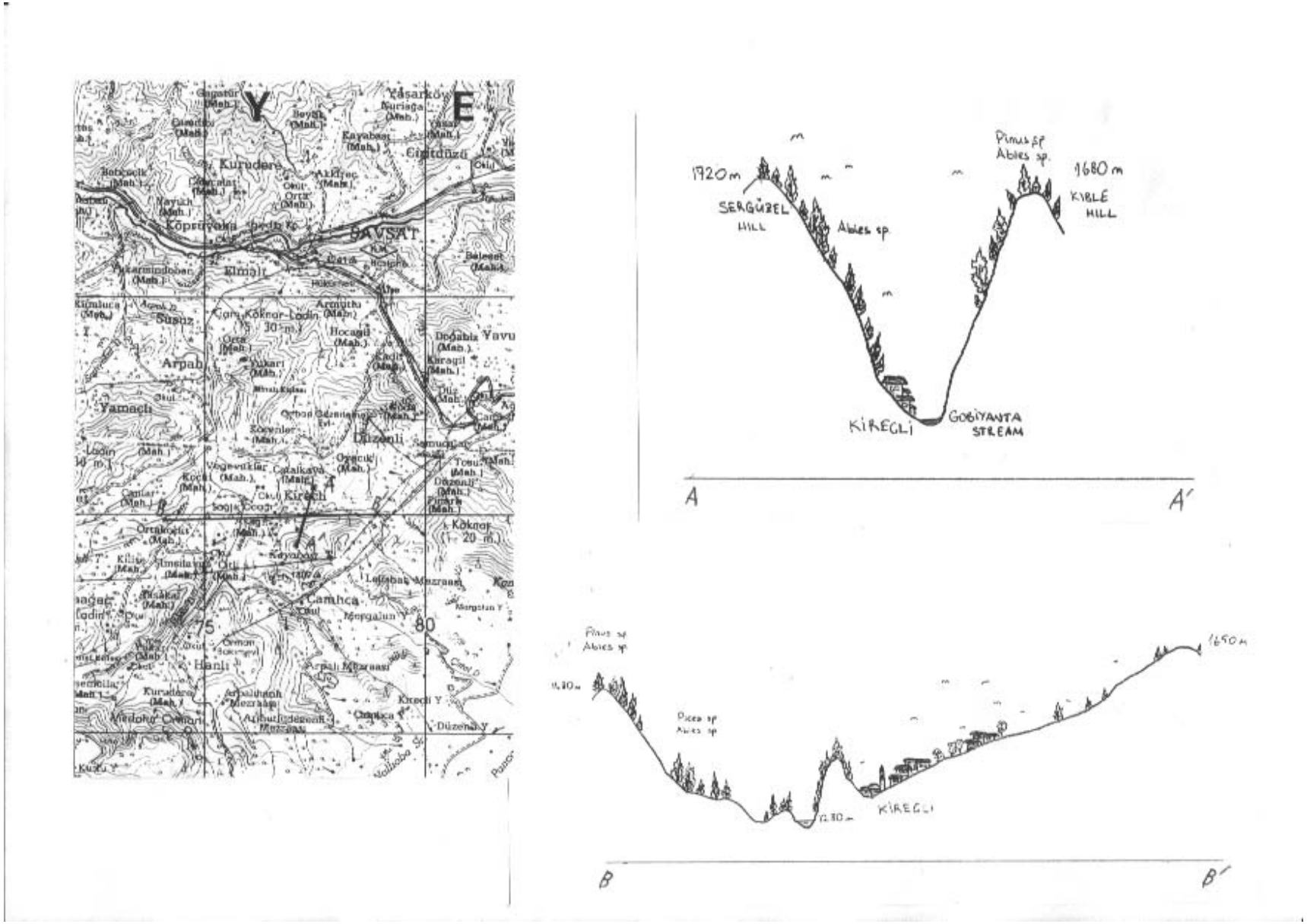


Figure J.2.1 Typical transects across the MC

Figure J.2.2: A Digital Elevation Model

J.2.2 Description of the Micro-Catchment

J.2.2.1 Location and Geographical Conditions

The MC is located in the northeastern corner of the Coruh River Basin and constitutes the upper catchments of the Berta River, which is a major tributary of the Coruh River. It has a total area of about 19,203 ha. The MC is roughly triangular in shape with the apex to the north, near the administrative centre of Savsat, and is some 20 km north to south and 18 km east to west across the base in the south. Altitudes in the MC range from 700 m to 3,000 m. The two main streams in the MC are the Hanli stream, which is joined by the Cavdarli stream before it enters the Berta River. The MC has a large proportion (30%) of gentle slopes (<12%) and 49% of the MC has slopes between 12% and 30%. The climate is hot in summer and cold with snowfalls in winter, and the mean annual rainfall (660 mm in Artvin, the nearest official recording station) is higher than most parts of the Coruh River catchment. Access to most villages in the MC, especially those in the southern parts, is not very good.

J.2.2.2 Natural Resources and Present Land Use

The dominant land use is transitional woodland and scrub (36%) followed by rangeland (30%) and forests (26%). Arable land is only 7% of the MC. According to the Forest Management Plan, Degraded High Forest (BK) and Degraded Coppice Forest (BBt) are predominant. Although the MC is located within an area with rich natural resources there are no officially designated Protected Areas.

The commonest geological type is Cretaceous Volcanic Facies and the most common soils are Brown Forest Soils, and High Mountain Pasture Soils in the southern parts of the MC. About 46% of the MC is severely eroded (Erosion Class 3) and most of the rest is moderately eroded (Class 2). Most areas needing rehabilitation have good potential. About 71% of the MC is in Land Capability Classes VI and VII, with 20% in Classes I to IV (cultivable).

J.2.2.3 Information about the Selected Villages

There are 15 villages within the MC, with a total population of about 3,509. The selected Forest Villages are Cavdarli, Ciftlik, Hanli, Kirecli, and Savskoy, with a total population in 2000 of 1,600. The population growth rates *per annum* during the decade from 1990 to 2000 were negative (averaging –5.1%) for all villages, with Savskoy having the highest rate of -6.4%. The proportion of the population dependent on pensions is least in Kirecli (25%) and highest in Savaskoy (65%). In Cavdarli, the production of potatoes and beans is the largest source of income, while in most other villages it is fodder crops, vegetables and livestock. The average annual income per household in 2002 in the selected villages was TL 5,202 million TL, ranging from Hanli (TL 5,860 m) to Savaskoy (TL 3,960 m).

There are 730 farm households in the selected villages. The main economic activity is cropping and raising livestock. Only 27 households raise sheep, totaling 5,580 head. About 1,020 cows are raised by 390 households, but Hanli and Kirecli have about 70% of the total. Goats are raised in Cavdarli and Kirecli, each with 100 head. The area of pasture and rangeland is about 1,500 ha, with the maximum at Kirecli (500 ha) and minimum at Ciftlik (150 ha). The total cultivated area of the selected villages is 1,118ha, and average landholding per household is 2.9 ha. The main crops cultivated include fodder crops, potatoes, wheat and beans. There is almost no rain during summer, which is the growing period for the crops, and agricultural production is difficult without irrigation. GDRS plans to ensure that all cultivated areas of Kirecli will be irrigated by 2003. Irrigation coverage in the other four villages ranges from 0% (Hanli) to 80% (Cavdarli). Basic rural infrastructures are present in all villages, but there are no clinics in any villages. Fuels are mainly fuelwood and cow dung, while coal is seldom used.

J.2.3 Major Problems, Constraints and Opportunities

J.2.3.1 Major Problems, Constraints and Opportunities in relation to Natural Resources

Major problems:

- Destruction/degradation of forests by local people to meet their energy needs for heating and cooking.

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Illicit cuttings and degradation of forests. 2. High costs and inadequate knowledge of alternative energy sources.	• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites. • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests. • Provision of coal at suitable prices. • Assistance in testing/development of other energy sources, such as bio-energy, solar energy.

Constrains on rehabilitation and sustainable use of natural resources:

- High dependency on excessive utilizations of upland resources.
- Inadequate attention on local needs during preparation of forest management plans.
- Lack of confidence between villagers and governmental agencies.
- Insufficient staff capacities of the MEF and other relevant government agencies.
- Insufficient collaboration among different government agencies.
- Lack of adequate awareness of local communities about causes and consequences of natural resources degradation and disasters.
- Incomplete cadastral surveys and vague borders of the forests and rangelands. Unclear rights of AGM for working on OT (Forest soil without trees- Forest management plan) areas.

Opportunities for rehabilitation and sustainable use of natural resources:

- Existence of wide area of coniferous forests and oak coppice forests.
- There is growing interest in the MC villagers for collaborating with MEF-AGM for undertaking collaborative in conducting afforestation activities.

Level of interest in sustainable natural resources management: Medium

Current strategies and contributions of the government agencies:

- Forest villagers in the MC are permitted to collect fuelwood from the forests depending on their capacity in the village area by paying modest charges to MEF-OGM.
- MEF-ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their income and for improving relations with the forest organization.
- AGM, OGM and MPG contract protection of forest and wildlife conservation areas to forest village communities by making certain payments to village budget. AGM has also started recently contracting of soil conservation works and tending of such areas to the village communities that have interest and capacity for undertaking such activities.
- Cadastre and border delineation works for range areas are being undertaken by MARA.
- Stream bed and bank rehabilitation activities are being taken by GDRS and DSI.
- Increased interest and efforts to involve local people in natural resources conservation and rehabilitation in combination with livelihood development among different units of MEF.

J.2.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:

- Low income due to low productivity of livestock and crop production which are major income sources for most villagers
- Insufficient employment opportunities due to limited income generating activities

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
Livestock 1. Low productivity of meat and milk 2. Inadequate marketing of livestock products 3. Insufficient credit support for livestock 4. Lack of veterinary services	• Rangeland rehabilitation • Introduction of exotic breeds • Provision of veterinary services • Quality improvement • Modernization of dairy industry • Provision of credit • Provision of periodic veterinary services
Crop production 1. Insufficient irrigation water supply 2. Insufficient agricultural knowledge/extension services 3. Inadequate marketing of agricultural products 4. Low productivity of land 5. Low profitability 6. High price of fertilizer 7. Insufficient credit support for agriculture	• Irrigation development (rehabilitation and improvement of existing canal, construction of new irrigation system) • Provision of adequate extension services • Quality improvement • Advertising • Research and development (soil analysis) • High value crop production (cherry, apple, pear, etc.) • Provision of credit

Constraints on livelihood improvement:

- Predominant aged population which hampers expansion of agricultural activity
- Lack of technical information
- Lack of entrepreneurship in managing dairy processing plant (Kirecli)
- Locational disadvantage in marketing products

Opportunities for livelihood improvement:

- Relatively gentle topography which allows mechanization of hay cutting
- Large pasture and meadow area with good quality pastures
- Experienced farmers
- Strong social ties with out-migrants who live in the western part of Turkey

Level of interest in improving livelihoods: High

Current strategies and contributions of the government agencies

- Direct income support for the farmers (MARA; financed by World Bank)
- Subsidy for forage crop production support (MARA; financed by Turkish Government)

J.2.4 Proposed Activities

J.2.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Afforestation	Cavdarli stream	133 ha	
2. Rehabilitation of Degraded Coppice Forest			
(Activity 1): Natural regeneration	Aradall stream (Hanli)	50 ha	Implement Activities 1 and 2
(Activity 2): Rehabilitation	Aradall stream (Kirecli)	52 ha	Implement Activities 1 and 2
	Civik, Karaagac stream	171 ha	Implement Activities 1 and 2
3. Energy Forest Plantation	Cavdarli stream (Ciftlik)	279 ha	
	Aradall stream (Kirecli)	74 ha	
4. Rangeland Rehabilitation			
(Activity 1): Natural regeneration	Aradall stream (Kirecli)	269 ha	Implement Activities 1,2,3 and 4
(Activity 2): Rangeland improvement			
(Activity 3): Gully plugging (stone walls)			
(Activity 4): Gully plugging (brush walls)			
5. Riverside Plantations	Cavdarli stream (Cavdarli)	0.4 ha	
	Aradall stream (Hanli)	0.4 ha	

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.2.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Cavdarli		
1.Irrigation		
-Canal rehabilitation	L=16,000 m	Lining of existing canals
-New canal construction	L= 1,350 m	Concrete canal
2.Crop Production Improvement		
-Forage production increase	A=123 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 11 ha	Potatoes, dry beans, tomatoes
-Fruit orchard rehabilitation	A= 7 ha	Replanting old trees of walnut, apple, sour cherry, cherry
3.Marketing Improvement		
-Collection and shipment	A=2,000 m^2	Co-collection and shipment facility
4.Agricultural mechanization	3 sets	Tractor (including attachments) and mower
5.Apiculture	6 units	10% of the households: 120 beehives
Ciftlik		
1.Irrigation		
-Canal rehabilitation	L=3,000 m	Lining of existing canals
2.Crop Production Improvement		
-Forage production increase	A= 42 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 5 ha	Potatoes, dry beans, tomatoes
-Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of walnut, apple, sour cherry, cherry
3.Marketing Improvement		
-Collection and shipment	A=2,000 m^2	Co-collection and shipment facility
4.Agricultural mechanization	2 sets	Tractor (including attachments) and mower
5.Apiculture	7 units	10% of the households: 140 beehives
Hanli		
1.Irrigation		
-Canal rehabilitation	L=10,000 m	Lining of existing canals
2.Crop Production Improvement		
-Forage production increase	A=157 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 17 ha	Potatoes, dry beans, tomatoes
-Fruit orchard rehabilitation	A= 5 ha	Replanting old trees of walnut, apple, sour cherry, cherry
3.Marketing Improvement		
-Collection and shipment	A=2,000 m^2	Co-collection and shipment facility
4.Agricultural mechanization	3 sets	Tractor (including attachments) and mower
5.Apiculture	10 units	10% of the households: 200 beehives
Kirecli		
1.Livestock Improvement		
-Improvement of breed	14 head of cattle	Local breed to pure breed
2.Crop Production Improvement		
-Forage production increase	A=290 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 27 ha	Potatoes, tomatoes, cucumbers, strawberries
-Fruit orchard rehabilitation	A= 14 ha	Replanting old trees of walnut, apple, sour cherry, cherry
3.Marketing Improvement		
-Collection and shipment	A=2,000 m^2	Co-collection and shipment facility
4. Agricultural mechanization	4 sets	Tractor (including attachments) and mower
5.Apiculture	30 units	10% of the households: 600 beehives
Savaskoy		
1.Irrigation		
-Canal rehabilitation	L=5,000 m	Lining of existing canal
2.Livestock Improvement		
-Animal breeding	12 head of cattle	Local breed to pure breed
3.Crop Production Improvement		
-Forage production increase	A=293 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 11 ha	Potatoes, dry beans, tomatoes
-Fruit orchard rehabilitation	A= 7 ha	Replanting old trees of walnut, apple, sour cherry, cherry
4.Marketing Improvement		
-Collection and shipment	A=2,000 m^2	Co-collection and shipment facility
5.Agricultural mechanization	3 sets	Tractor (including attachments) and mower
6.Apiculture	20 units	10% of the households: 400 beehives

J.2.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula*, *Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.2.5 Activities, Effects, Benefits, Inputs and Costs

J.2.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Afforestation	-Increasing both quality and quantity of tree stock -Providing better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape	133 ha	224	
2. Rehabilitation of Degraded Coppice Forest	-Decreasing soil erosion -Increasing both quality and quantity of tree growing stock -Providing better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape	273 ha	160	Activities include: 1. Rehabilitation 2. Natural regeneration
3. Energy Forest Plantation	-Increasing vegetation coverage -Increasing both quality and quantity of tree stock -Improving water balance -Increasing aesthetic value of the landscape.	353 ha	595	
4. Rangeland Rehabilitation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing fodder production -Increasing aesthetic value of the landscape	269 ha	117	Activities include: 1. Natural regeneration 2. Controlled grazing 3. Gully plugging 4. Watering troughs
5. Riverside Plantations	-Protection of inhabitant's livelihood and farmland -Increasing aesthetics value of the landscape.	(0.8 ha)	5	
Sub-total cost			**1,101**	

J.2.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Irrigation Improvement	-Increase of crop production and improvement of productivity -Expansion of irrigation area	Rehabilitation of canal: L=34,000m New canal: L= 1,350m	391 31	Lining of existing canal Extension of new canal
2. Livestock Improvement	-Increase of milk production and live weight -Quality improvement	26 heads	49	Animal breeding
3. Fodder Production Irrigated Land	-Stable supply of forage for livestock -Livestock quality improvement	A=905 ha	210	Increase forage production
4. Fruit Orchard Rehabilitation	-Improvement of productivity -Quality improvement	A= 35 ha	56	Replanting of old fruit trees
5. Agricultural Mechanization	-Improvement of work shortage -Improvement of cropping system according to the cultivation season	10 set	300	Tractor and mower
5. Apiculture	-Diversification of economic activity -Increase sub-income	73 units	29.2	740 beehives
6.Marketing Improvement	-Shipment according to market trend -Reduction of post harvest loss	A=10,000m^2	300	Co-collection and shipment facility: 1unit 2000m^2
Sub-total cost			**1,366**	

J.2.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS & OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training of engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of the natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lecture in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Vide films, brochures, posters, etc.

3. Research (for whole MC)			100	
- Research on disaster mechanism	Provide mechanism of the occurrence of disaster	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control project	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management method	3 years,		Equipment; field test, analysis
- Wildlife inventory	Grasping the number of wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy	2 years,		Demo-plants construction, experiment by demo-plants
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding of various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water and farm management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practice on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**2,825**	

J.2.6 Total Project Cost in Savsat Micro-Catchment (BT-04)

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)
1. Natural Resource Rehabilitation and Management (Area of MC: 19,203 ha)		
1. Afforestation	246 ha	415
2. Rehabilitation of Degraded Coppice Forest	505 ha	296
3. Energy Forest Plantation	657 ha	1,101
4. Rangeland Rehabilitation	498 ha	217
5. Riverside Plantations	(1.5 ha)	9
Sub-total cost		**2,038**
2. Livelihood Improvement (No. of forest villages: 15)		
1. Irrigation Improvement	Rehabilitation of canal: L=95,200m New canal: L= 3,780m	1,182
2. Livestock Improvement	73 heads	137
3. Fodder Production Improvement	A=2,534 ha	588
4. Fruit Orchard Rehabilitation	A= 98 ha	160
5. Agricultural Mechanization	28 set	840
6. Apiculture	204 units	82
7.Marketing Improvement	A=28,000m^2	840
Sub-total cost		**3,829**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		84
3. Research		100
4. Demonstration		140
5. Technical Assistance		75
Sub-total cost		**499**
Total Cost		**6,366**

J.2.7 Implementation Schedule

ACTIVITY	PRIOR-ITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional arrangement							
Natural Resources							
1. Afforestation							
2. Rehabilitation of degraded coppice forest	●						
3. Energy forest plantation	●						
4. Rangeland rehabilitation	●						
5. Riverside plantations							
Livelihood Improvement							
1. Irrigation development	●						
2. Livestock development	●						
3. Fodder production	●						
4. Fruit orchard rehabilitation							
5. Agricultural mechanization	●						
6. Apiculture development							
7. Marketing improvement							
Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters							
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory							
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows	●						
- Crop production	●						
5. Technical assistance							
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

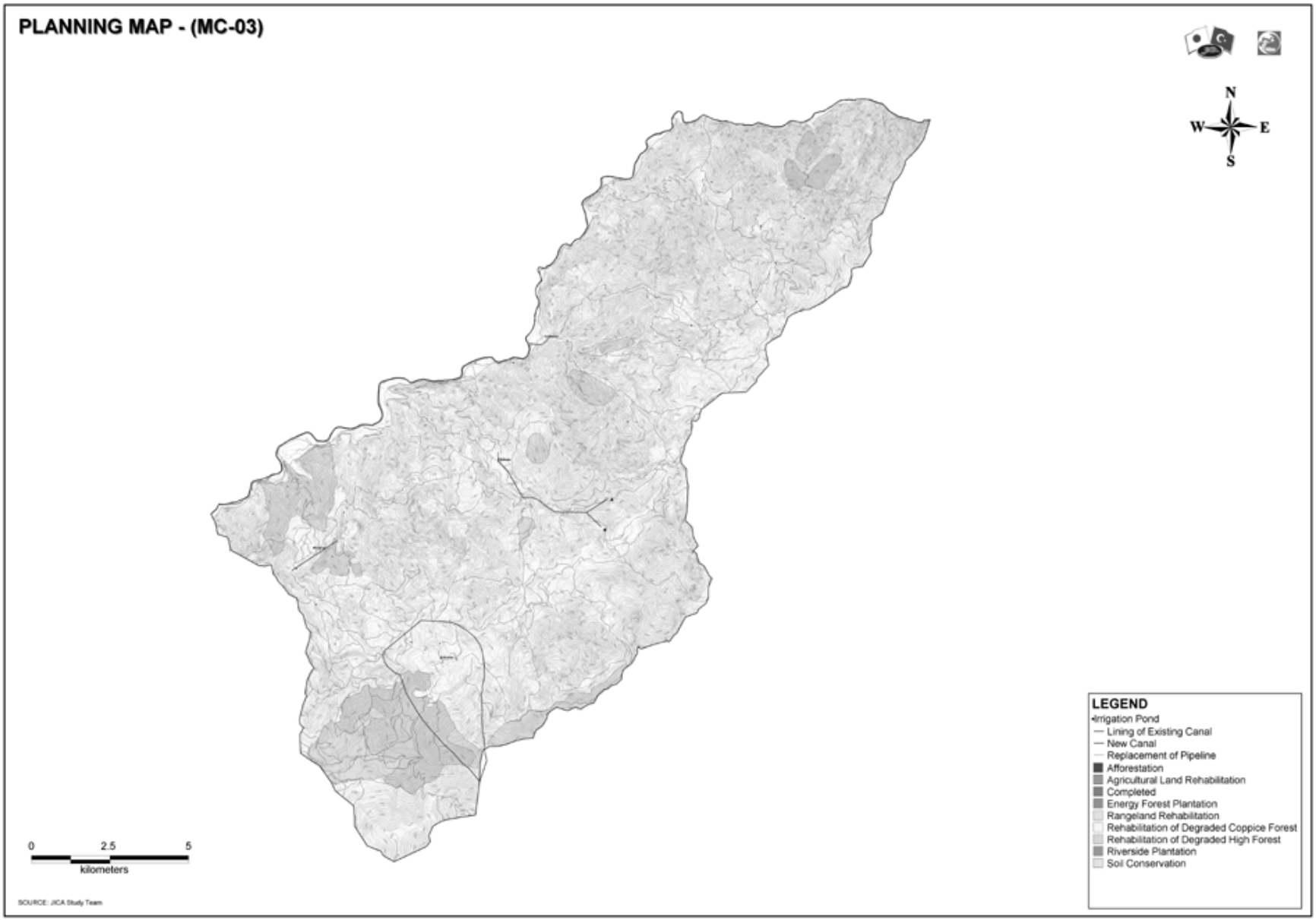
J.3 YUSUFELI MC-03 MICRO-CATCHMENT PLAN

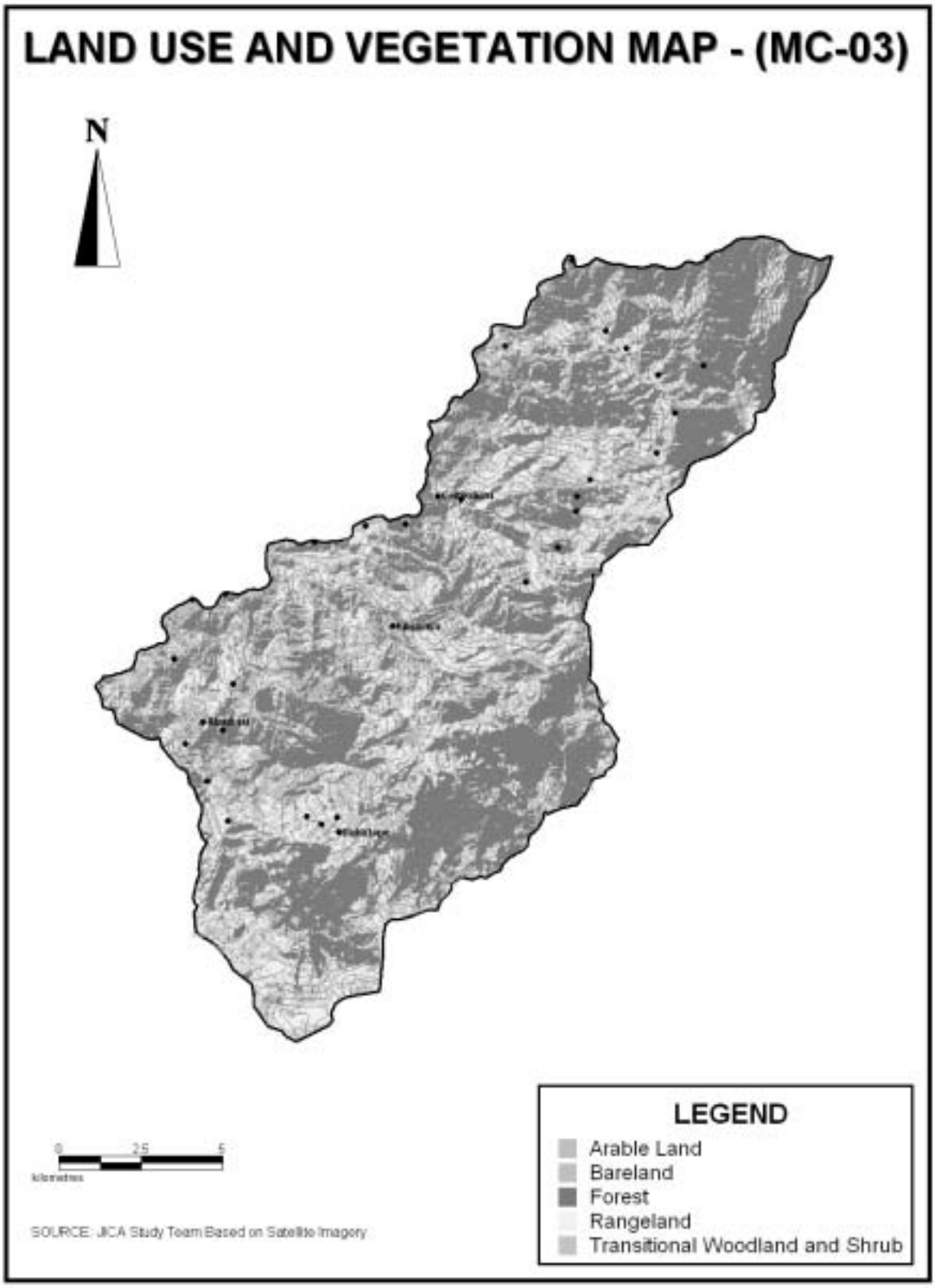
J.3.1 Overview of Yusufeli MC-03 Micro-Catchment Plan

The Yusufeli Micro-Catchment (MC) covers about 22,643 hectares south and east of the main administrative center of Yusufeli, and its streams drain directly into the Coruh River. The MC is characterized by extremely steep, eroded and rocky mountains with active natural erosion and landslides, and about 52% of the land is steeper than 30% slope. The altitudinal range within the MC is from 600 m to 3,000 m above sea level. The rainfall is very low – about 300 mm annually in Yusufeli – with very cold snowy winters and extremely hot summers. About 65% of the MC exhibits severe soil erosion (Erosion Class 3). About 96% of the MC is in Land Capability Classes VI, VII and VIII, unsuitable for cultivation. The most common soils are infertile and shallow Brown Forest Soils, with a few small scattered areas of Alluvial Soils. The main land uses in the MC are 44% under forests, 21% under rangelands and 18% of arable land. The MC has three Forest Villages and one normal village, with a total population in 2000 of 4,053 in 1,125 households. The normal village, Kilickaya, is actually a Sub-District center and has an unusually large population of 2,859 people. The populations of the three conventional Forest Villages have declined during the last decade at a rate of about –4.2% *per annum*, but the population of Kilickaya is virtually stable. The proportion of the populations dependent on pensions for annual incomes is as high as 85% in Celtikduzu and other villages have about 60% dependency. The average annual household income in the selected villages in 2002 was about TL 4,830 million (about US$ 3,220), derived from pensions, livestock, crops (including rice, fruits and vegetables).

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are poor village roads, inadequate sewerage systems, inadequate health systems, difficult lives and harsh conditions in villages, poor marketing systems for agricultural products, insufficient drinking water and low incomes. Priority problems related to natural resources included natural disasters (especially floods and landslides) and lack of fuelwood.

The proposed activities include: soil conservation, rehabilitation of degraded High Forest and rangeland rehabilitation, (for natural resource management); irrigation, livestock improvement, crop production and forage crops, fruit orchard rehabilitation and improvement of marketing (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 1,238, 1,201 and 355 Billion Turkish Lira (BTL), for a total cost of 2,794 BTL for the four selected villages of the MC.


PLANNING MAP - (MC-03)
N
W
E
S
LEGEND
Irrigation Pond
Lining of Existing Canal
New Canal
Replacement of Pipeline
Afforestation
Agricultural Land Rehabilitation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Rehabilitation of Degraded High Forest
Riverside Plantation
Soil Conservation
0
2.5
5
kilometers
SOURCE: JICA Study Team



TOPOGRAPHY AND LAND USE MAP

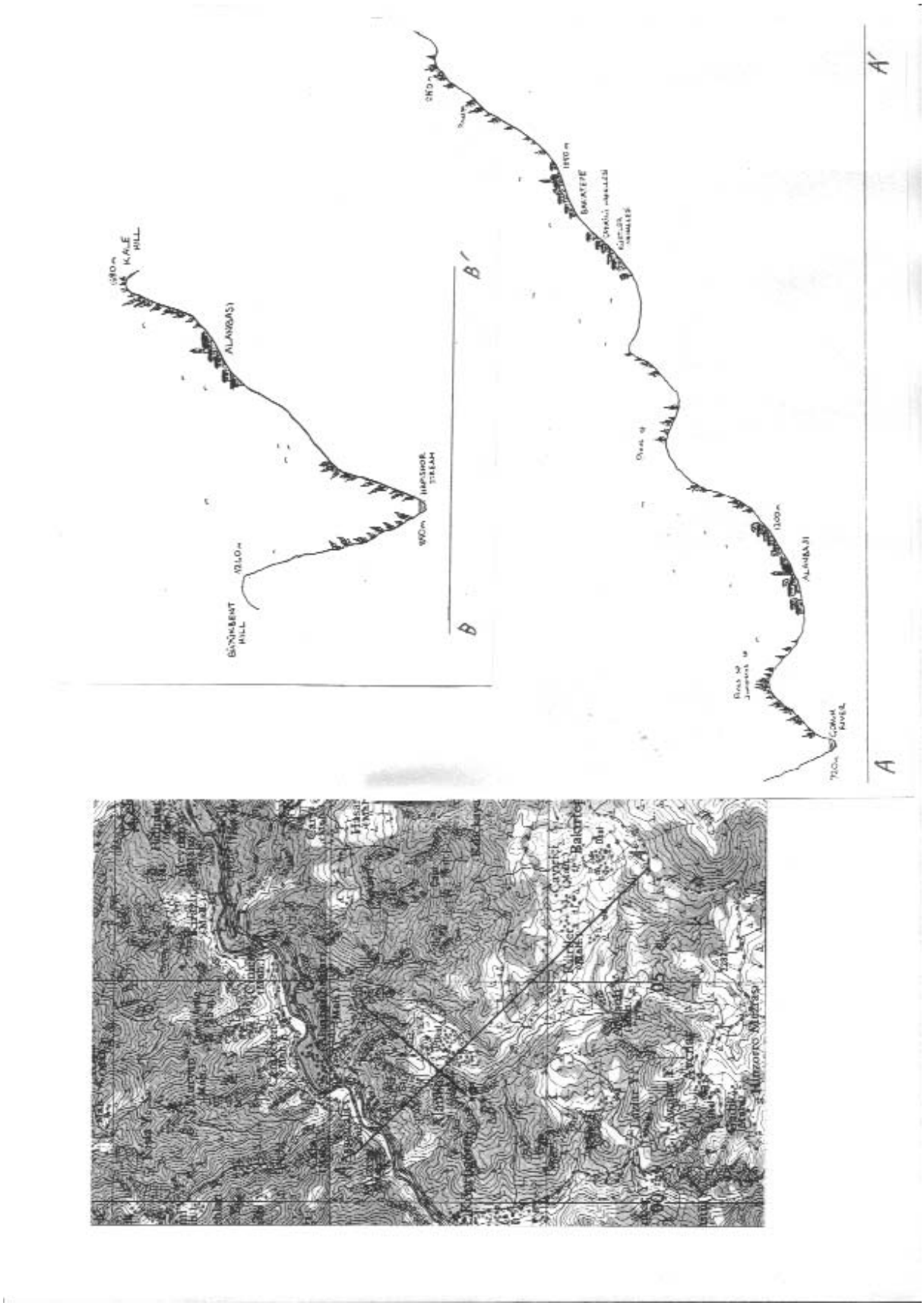


Figure J.3.1 Typical transects across the MC

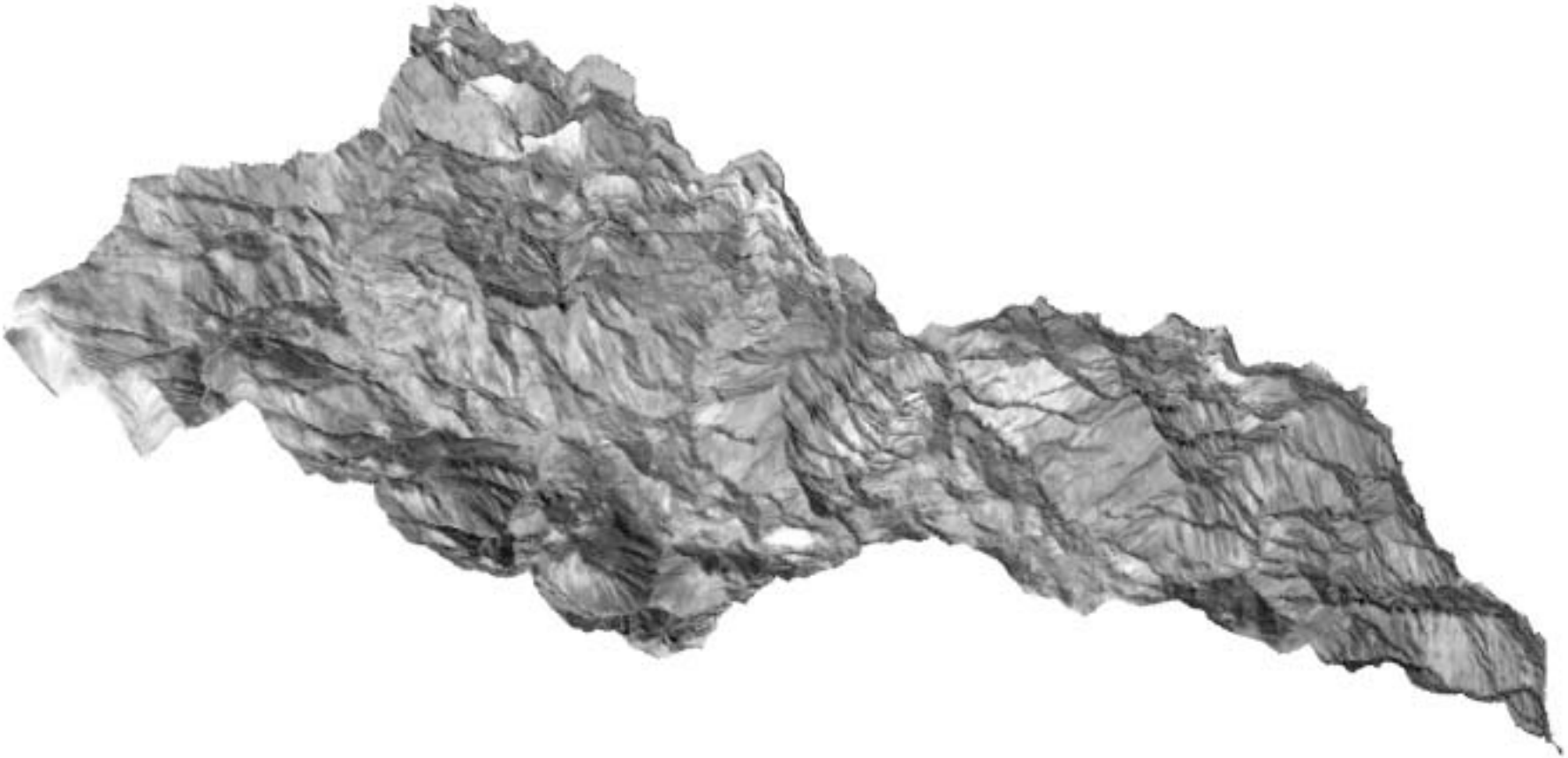


Figure J.3.2: A Digital Elevation Model

J.3.2 Description of the Micro-Catchment

J.3.2.1 Location and Geographical Conditions

The MC is located in the central part of the Coruh River catchment and has an area of about 22,643 ha. It extends to the south of the main administrative centre, Yusufeli, along the right bank of the Coruh River and is about 22 km long east to west and 23 km wide north to south. The Coruh River forms the northwestern boundary of the MC, and the landscape is characterized by extremely steep and rugged topography, especially in the gorge of the Coruh River. Altitudes range from about 600 to 3,000 m above sea level. There are eight significant tributaries of the Coruh within the MC – the Kavus, Buyukkotenek, Vardenet, Sekisel, Balsuyu, Kilickaya, Ardere and Hapishor streams. The MC has very steep topography, with 20% of the land over 45% slope, 32% over 30% slope and only 9% less than 12% slope. The climate varies with location and altitude, but is generally extremely hot and dry in summer and bitterly cold in winter. The mean annual rainfall at Yusufeli is only about 300 mm. Access to Kilickaya and Celtikduzu is quite good but the other villages are very poorly served with roads, especially Alanbasi.

J.3.2.2 Natural Resources and Present Land Use

The MC has about 44% of its area covered with forests, followed by rangeland (21%) and arable land (18%). The forests are mostly High Forest (type NK) or Degraded High Forest (BK). There are some areas of Degraded Coppice Forest (BBt). There are extensive areas of rangelands above about 1900 m altitude. The northern area of the MC, including and north of the village of Irmakyani, is an officially-designated Wildlife Conservation Area for hooked-horn wild goats.

The dominant geological types are Eocene Volcanic Facies and Eocene Flysch. The most common soils are Brown Forest Soils, which are generally infertile and shallow, and a few small scattered areas of Alluvial Soils. About 65% of the MC has Class 3 Soil Erosion (Severe), and most of the rest of the MC is in Class 2 (Moderate). The potential for rehabilitation is generally poor, due to the physical severe constraints. About 96% of the MC is in Land Capability Classes VI, VII and VIII.

J.3.2.3 Information about the Selected Villages

There are four villages within the MC, with a total population in 2000 of about 4,053. Among these, The three Forest Villages (Alanbasi, Bakirtepe and Celtikduzu) have a total population of about 1,194 and the one normal village (Kilickaya, a Sub-District centre) has about 2,859 people. The population growth rates from 1990 to 2000 were negative for all villages, with Bakirtepe having the highest rate of -5.7% *per annum* and Kilickaya only –0.4%. The proportion of the population dependent on pensions for annual income is as high as 85% in Celtikduzu and other villages have about 60% dependency. Pensions are the largest source of income for all the selected villages. The average annual household income in 2002 was TL 4,830 million (US$3,220).

The total number of households in the four villages is 1,125. While the main economic activity is raising livestock, crops such as rice, vegetables and fruits are also produced. Cattle (a total of about 1620) are raised by almost all farm households in Alanbasi and Bakirtepe (normally 6-8 cows per household). However, only 70 of the Celtikduzu households and only 6 households in Kilickaya raise cattle. The number of households raising sheep is low but there are 1,680 sheep. There are about 2,300 goats in the four villages, with about 1,500 head in Celtikduzu.

The total cultivated area of the selected villages is 2,882 ha (1,680 in Kilickaya), and the average landholding per household is 3.1 ha. The main crops cultivated include wheat, fruits, beans and vegetables, with rice being cultivated along the Coruh river. Beekeeping is a valuable source of income, with some 400 beehives in Alanbasi and more than 200 hives in each of the other villages. Basic rural infrastructures are present in all villages, but Alanbasi is the only village with a clinic. Fuels are mainly fuelwood and coal, but LPG is also used for cooking.

J.3.3 Major Problems, Constraints and Opportunities

Major problems:

- Natural disaster (e.g. floods) and soil erosion due to fragile site and over-use/degradation of forest and range resources.
- Overuse of forest resources by local people to meet their energy needs for heating and cooking.

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Natural disasters (e.g. floods, avalanches, landslides). 2. Soil erosion, de-regulation and losses of water resources.	• Soil conservation measures on degraded area.
3. Illicit cuttings and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites. • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests. • Provision of coal at suitable prices. • Assistance in testing/development of other energy sources, such as bio-energy, solar energy.
5. Degradation, low productivity, under-utilization of range resources.	• Range improvement measures (e.g. water troughs, re-seeding, fertilization). • Development of forage production on suitable lands. • Supporting/development of stall-feeding.

Constrains on rehabilitation and sustainable use of natural resources:

- Extremely steep and unstable slopes, especially in the gorge of the Coruh River.
- Shallow soils and very dry climates.
- Variable, but often severe, village opposition to involvement in erosion control work.
- Degraded conditions and low productivity of the significant parts of the forest resources.
- High dependency on excessive utilizations of upland resources.
- Inadequate attention on local needs during preparation of forest management plans.
- Lack of confidence between villagers and governmental agencies.
- Insufficient staff capacities of the MEF and other relevant government agencies.
- Lack of adequate awareness of local communities about causes and consequences of natural resources degradation and disasters.
- Incomplete cadastral surveys and vague borders of the forests and rangelands. Unclear rights of AGM for working on OT (Forest soil without trees- Forest management plan) areas.

Opportunities for rehabilitation and sustainable use of natural resources:

- Existence of potential for oak coppice rehabilitation under controlled grazing.
- There is growing interest in the MC villagers for collaborating with AGM for undertaking collaborative in conducting soil conservation and afforestation activities.
- Existence of wide variety of multipurpose local tree, shrub and grass species for undertaking technically successful and socially acceptable rehabilitation activities.

Level of interest in sustainable natural resources management: Medial to Low

Current strategies and contributions of the government agencies:

- Forest villagers in the MC are permitted to collect fuelwood from the forests depending on their capacity in the village area by paying modest charges to OGM.
- MEF-ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their income and for improving relations with the forest organization.
- AGM, OGM and MPG contract protection of forest and wildlife conservation areas to forest village communities by making certain payments to village budget. AGM has also started

recently contracting of soil conservation works and tending of such areas to the village communities that have interest and capacity for undertaking such activities.
- Cadastre and border delineation works for range areas are being undertaken by MARA.
- Stream bed and bank rehabilitation activities are being taken by GDRS and DSI.
- Increased interest and efforts to involve local people in natural resources conservation and rehabilitation in combination with livelihood development among different units of MEF.

J.3.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:
- Low incomes due to low productivity of livestock and crop production, which are the major income sources for most villagers
- Insufficient employment opportunities due to the limited income generating activities

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
Livestock 1. Marketing 2. Low productivity 3. Lack of veterinary services	 • Dairy processing plant • Cooperative establishment • Cattle breeding through artificial insemination • Fodder crop production increase • Pasture improvement (water troughs, re-seeding, fertilizer application, and controlled grazing) • Provision of veterinary service
Crop production 1. Lack of irrigation water 2. Low productivity of crops 3. Damage by pests and diseases 4. Lack of information on agricultural technology 5. No agricultural extension support 6. Lack of machinery	 • Rehabilitation of existing irrigation system • Irrigation supply • Provision of agricultural extension • Provision of agricultural extension • Provision of agricultural extension and credit • Provision of credit
	Other activities to increase incomes, subject to proven economic feasibility • Bee keeping • Handicrafts (Kilims and carpet weaving)

Constraints on livelihood improvement:
- Lack of labor force as a result of out-migration leaving aged people in the villages
- Fragmented small farmlands which prevent efficient farming
- Lack of technical information
- Harsh topography
- Threat of floods to agricultural land

Opportunities for livelihood improvement:
- Sufficient irrigation water available
- Room for productivity increase
- Warm climate along the Coruh river due to micro-climate that allows production of fruit and rice
- Experienced farmers

Level of interest in improving livelihoods: High

Current strategies and contributions of the government agencies:
- Direct income support for the farmers (MARA; financed by World Bank)
- Subsidy for forage crop production support (MARA; financed by Turkish Government)

J.3.4 Proposed Activities

J.3.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Soil Conservation			
(Activity 1): Natural regeneration	Selisel, Balsuyu stream	150 ha	Implement Activities 1, 4, 5, 6 and 7
(Activity 2): Afforestation, (Type 1)	Hapisor stream	531 ha	Implement Activities 1, 3, 4, 5, 6 and 7
(Activity 3): Afforestation, (Type 2)	Kilickaya stream	150 ha	Implement Activities 1, 4, 5, 6 and 7
(Activity 4): Re-greening (Type 1)			
(Activity 5): Re-greening (Type 2)			
(Activity 6): Gully plugging (gabion walls)			
(Activity 7): Gully plugging (brush walls)			
2. Rehabilitation of Degraded High Forest			
(Activity 1): Natural regeneration	Hapisor stream	838 ha	Implement Activities 1 and 2
(Activity 2): Rehabilitation			
3. Rangeland Rehabilitation			
(Activity 1): Natural regeneration	Hapisor stream	394 ha	Implement Activities 1, 2, 3 and 4
(Activity 2): Rangeland improvement			
(Activity 3): Gully plugging (gabion walls)			
(Activity 4): Gully plugging (brush walls)			

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.3.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Alanbasi		
1. Irrigation Improvement		
-Replacement of irrigation pipe	L= 370 m	Diameter 500mm
-New branch canal	L= 1,500 m	Concrete canal
2. Livestock Improvement		10% of households
-Animal breeding	240 head of cattle	Local breed to pure breed
3. Crop Production Improvement		
-Forage production increase	A=189 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 40 ha	Rice, potatoes, dry beans, tomatoes, strawberries
-Fruit orchard rehabilitation	A= 12 ha	Replanting old trees of walnut, peach, sour cherry, cherry
4. Apiculture	A= 18 units	10% of households, 360 beehives (1unit 20 beehives)
Bakirtepe		
1. Irrigation Improvement		
-Canal rehabilitation	L= 17,000m	Lining of existing canals
2. Livestock Improvement		
-Animal breeding	15 head of cattle	Local breed to pure breed
3. Crop Production Improvement		
-Forage production increase	A= 70 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 7 ha	Potatoes, dry beans, tomatoes, strawberries
-Fruit orchard rehabilitation	A= 4 ha	Replanting old trees of walnut, apple, sour cherry
4. Apiculture	A= 5 units	10% of households, 100 beehives (1unit 20 beehives)
Celtikduzu		
1. Crop Production Improvement		
-Forage production increase	A= 179 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 50 ha	Rice, potatoes, dry beans, tomatoes
-Fruit orchard rehabilitation	A= 6 ha	Replanting old trees of walnut, peach, sour cherry, cherry
2. Apiculture	A= 20 units	10% of households, 400 beehives (1unit 20 beehives)
Kilickaya		
1. Irrigation Improvement		
-Pond	V=1,200m^3	2 concrete pond
-Canal rehabilitation	L=5,500m	Lining of existing canal
2. Livestock		
-Animal breeding	9 head of cattle	Local breed to pure breed
3. Crop Production Improvement		
-Forage production increase	A= 563 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 54 ha	Rice, potatoes, dry beans, tomatoes, strawberries
-Fruit orchard rehabilitation	A= 26 ha	Replanting old trees of peach, apple, sour cherry, cherry
4. Apiculture	A= 58 units	10% of households, 1,160 beehives (1unit 20 beehives)

J.3.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula, Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.3.5 Activities, Effects, Benefits, Inputs and Costs

J.3.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Soil Conservation	-Decreasing soil erosion -Increasing vegetation coverage -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	831 ha	635	Activities include: 1. Natural regeneration 2. Afforestation 3. Re-greening 4. Gully plugging
2. Rehabilitation of Degraded High Forest	-Decreasing soil erosion -Increasing both quality and quantity of tree growing stock -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	838 ha	309	Activities include: 1. Rehabilitation 2. Natural regeneration
3. Rangeland Rehabilitation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing fodder production -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of landscape	394 ha	173	Activities include: 1. Natural regeneration 2. Rangeland improvement 3. Gully plugging 4. Watering troughs
Sub-total cost			**1,117**	

J.3.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Irrigation Improvement	-Increase of crop production and improvement of productivity	Pond: V=1,200m^3 Rehabilitation of canal: L=22,500m	101 259	2 Pond (concrete) Lining of existing canal
	-Expansion of irrigation area	New canal: L= 1,500m Pipe line: L= 370m	35 8	Extension of new canal Replacement of pipeline (Diameter 500mm)
2. Livestock Improvement	-Increase of milk production and weight -Quality improvement	264 head of cattle	506	Animal breeding
3. Fodder Production Irrigated Land	-Stable supply of forage for livestock -Quality improvement	A=1,000 ha	233	Increase forage production
4. Fruit Orchard Rehabilitation	-Enhancement of productivity -Quality improvement	A= 48 ha	79	Replanting of old fruit trees
5. Apiculture	-Diversification of economic activity -Increase income	101 units	40.4	2,020 beehives
Sub-total cost			**1,261**	

J.3.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of the natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lecture in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Video films, brochures, posters, etc.
3. Research (for whole MC)			100	
- Research on disaster mechanism	Provide mechanism of the occurrence of disaster	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control project	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management method	3 years,		Equipment; field test, analysis
- Wildlife inventory	Surveying wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy	2 years,		Demo-plants construction, experiment by demo-plants
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding of various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practice on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**2,673**	

J.3.6 Total Project Cost in Yusufeli Micro-Catchment (MC-03)

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)
1. Natural Resources Rehabilitation and Management (Area of MC: 22,643 ha)		
1. Soil Conservation	921 ha	704
2. Rehabilitation of Degraded High Forest	929 ha	342
3. Rangeland Rehabilitation	437 ha	192
Sub-total cost		**1,238**
2. Livelihood Improvement (No. of forest villages: 3)		
1. Irrigation Improvement	Pond: V=1,200m^3 Pipe line: L= 370m Rehabilitation of canal: L=22,500, New canal: L=1,500m	403
2. Livestock Improvement	264 head of cattle	506
3. Fodder Production Improvement	A=1,000 ha	233
4. Fruit Orchard Rehabilitation	A= 48 ha	79
5. Apiculture	101 units	40
Sub-total cost		**1,261**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		30
3. Research		100
4. Demonstration		50
5. Technical Assistance		75
Sub-total cost		**355**
Total Cost		**2,854**

J.3.7 Implementation Schedule

ACTIVITY	PRIOR-ITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional arrangement							
Natural Resources							
1. Soil conservation	●						
2. Rehabilitation of degraded high forest	●						
3. Rangeland rehabilitation	●						
Livelihood Improvement							
1. Irrigation development	●						
2. Livestock development	●						
3. Fodder production	●						
4. Fruit orchard rehabilitation							
5. Apiculture development							
Training, Awareness, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters							
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory							
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows	●						
- Crop production	●						
5. Technical assistance							
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

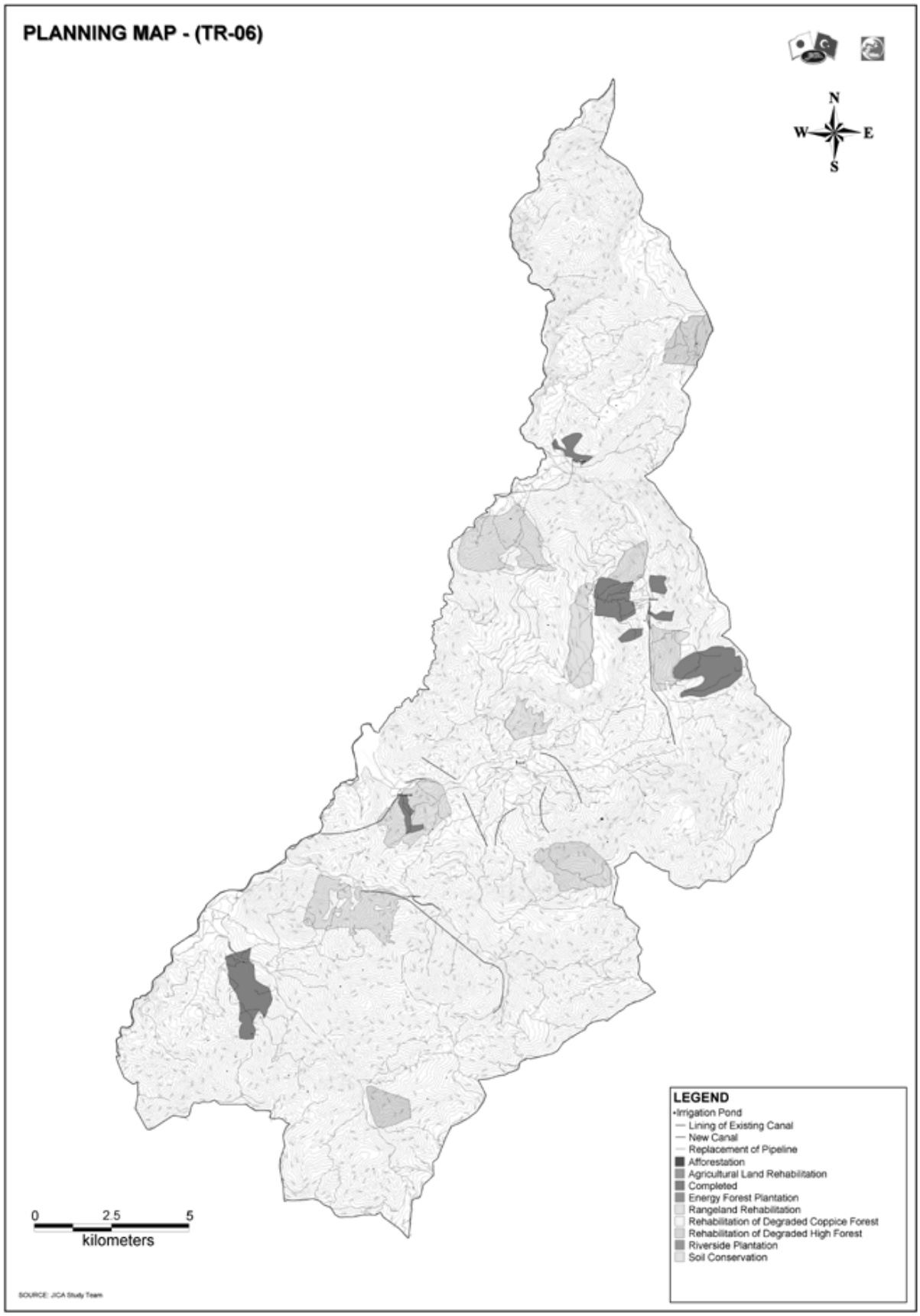
J.4 UZUNDERE TR-06 MICRO-CATCHMENT PLAN

J.4.1 Overview of Uzundere TR-06 Micro-Catchment Plan

The Uzundere Micro-Catchment (MC) covers about 31,240 hectares northeast of the main administrative center of Uzundere, and is drained by the Tortum River which joins the Coruh River downstream from the Tortum Lake. The MC is characterized by extremely steep and bare rocky mountains with active natural erosion and landslides, and about 60% of the land is steeper than 30% slope. The altitudinal range within the MC is from 800 m to 3,000 m above sea level. About 36% of the MC exhibits severe soil erosion (Erosion Class 3) and 40% has very severe erosion (Class 4). About 97% of the MC is in Land Capability Classes VI, VII and VIII, unsuitable for cultivation. The most common soils are infertile and shallow Brown Forest Soils, with a few small scattered areas of Colluvial Soils and a small area of Basaltic Soils south of Uzundere. The main land uses in the MC are 37% of rangelands, 19% of arable land, 28% of forests and 3% under transitional woodland and scrub. The MC has 5 villages with a total population of 3,252 in 930 households, all of which are Forest Villages and have been selected for detailed study. The population of these villages has declined during the last decade at a rate of about –2%. The average annual household income in the selected villages in 2002 was about TL 5,570 million (about US$ 3,700), derived from crops (including vegetables), livestock and pensions. The MC is notable for the large number – 133 – of greenhouses and intensive vegetable production.

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are low incomes, poor irrigation systems and lack of irrigation and drinking water, poor village roads, poor sewerage systems, inadequate health systems and difficulty living in the village. Most of these and other problems are related to the degraded natural resources.

The proposed activities include: soil conservation, rehabilitation of degraded High Forest, afforestation, rangeland rehabilitation and riverside plantations (for natural resource management); irrigation, greenhouse construction, livestock improvement, crop production and forage crops, fruit orchard rehabilitation and improvement of marketing (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 1,528, 1,732 and 355 Billion Turkish Lira (BTL), for a total cost of 3,615 BTL for the five selected villages of the MC.


PLANNING MAP - (TR-06)
N
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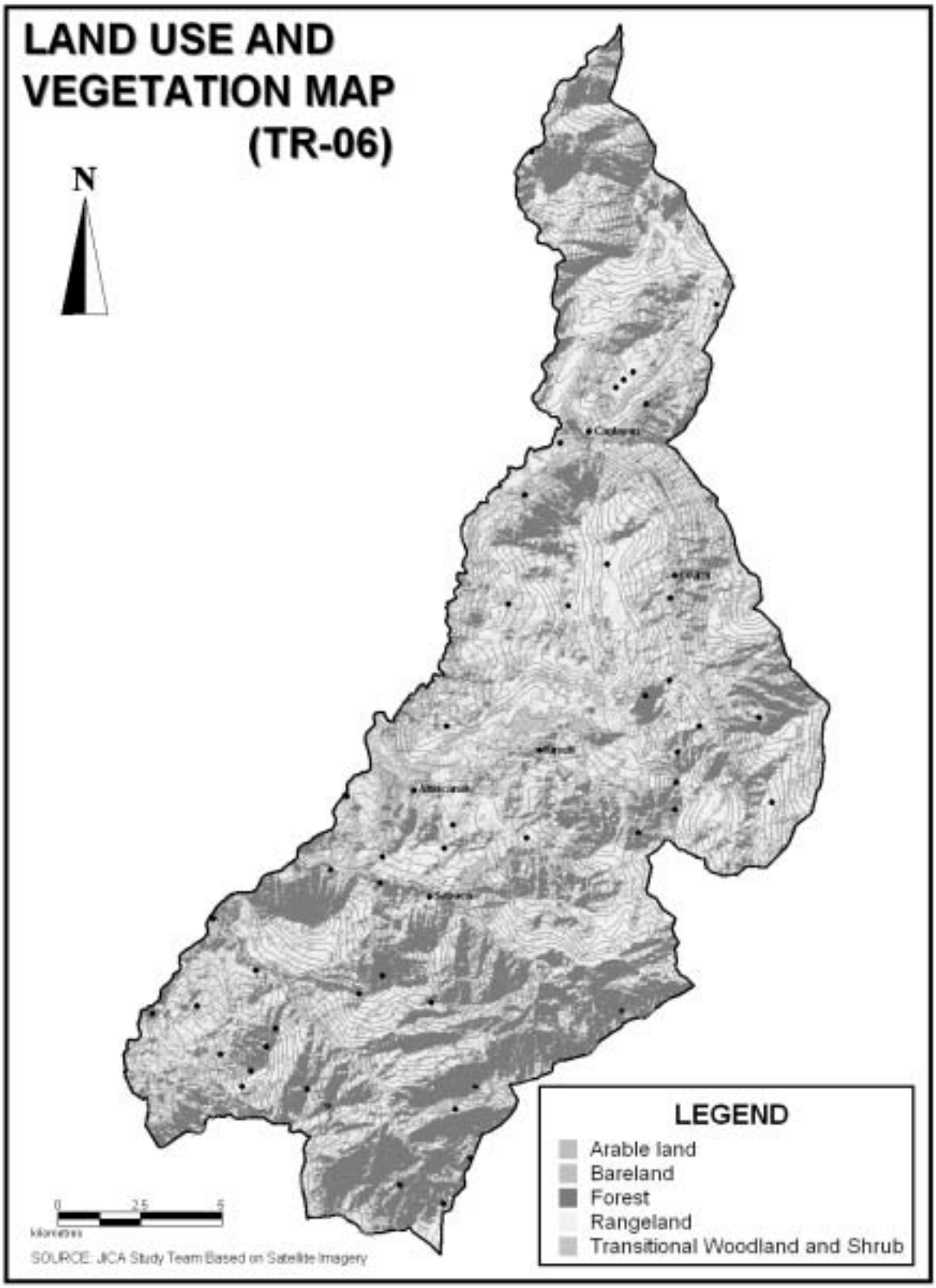
kilometers
LEGEND
Irrigation Pond
Lining of Existing Canal
New Canal
Replacement of Pipeline
Afforestation
Agricultural Land Rehabilitation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Rehabilitation of Degraded High Forest
Riverside Plantation
Soil Conservation
SOURCE: JICA Study Team



TOPOGRAPHY AND LAND USE MAP

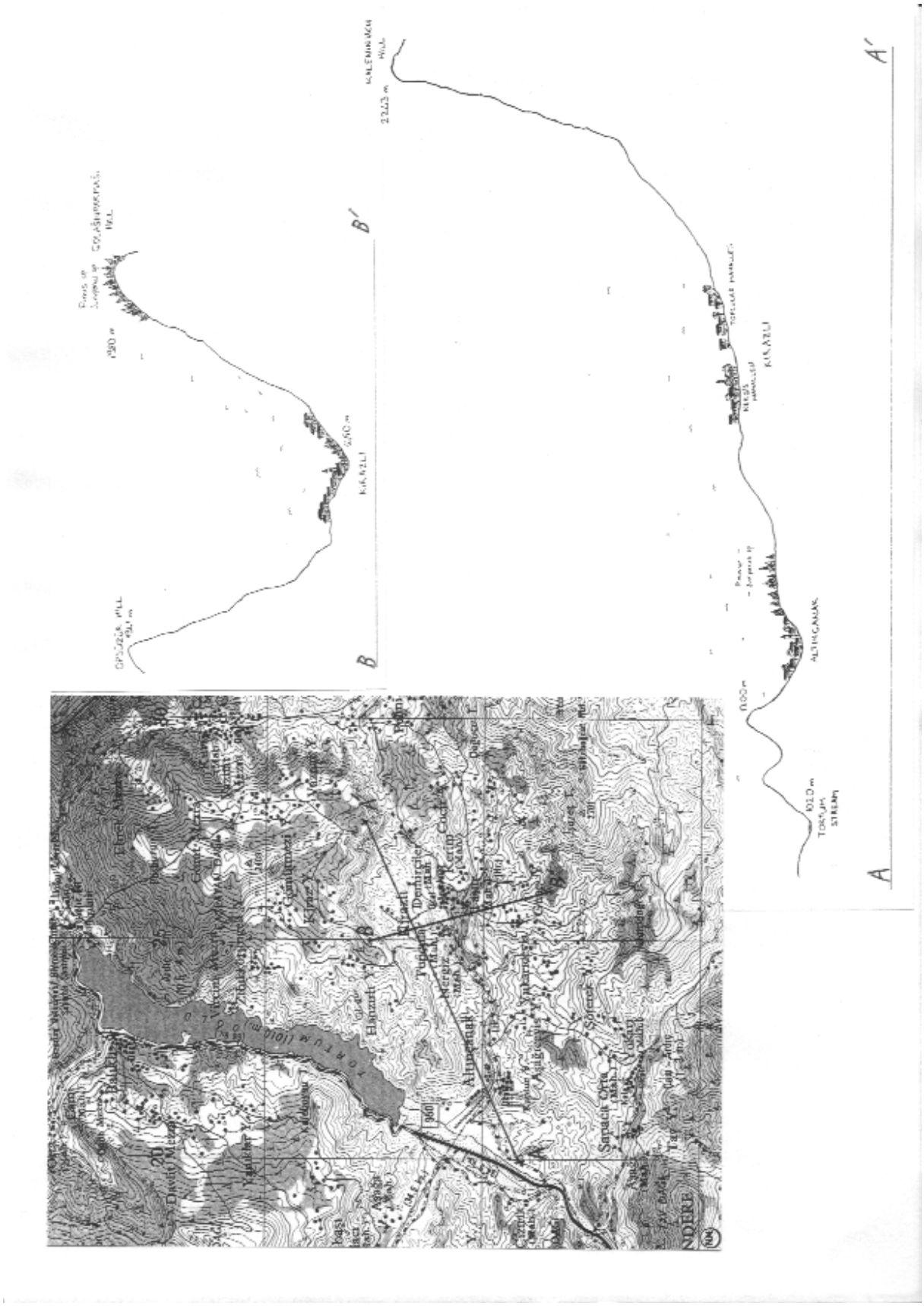


Figure J.4.1 Typical transects across the MC

Figure J.4.2: A Digital Elevation Model

J.4.2 Description of the Micro-Catchment

J.4.2.1 Location and Geographical Conditions

The MC is located in the southeastern part of the Coruh River basin, and constitutes the middle part of the Tortum River catchment which is a tributary of the Coruh River. The Tortum Lake, formed naturally behind a huge ancient landslide, adjoins part of the west boundary of the MC, and the Tortum Falls at the northern end of the Lake are a tourist attraction. The total area of the MC is about 31,240 ha. The main administrative centre is Uzundere, in the southwest of the MC. The MC is about 21 km long east to west and 36 km wide north to south. The MC, which has altitudes between 800 and 3,000 m, is characterized by extremely steep and bare rocky mountains, with active natural erosion and landslides. The MC has 33% of steep slopes and 26% of very steep slopes. There are five significant tributaries of the Tortum River –the Cevizli, Kilizli, Sapaca, Uzun and Tasbasi streams. The climate is characteristically very cold in winter and extremely hot and dry in summer. The mean annual rainfall is about 430 mm. Access to most of the villages is good or moderate, but poor to Cevizli.

J.4.2.2 Natural Resources and Present Land Use

The dominant land use is rangeland (37%), followed by forest (28%) and arable land (19%). According to the Forest Management Plan, most of the forest area is High Forest (NK) with some Degraded High Forest (BK). There is very little coppice forest (Bt), but some degraded coppice forest (BBt). There are no Protected Areas in the MC at the moment, but the Tortum Lake and its immediate surroundings may be designated as a Nature Park in the near future.

The dominant geological type is Volcanic Facies, but the east there is some Malm. The most common soils are Brown Forest Soils. About 40% of the MC is very severely eroded (Erosion Class 4) and most of the rest is severely eroded (Class 3). The potential for rehabilitation is low, due to the extreme slopes, mass earth movements and shallow soils. The streams are delivering large amounts of coarse rocky debris to the Tortum River. About 97% of the MC is in Land Capability Classes VI, VII and VIII.

J.4.2.3 Information about the Selected Villages

There are 5 villages within the MC, with a total population of about 3,252. All are Forest Villages, namely Altincanak, Sapaca, Cevizli, Kirazli and Caglayan. Over the last decade all villages have had an average annual depopulation rate of about -2%. Three of the villages have 50-60% of their populations dependent on pensions. The other sources of household income include sales of crops (vegetables and fruit) and livestock. The average annual household income in 2002 was TL 5,570 million, ranging from TL 3,470 m in Cevizli to TL 7,270 m in Sapaca. The average annual *per capita* income in 2002 was TL 1,590 (US$ 1,060), ranging from TL 2,345 m (US$ 1,563) in Sapaca to TL 880 m (US$ 585) in Caglayan.

The total number of farm households is 930, having 2,200 cows (about 2 per household) and about 3,400 sheep. There are 300 goats in Kirazli and 1,500 in Sapaca. The area of pasture and rangeland is 3,080 ha, mostly around Kirazli and Sapaca. The total cultivated area is about 2,895 ha, with an average household landholding of 3.0 ha. Fruits, wheat, fodder crops and vegetables are produced. There are 133 greenhouses, about 60% of which are in Caglayan. The irrigation coverage is about 15-25%. Basic infrastructures are present in all villages, although clinics are found in only 3 villages and are poorly staffed. Fuels are mostly fuelwood, coal and LPG.

J.4.3 Major Problems, Constraints and Opportunities

J.4.3.1 Major Problems, Constraints and Opportunities in relation to Natural Resources

After assessment of the whole set of identified problems, the major problems and possible solutions were identified and are shown in the Table below.

Major problems:

- Natural disasters (floods, rock slides) and soil erosion due to fragile site and over-use and degradation of forest and range resources.
- Destruction and degradation of forests by local people to meet their energy needs for heating and cooking.

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Natural disasters (e.g. floods, rockslides). 2. Soil erosion, de-regulation and losses of water resources.	• Soil conservation measures on degraded area.
3. Illicit cutting and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites. • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests. • Provision of coal at suitable prices. • Assistance in testing/development of other energy sources, such as bio-energy, solar energy.
5. Degradation, low productivity, under-utilization of range resources.	• Range improvement measures (e.g. water troughs, re-seeding, fertilization). • Development of forage production on suitable lands. • Supporting/development of stall-feeding.

Constraints on rehabilitation and sustainable use of natural resources:

- Extremely steep bare rocky slopes with active natural erosion and landslides.
- Frequent severe flash floods and considerable movement of coarse rocky debris in streambed.
- Degraded conditions and low productivity of the significant parts of the forest resources.
- High dependency on excessive utilization of upland resources.
- Inadequate attention to local needs during preparation of forest management plans.
- Lack of confidence between villagers and governmental agencies.
- Insufficient staff capacities of the MEF and other relevant government agencies.
- Insufficient collaboration among different government agencies.
- Lack of adequate awareness of local communities about causes and consequences of natural resource degradation and disasters.
- Incomplete cadastral surveys and vague borders of the forests and rangelands. Unclear rights of AGM for working on OT ("forest soil without trees", as in Forest Management Plans)

Opportunities for rehabilitation and sustainable use of natural resources:

- Reversibility of natural resources degradation is generally poor, due to the severe constraints.
- Need for civil works to prevent gully erosion in selected areas.
- There is growing interest in the MC villagers for collaborating with AGM for undertaking collaborative implementation of soil conservation and afforestation activities.

Level of interest in sustainable natural resources management: Medium

Current strategies and contributions of the government agencies:

- AGM has conducted some soil conservation activities on a modest scale in the MC areas, including Sapaca, Altincanak, Kirazli, Caglayan and Cevizli villages during previous years.

- Forest villagers in the MC are permitted to collect fuelwood from the forests in the local area depending on their capacity by paying modest charges to OGM.
- ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their incomes and for improving relations with the forest organization.
- AGM, OGM and MPG contract protection of forest and wildlife conservation areas to forest village communities by making certain payments to the village budget. AGM has also recently started contracting of soil conservation works and tending of some areas to the village communities that have interest and capacity for undertaking such activities.
- Cadastre and border delineation works for range areas are being undertaken by MARA.
- Streambed and bank rehabilitation activities are being undertaken by GDRS and DSI.
- Increased interest and efforts to involve local people in natural resource conservation and rehabilitation in combination with livelihood development among different units of MEF.

J.4.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:

- Low income due to low productivity of livestock and crop production, which are the major income sources for most villagers
- Limited activities for income generation

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
Livestock 1. Low productivity 2. Insufficient labor	• Cattle breeding • Forage production increase through irrigation
Crop production 1. Insufficient irrigation water due to water loss from earth canals and lack of irrigation canals 2. Low productivity 3. Insufficient land available 4. Marketing	• Lining of earth canal portion and construction of new irrigation canal • Irrigation • Rehabilitation of orchards (new planting) • Diversified agricultural activities including various fruit trees (cherry, sour cherry, walnut, almond) • Improved marketing with cold storage facilities

Constraints on livelihood improvement:

- Lack of technical information
- Harsh geographic conditions
- Occurrence of floods at some areas

Opportunities for livelihood improvement:

- Suitable climates for agricultural production, with an effective incidence and amount of solar radiation
- Relatively long production period (alfalfa can be harvested four times/year)
- Sufficient irrigation water available
- High value fruits (cherry, sour cherry, walnut) production area
- Experienced farmers
- Room for productivity increase

Level of interest in improving livelihoods: high

Current strategies and contributions of the government agencies:

- Direct income support for the farmers (MARA; financed by World Bank)
- Subsidy for forage crop production support (MARA; financed by Turkish government)

J.4.4 Proposed Activities

J.4.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Soil Conservation			
(Activity 1): Natural regeneration	Near Caglayan	405 ha	Implement Activities 1, 3, 6 and 7
(Activity 2): Afforestation, (Type 1)	Upper Kilizli stream	111 ha	Implement Activities 1, 5, 6 and 7
(Activity 3): Afforestation, (Type 2)	Near Altincanak	279 ha	Implement Activities 1, 3, 6 and 7
(Activity 4): Re-greening (Type 1)	Near Sapaca	365 ha	Implement Activities 1, 3, 6 and 7
(Activity 5): Re-greening (Type 2)			
(Activity 6): Gully protection (stone walls)			
(Activity 7): Gully protection (brush walls)			
2. Rehabilitation of Degraded High Forest			
(Activity 1): Natural regeneration	Upper Armust stream	172 ha	Implement Activities 1 and 2
(Activity 2): Rehabilitation			
3. Rangeland Rehabilitation			
(Activity 1): Natural regeneration	Upper Kilizli stream	175 ha	Implement Activities 1, 2, 3 and 4
(Activity 2): Rangeland improvement			
(Activity 3): Gully protection (stone walls)			
(Activity 4): Gully protection (brush walls)			
4. Riverside Plantations	Kilizli stream	0.2 ha	
	Sapaca stream	0.2 ha	
	Cevizli stream (Cevizli)	0.2 ha	

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.4.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Altincanak		
1. Irrigation Improvement		
- Canal rehabilitation	L= 2,900 m	Lining of existing canal
2. Greenhouse Construction	A= 500 m^2 x 7 units	10% of households
3. Crop Production Improvement		
- Forage production increase	A= 25 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 10 ha	Tomatoes, cucumbers, strawberries
- Fruit orchard rehabilitation	A= 2 ha	Walnut, peach, apple, sour cherry, cherry
4. Marketing Improvement		
- Installation of collection and shipment facility	A=2,000 m^2	Co-collection and shipment facility
Caglayan		
1.Irrigation Improvement		
- Replacement of pipeline	L= 3,600 m	Diameter 500mm
2.Greenhouse Construction		
- Greenhouse	A= 500 m^2 x 8 units	10% of households
3.Livestock Improvement		
- Animal breeding	50 head	Local breed to pure breed
4.Crop Production Improvement		
- Forage production increase	A=100 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 10 ha	Tomatoes, cucumbers, strawberries
- Fruit orchard rehabilitation	A= 5 ha	Walnut, peach, apple, sour cherry, cherry
5.Marketing Improvement		
- Installation of collection and shipment facility	A=2,000 m^2	Co-collection and shipment facility
Cevizli		
1. Irrigation Improvement		
- Canal rehabilitation	L= 5,500 m	Lining of existing canal
2. Greenhouse Construction	A= 500 m^2 x 30 units	10% of households
3. Livestock Improvement		
- Animal breeding	120 head	Local breed to pure breed
4. Crop Production Improvement		
- Forage production increase	A= 335 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 36 ha	Tomatoes, cucumbers, strawberries
- Fruit orchard rehabilitation	A= 11 ha	Walnut, peach, apple, pear, sour cherry, cherry
5. Marketing Improvement		
- Installation of collection and shipment facility	A=2,000 m^2	Co-collection and shipment facility
Kirazli		
1. Irrigation Improvement		
- Canal rehabilitation	L= 10,000 m	Lining of existing canal
- Pond	V= 800 m^3	Concrete pond
2. Greenhouse Construction	A= 500 m^2 x 31 units	10% of households
3. Livestock Improvement		
- Animal breeding	30 head	Local breed to pure breed
4. Crop Production Improvement		
- Forage production increase	A=522 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 45 ha	Tomatoes, cucumbers, strawberries
- Fruit orchard rehabilitation	A= 20 ha	Walnut, peach, apple, sour cherry, cherry
5. Marketing Improvement		
- Installation of collection and shipment facility	A=2,000 m^2	Co-collection and shipment facility
Sapaca		
1. Irrigation		
- Canal rehabilitation	L= 8,000 m	Lining of existing canal
2. Greenhouse Construction	A= 500 m^2 x 17 units	10% of households
3. Livestock		
- Improvement of animal breeding	21 head	Local breed to pure breed
4. Crops production		
- Forage production increase	A= 107 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 10 ha	Tomatoes, cucumbers, strawberries
- Fruit orchard rehabilitation	A= 4 ha	Walnut, apple, sour cherry, cherry

J.4.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula*, *Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.4.5 Activities, Effects, Benefits, Inputs and Costs

J.4.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Soil Conservation	-Decreasing soil erosion -Increasing vegetation coverage -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape	1,160ha	856	Activities include: 1. Natural regeneration 2. Afforestation 3. Re-greening 4. Gully plugging
2. Rehabilitation of Degraded High Forest	-Decreasing soil erosion -Increasing both quality and quantity of tree growing stock -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape	172ha	81	Activities include: 1. Rehabilitation 2. Natural regeneration
3. Rangeland Rehabilitation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing fodder production -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape	175ha	123	Activities include: 1. Natural regeneration 2. Rangeland improvement 3. Gully plugging 4. Watering troughs
4. Riverside Plantations	-Protection of inhabitant's livelihood and farmland -Environmental improvement -Ensuring employment -Increasing aesthetics value of the landscape	0.6 ha	4	
Sub-total cost			**1,064**	

J.4.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Irrigation Improvement	- Expansion of irrigation area - Increase of crop production & improvement of productivity	Canal: L=26,400 m Pipeline:L=3,600 m Pond: V= 800 m^3	304 72 67	Lining of existing canal Replacement of pipeline (D=500mm) Concrete pond
2. Greenhouse Construction	- Increase of agricultural income - Promotion of intensive agriculture	A= 46,500 m^2 (93 units)	1,302	10% of household 1 unit: 500m^2
3. Livestock Improvement	- Increase of milk production and weight of animals	221 heads	424	Animal breeding
4. Fodder Production under Irrigation	- Stable supply of forage for livestock	A= 1,089 ha	253	Increase of alfalfa production
5. Fruit Orchard Rehabilitation	- Improvement of productivity	A= 42 ha	68	Replanting of old fruit trees
6. Marketing Improvement	- Shipment according to market trend - Reduction of harvest loss	A=10,000 m^2	300	Co-collection and shipment facility
Sub-total cost			**2,790**	

J.4.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training of engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of the natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lecture in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Vide films, brochures, posters, etc.
3. Research (for whole MC)			100	
- Research on disaster mechanism	Provide mechanism of the occurrence of disaster	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control project	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management method	3 years,		Equipment; field test, analysis
- Wildlife inventory	Grasping the number of wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy	2 years,		Construction of demo-plants and experiment
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding of various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water and farm management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practice on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**4,209**	

J.4.6 Total Project Cost in Uzundere Micro-Catchment (TR-06)

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)
1. Natural Resource Rehabilitation and Management (Area of MC: 31,240 ha)		
1. Soil Conservation	1,665 ha	1,229
2. Rehabilitation of Degraded High Forest	247 ha	116
3. Rangeland Rehabilitation	251 ha	177
4. Riverside Plantations	0.9 ha	6
Sub-total cost		**1,528**
2. Livelihood Improvement (No. of forest villages: 5)		
1. Irrigation Improvement	Rehabilitation of canal: L=26,400 m Pipeline:L=3,600 m, Pond: V= 800 m^3	443
2. Greenhouse Construction	A= 46,500 m^2 (93 units)	1,302
3. Livestock Improvement	221 heads	424
4. Fodder Production Improvement	A= 1,089 ha	253
5. Fruit Orchard Rehabilitation	A= 42 ha	68
6. Marketing Improvement	A=10,000 m^2	300
Sub-total cost		**2,790**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		30
3. Research		100
4. Demonstration		50
5. Technical Assistance		75
Sub-total cost		**355**
Total Cost		**4,673**

J.4.7 Implementation Schedule

ACTIVITY	PRIOR-ITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional arrangement							
Natural Resources							
1. Soil conservation	●						
2. Rehabilitation of degraded high forest	●						
3. Rangeland improvement	●						
4. Riverside plantations							
Livelihood Improvement							
1. Irrigation development	●						
2. Greenhouse							
3. Livestock development	●						
4. Fodder production	●						
5. Fruit orchard rehabilitation							
6. Marketing improvement							
Training, Awareness, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters							
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory							
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows	●						
- Crop production	●						
5. Technical assistance							
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

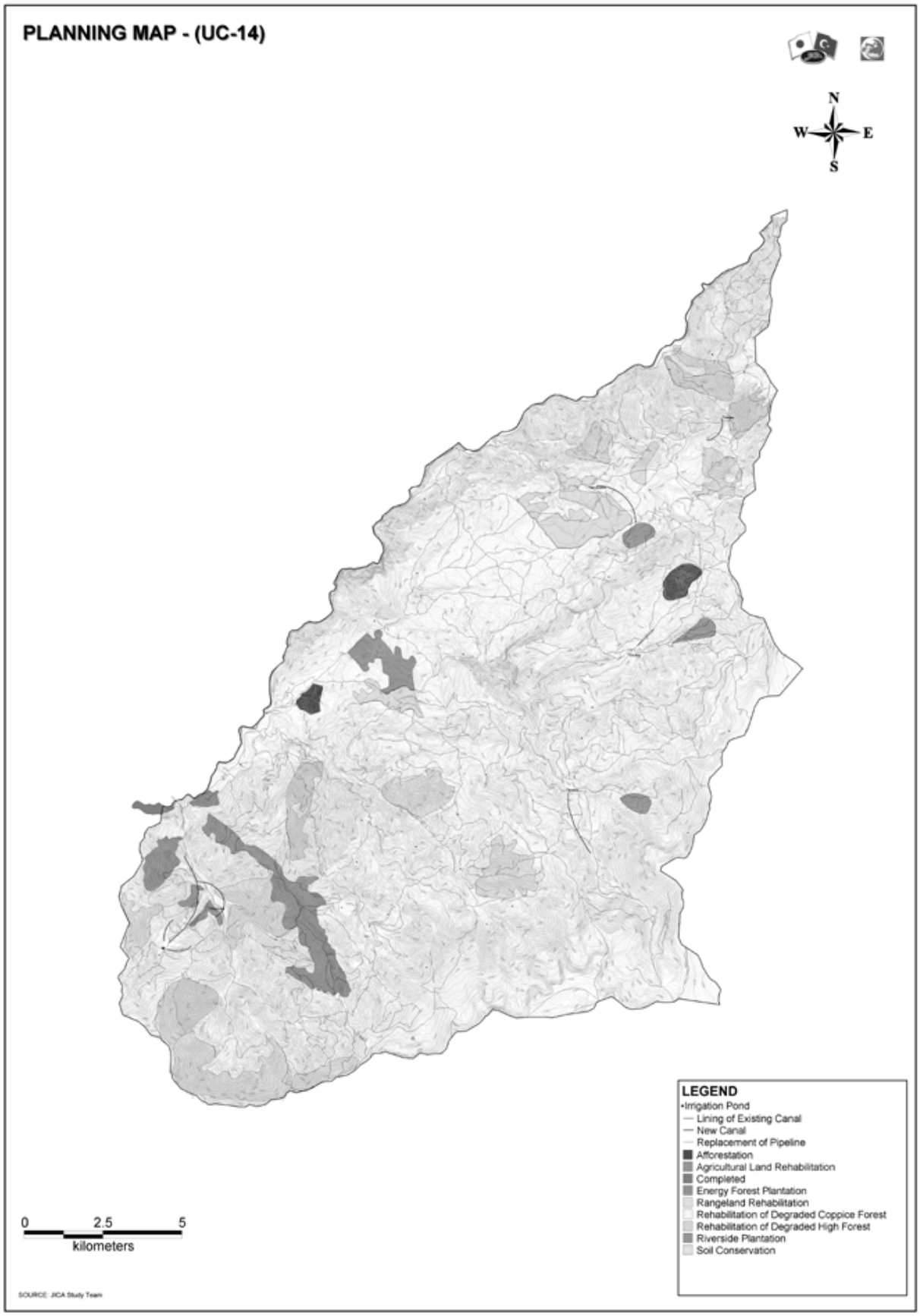
J.5 ISPIR UC-14 MICRO-CATCHMENT PLAN

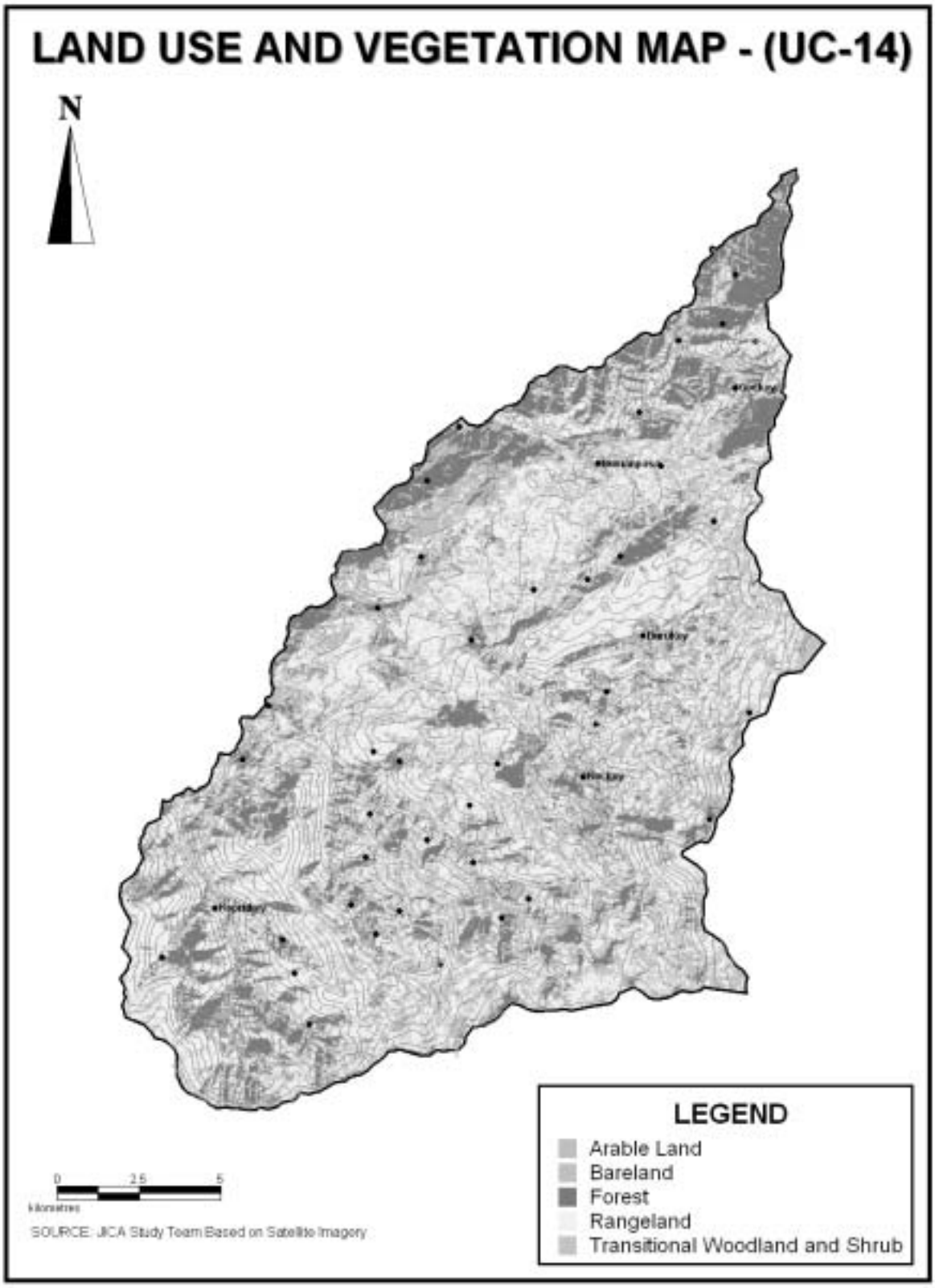
J.5.1 Overview of Ispir UC-14 Micro-Catchment Plan

The Ispir Micro-Catchment (MC) covers about 31,934 hectares east of the main administrative center of Ispir, and is drained by at least six significant streams which flow into the Coruh River, the right bank of which forms the northwestern boundary of the MC. The MC is characterized by the rocky gorges of the Coruh River north of Ispir which provide excellent conditions for rafting. The MC has about 43% of moderately steep land and 39% of extremely steep land, and has an altitudinal range from 1,100 m to 3,100 m above sea level. About 51% of the MC exhibits moderate soil erosion (Erosion Class 2) and most of the rest has severe erosion (Class 3). About 87% of the MC is in Land Capability Classes VI, VII and VIII, unsuitable for cultivation. The most common soils are Chestnut Soils (67% of the area) Basaltic Soils (15%) and Brown Forest Soils (7%). The main land uses in the MC are 44% of rangelands, 22% of arable land, 16% of forests and 8% under transitional woodland and scrub. The MC has 24 villages (8 forest villages) with a total population of 4,312, of which the five Forest Villages selected for detailed study have a total population of 1,590 living in 422 households. The population of these villages has declined during the last decade at about –4% per annum. The average annual household income in the selected villages in 2002 was about TL 4,554 million (about US$ 3,000), mostly derived from pensions and livestock.

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are poor village roads, followed by poor irrigation systems, loneliness, harsh winter conditions and insufficient fuelwood, in that order. Inadequate health services, low incomes and low returns from agricultural activities are also significant problems. Many of the problems are related to the degraded natural resources.

The proposed activities include: soil conservation, afforestation, rehabilitation of degraded High Forests and Coppice Forests, energy forests, rangeland rehabilitation and riverside (for natural resource management); irrigation, livestock improvement, crop and forage production, agricultural mechanization, fruit orchard rehabilitation and apiculture (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 3,877, 2,069 and 403 Billion Turkish Lira (BTL), for a total cost of 6,349 BTL for the five selected villages of the MC.


PLANNING MAP - (UC-14)
N
W
E
S
LEGEND
Irrigation Pond
Lining of Existing Canal
New Canal
Replacement of Pipeline
Afforestation
Agricultural Land Rehabilitation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Rehabilitation of Degraded High Forest
Riverside Plantation
Soil Conservation
0
2.5
5
kilometers
SOURCE: JICA Study Team



TOPOGRAPHY AND LAND USE MAP

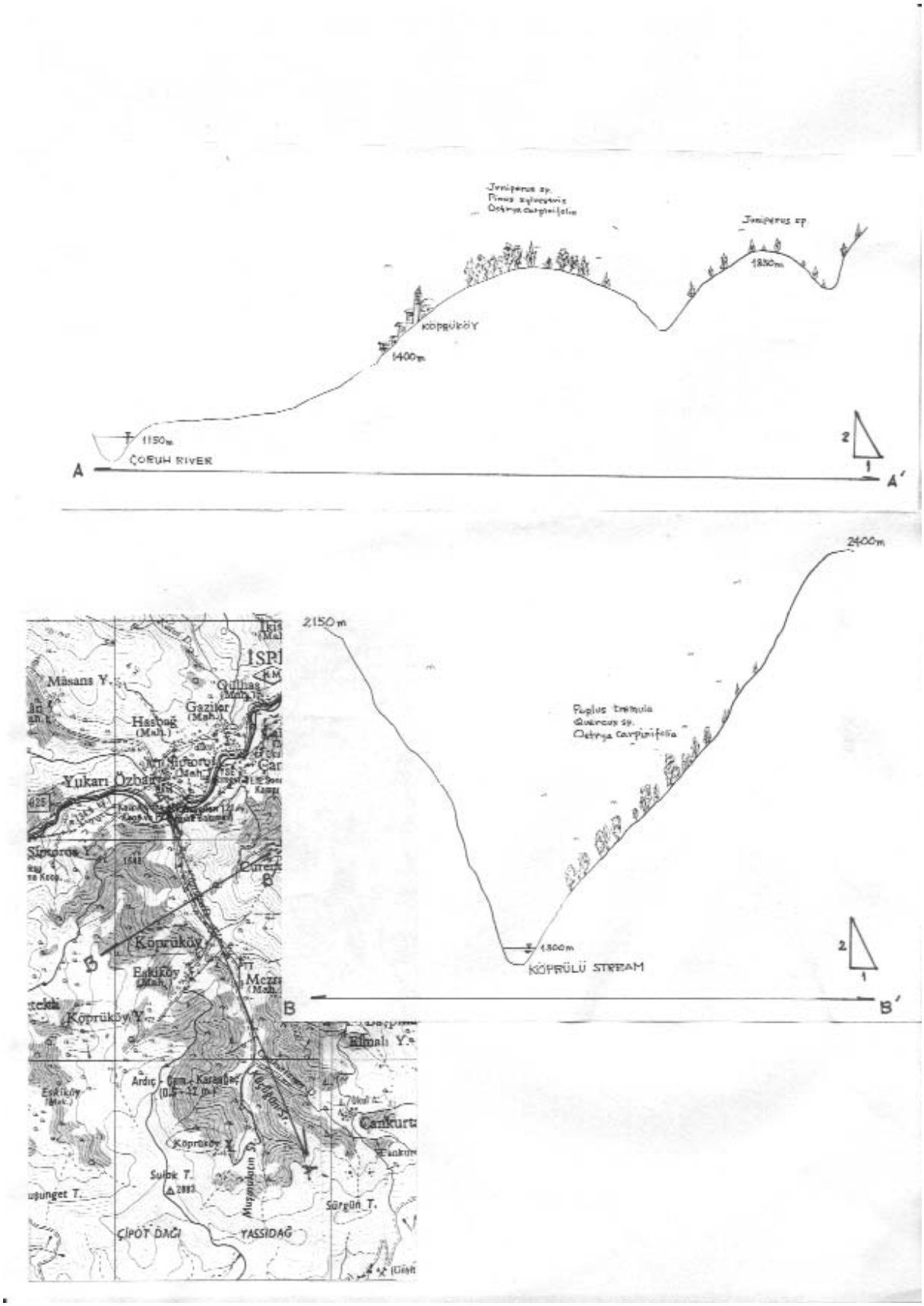


Figure J.5.1 Typical transects across the MC

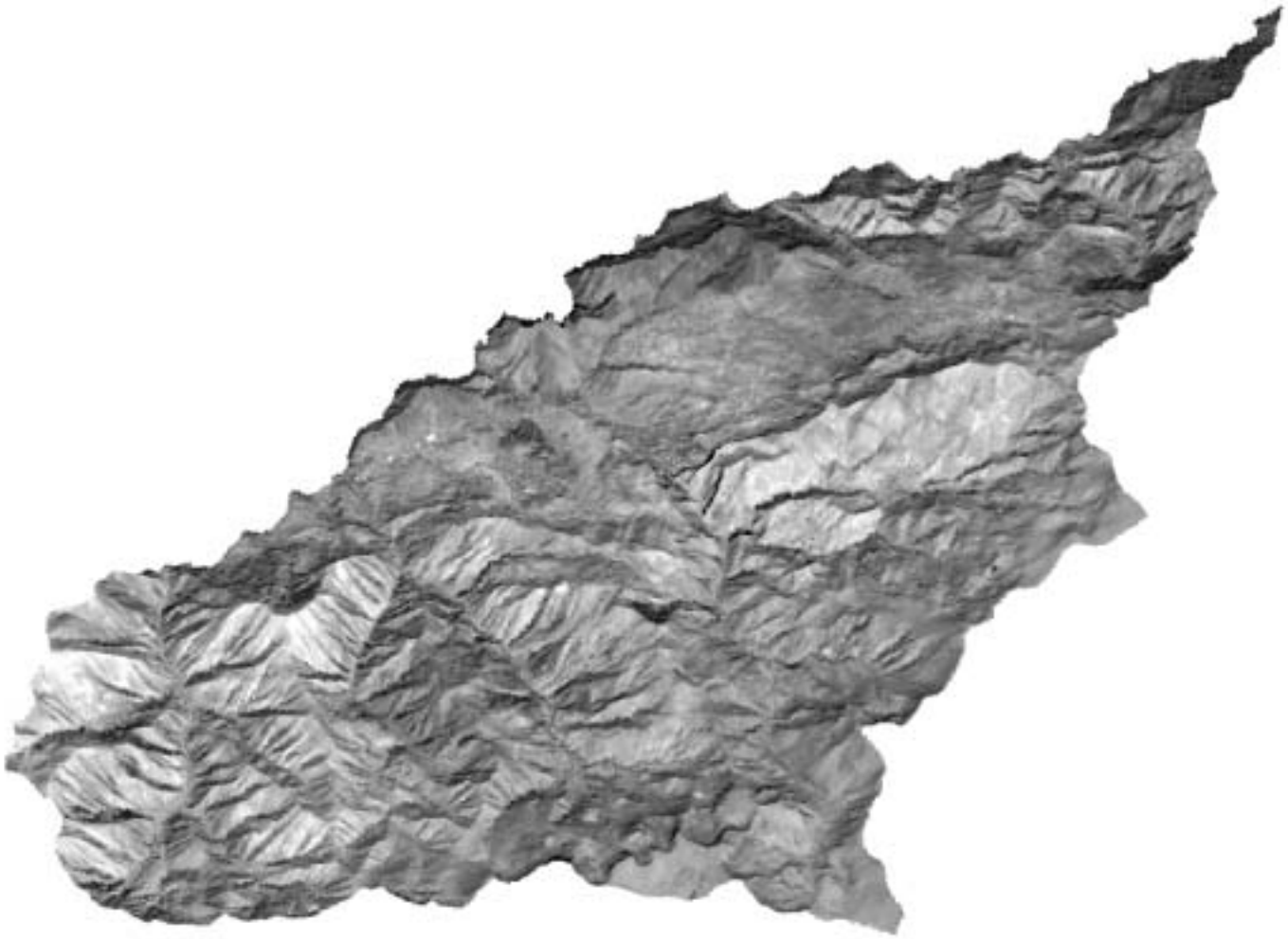


Figure J.5.2: A Digital Elevation Model

J.5.2 Description of the Micro-Catchment

J.5.2.1 Location and Geographical Conditions

The MC is located east of Ispir Municipality, which is the main administrative centre for the MC. It is approximately 20 km long east to west and 27 km wide north ot south, with a total area of about 31,934 ha. The right bank of the Coruh River forms the northwestern boundary of the MC, which is characterised by extremely steep land around most villages, except the rolling rangelands around Numanpasa. The rocky gorges along the Coruh River north of Ispir provide excellent conditions for rafting. There is about 43% of moderately steep land, 39% of very steep and extremely steep land (>30%) and 17% of land <12% slope. The altitudes in the MC range from 1,100 to 3,100 m above sea level. There are six significant tributaries of the Coruh River within the MC – the Goc, Gurulek, Bulanik, Asagigullubag, Sehir and Kopruk streams. The climate is characteristically hot in summer and very cold in winter, with heavy snow. Access to most of the villages except Koprukoy is poor.

J.5.2.2 Natural Resources and Present Land Use

The dominant land use is rangeland (44%), followed by arable land (22%), forest (16%), transitional woodland and scrub (8%) and other land uses (10%). According to the Forest Management Plan, most of the forests are High Forest (type NK) or Degraded High Forest (type BK). There are small areas of Normal Coppice Forest (Bt) and Degraded Coppice Forest (BBt) around Kockoy. The northern end of the MC north of Gockoy (and continuing north outside the MC) is designated as the Ispir-Cercenink Dago wildlife protection area for the hooked-horn wild goats.

The predominant geological type is Eocene Volcanic Facies, but in the southern part there are areas of Lias and Malm. The most common soils are Chestnut Soils (67% of the area), Basaltic Soils (15%) and Brown Forest Soils (7%). The Chestnut and Basaltic Soils may be moderately deep and moderately fertile, except on steep slopes. About 51% of the MC has Class 2 soil erosion (moderate) and most of the rest is Class 3 (severe). The visible soil erosion is mostly reversible, except on steep slopes, although very little can be done to mitigate mass earth movements. Effective grazing control on the rangelands may mitigate erosion on moderate and even steep slopes. About 87% of the MC is in Land Capability Classes VI, VII and VIII.

J.5.2.3 Information about the Selected Villages

There are 24 villages within the MC, with a total population of about 4,312. Among these, there are 8 Forest Villages, of which the selected villages are Durukoy, Gockoy, Kockoy, Koprukoy and Numanpasa, with a total population of 1,590. Over the last decade most villages have had an average annual depopulation rate of about 4%, with Kockoy at 6.8%. The population dependent on pensions is least (about 40%) in Kockoy and Numanpasa and 70% in Gockoy. Pensions form a significant proportion of household incomes in most villages, with livestock as either the first or second most important source of income. The average annual household income in the selected villages in 2002 was about TL 4,554 million (about US$3,000).

The total number of farm households in the selected villages is 422, and most raise cows (normally 3-7 per household). There are no goats in the selected villages, and only one household in Koprukoy is raising 20 sheep. The total area of crop cultivation in the selected villages is 1,219 ha, with an average of 2.9 ha per household. The main crops are fodder crops, wheat, potatoes and dry beans, mostly for home consumption or sale if surplus. GDRS has installed irrigation and drinking water facilities in some villages. The irrigation coverage ranges from 5% in Koprukoy to 52% in Durukoy, but three of the villages have less than 15% coverage. AGM has undertaken some afforestation and erosion control at Koprukoy. Basic rural infrastructures are available in all villages, and fuels are mostly fuelwood and cowdung.

J.5.3 Major Problems, Constraints and Opportunities

J.5.3.1 Major Problems, Constraints and Opportunities in relation to Natural Resources

Major problems:

- Natural disaster (e.g. floods, landslide) due to fragile site and over-use/degradation of forest and range resources.
- Destruction/degradation of forests by local people to meet their energy needs for heating and cooking.

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Natural disasters (*e.g.* floods, landslides). 2. Soil erosion, de-regulation and losses of water resources.	• Soil conservation measures on degraded area. • Riverbed rehabilitation (civil engineering measures), riverbank reinforcement (civil engineering structures, gallery plantation).
3. Illicit cuttings and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites. • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests. • Provision of coal at suitable prices. Assistance in testing/development of other energy sources, such as bio-energy, solar energy.
5. Degradation, low productivity, under-utilization of range resources.	• Range improvement measures (e.g. water troughs, re-seeding, fertilization). • Development of forage production on suitable lands. • Supporting/development of stall-feeding.

Constrains on rehabilitation and sustainable use of natural resources:

- Extremely steep land around most villages, except the rolling rangelands at Numanpasa.
- Generally erodible soils if improperly managed.
- Degraded conditions and low productivity of the significant parts of the forest resources.
- High dependency on excessive utilizations of upland resources.
- Inadequate attention on local needs during preparation of forest management plans.
- Lack of confidence between villagers and governmental agencies.
- Insufficient staff capacities of the MEF and other relevant government agencies.
- Insufficient collaboration among different government agencies.
- Lack of adequate awareness of local communities about causes and consequences of natural resources degradation and disasters.
- Incomplete cadastral surveys and vague borders of the forests and rangelands. Unclear rights of AGM for working on OT (Forest soil without trees- Forest management plan) areas.

Opportunities for rehabilitation and sustainable use of natural resources:

- Quite promising nature disaster conservation by using conventional methods.
- Villagers' eagerness to tackle with natural disasters.
- There is growing interest in the MC villagers for collaborating with MEF-AGM for undertaking collaborative in conducting soil conservation and afforestation activities.
- Existence of wide variety of multipurpose local tree, shrub and grass species for undertaking technically successful and socially acceptable rehabilitation activities.

Level of interest in sustainable natural resources management: High

Current strategies and contributions of the government agencies:

- MEF-AGM has conducted some soil conservation activities on modest scale in the MC areas, along the Kopru stream during previous years.
- Forest villagers in the MC are permitted to collect fuelwood from the forests depending on their capacity in the village area by paying modest charges to MEF-OGM.
- MEF-ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their income and for improving relations with the forest organization.
- AGM, OGM and MPG contract protection of forest and wildlife conservation areas to forest village communities by making certain payments to village budget. AGM has also started recently contracting of soil conservation works and tending of such areas to the village communities that have interest and capacity for undertaking such activities.
- Cadastre and border delineation works for range areas are being undertaken by MARA.
- Stream bed and bank rehabilitation activities are being taken by GDRS and DSI.
- Increased interest and efforts to involve local people in natural resources conservation and rehabilitation in combination with livelihood development among different units of MEF.

J.5.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:

- Low household incomes due to low productivity of livestock and crops, which are the major sources of income for most villagers
- Limited opportunities and activities for income generation

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
<u>Livestock</u> 1. Low productivity 2. No shepherds	• Cattle breeding • Forage production increase through irrigation
<u>Crop production</u> 1. Insufficient irrigation water due to water loss from earth canals and lack of irrigation canals 2. Low productivity 3. Insufficient land available 4. Marketing 5. Lack of information on agricultural technology	• Lining of earth canal portion and construction of new irrigation canal • Diversified agricultural activities including apiculture, aquaculture, fruit production, *etc*. • Terracing • Diversification of activities • Provision of agricultural extension

Constraints on livelihood improvement:

- Lack of labor force as a result of out-migration leaving a high proportion of aged people in the villages
- Fragmented small farmlands
- Lack of technical information

Opportunities for livelihood improvement:

- Sufficient irrigation water available
- Room for productivity increases
- Experienced farmers
- High value dry bean production area

Level of interest in improving livelihoods: high

Current strategies and contributions of the government agencies:

- Direct income support for the farmers (MARA; financed by World Bank)
- Subsidy for forage crop production support (MARA; financed by Turkish Government)

J.5.4 Proposed Activities

J.5.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Soil Conservation			
(Activity 1): Natural regeneration	Middle Goc stream	100 ha	Implement Activities 1, 3, 4, 6 and 7
(Activity 2): Afforestation (Type 1)	Upper Goc stream	126 ha	Implement Activities 1, 3, 4, 6 and 7
(Activity 3): Afforestation (Type 2)	Middle Kopruk stream	396 ha	Implement Activities 1, 2, 3, 6 and 7
(Activity 4): Re-greening (Type 1)	Near Koprukoy	106 ha	Implement Activities 1, 2, 3, 6 and 7
(Activity 5): Re-greening (Type 2)			
(Activity 6): Gully plugging (stone walls)			
(Activity 7): Gully plugging (brush walls)			
2. Afforestation	Near Durukoy	93 ha	Pine plantation
3. Rehabilitation of Degraded High Forest			
(Activity 1): Natural regeneration	Upper Kopruk stream	157 ha	Implement Activities 1 and 2
(Activity 2): Rehabilitation			
4. Rehabilitation of Degraded Coppice Forest			
(Activity 1): Natural regeneration	Middle Kopruk stream	108 ha	Implement Activities 1 and 2
(Activity 2): Rehabilitation	Upper Kopruk stream	99ha	Implement Activities 1 and 2
5. Energy Forest Plantation			
	Near Durukoy	140 ha	
	Bulanik stream (Numanpasa)	186 ha	
	Yayla stream (Kockoy)	93 ha	
6. Rangeland Rehabilitation			
(Activity 1): Natural regeneration	Upper Kopruk stream	558 ha	Implement Activities 1, 2, 3 and 4
(Activity 2): Rangeland improvement	Bulanik stream	100 ha	Implement Activities 1, 2, 3 and 4
(Activity 3): Gully plugging (gabion walls)			
(Activity 4): Gully protection (brush type)			

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.5.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Durukoy		
1.Irrigation		
- Canal rehabilitation	L= 1,000 m	Lining of existing canal
2.Livestock		
- Improvement of breed	180 head of cattle	Local breed to pure breed
3.Crop production		
- Forage production increase	A= 108 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 24 ha	Potatoes, dry beans
4.Agricultural mechanization	2 sets	Tractor (including attachments) and mower
5.Apiculture	11 units	10% of the total households (1unit: 20 beehives)
Gockoy		
1.Irrigation		
- Canal rehabilitation	L= 1,000 m	Lining of existing canal
2.Livestock		
- Improvement of breed	75 head of cattle	Local breed to pure breed
3.Crop production		
- Forage production increase	A= 29 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 4 ha	Potatoes, dry beans, strawberries
- Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of walnuts and apples
4.Agricultural mechanization	1 set	Tractor (include attachments) and mower
5.Apiculture	5 units	10% of the total households (1unit; 20 beehives)
Kockoy		
1.Irrigation		
- Canal rehabilitation	L= 4,000 m	Lining of existing canal
2.Livestock		
- Improvement of breed	18 head of cattle	Local breed to pure breed
3.Crop production		
- Forage production increase	A= 83 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 11 ha	Potatoes, dry beans, strawberries
- Fruit orchard rehabilitation	A= 3 ha	Replanting old trees of walnuts and apples
4. Agricultural mechanization	2 sets	Tractor (include attachments) and mower
5. Apiculture	6 units	10% of the total households (1unit; 20 beehives)
Koprukoy		
1. Irrigation		
- Farm pond construction	V= 500 m^3	Concrete pond
- Canal rehabilitation	L= 9,000 m	Lining of existing canal
- New canal construction	L= 1,000 m	Concrete canal
- Replacement of pie	L= 500 m	Diameter: 100mm
2. Livestock		
- Improvement of breed	105 head of cattle	Local breed to pure breed
3. Crop production		
- Forage production increase	A= 126 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 11 ha	Potatoes, dry beans, strawberries
4. Agricultural mechanization	2sets	Tractor (including attachments) and mower
5. Apiculture	16 units	10% of the total households (1unit; 20 beehives)
Numanpasa		
1.Irrigation		
- Canal rehabilitation	A= 2,000 m	Lining of existing canal
2. Livestock		
- Improvement of breed	15 head of cattle	Local breed to pure breed
3. Crop production		
- Forage production increase	A= 112 ha	Increase of area under alfalfa
- Introduction of high value crops	A= 10 ha	Potatoes, dry beans, strawberries
- Fruit orchard rehabilitation	A= 5 ha	Replanting old trees of walnuts, apples and apricot
4. Agricultural mechanization	2 sets	Tractor (including attachments) and mower
5. Apiculture	5 units	10% of the total households (1unit; 20 beehives)

J.5.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula, Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites.	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.5.5 Activities, Effects, Benefits, Inputs and Costs

J.5.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY OF INPUTS	COST OF INPUTS (Billion TL)	COMMENTS
1. Soil Conservation	-Decreasing soil erosion -Increasing vegetation coverage -Ensuring employment -Improving water balance	728 ha	624	Activities include: 1.Natural regeneration 2. Afforestation 3. Re-greening 4. Gully plugging
2. Afforestation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing both quality and quantity of tree stock -Increasing biodiversity -Ensuring better conditions for wildlife -Improving water balance -Increasing aesthetic value of the landscape.	93 ha	157	
3. Rehabilitation of Degraded High Forest	-Decreasing soil erosion -Increasing both quality and quantity of tree stock -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	157 ha	43	Activities include: 1. Rehabilitation 2. Natural regeneration
4. Rehabilitation of Degraded Coppice Forest	-Decreasing soil erosion -Increasing both quality and quantity of tree stock -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of landscape	207 ha	49	Activities include: 1. Rehabilitation 2. Natural regeneration
5. Energy Forest Plantation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing quantity of fuel wood -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	419 ha	704	
6. Rangeland Rehabilitation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing fodder production -Ensuring employment -Improving water balance -Increasing aesthetic value of landscape	658 ha	236	Activities include: 1. Natural regeneration 2. Rangeland improvement 3. Gully plugging 4. Watering troughs
Sub-total cost			**1,813**	

J.5.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL)	COMMENTS
1. Irrigation Improvement	-Increase of crop production and improvement of productivity -Expansion of irrigation area -Increase in agricultural income	Pond :V=500m^3 Canal: L=18,000m Pipeline: L=500m	42 218 2	Concrete pond Lining of existing canal Replacement (Diameter 100mm)
2. Livestock Improvement	-Increased of milk production and live weight of animal -Quality improvement -Increase in income	393 heads of cattle	754	Animal breeding
3. Fodder Production	-Stable supply of forage for livestock	A= 458ha	106	Increase of alfalfa production
4. Fruit Orchard Rehabilitation	-Improvement of productivity -Quality improvement -Increase in income	A= 10ha	16	Replanting old fruit trees
5.Agricultural Mechanization	-Improvement of work efficiency -Improvement of cropping system according to the cultivation season	9 sets	156	Tractor and mower
6. Apiculture	-Diversification of economic activity and increase in income	43 units	17.2	860 beehives
Sub-total cost			**1,305**	

J.5.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training of engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of the natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lecture in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Video films, brochures, posters, etc.

3. Research (for whole MC)			100	
- Research on disaster mechanism	Provide mechanism of the occurrence of disaster	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control project	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management method	3 years,		Equipment; field test, analysis
- Wildlife inventory	Grasping the number of wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy	2 years,		Demo-plants construction, experiment by demo-plants
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding of various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water and farm management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practice on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**3,473**	

J.5.6 Total Project Cost in Ispir Micro-Catchment (UC-14)

ACTIVITY	QUANTITY OF INPUTS	COST OF INPUTS (Billion TL)
1. Rehabilitation and Management of the Natural Resources (Area of MC: 31,934 ha)		
1. Soil Conservation	1,556 ha	1,334
2. Afforestation	199 ha	336
3. Rehabilitation of Degraded High Forest	336 ha	92
4. Rehabilitation of Degraded Coppice Forest	443 ha	105
5. Energy Forest Plantation	893 ha	1,505
6. Rangeland Rehabilitation	1,407 ha	505
Sub-total cost		**3,877**
2. Livelihood Improvement (No. of forest villages: 8)		
1. Irrigation Improvement	Pond :V=800m^3 Rehabilitation of canal: L=28,800m, Pipeline: L=800m	419
2. Livestock Improvement	629 heads of cattle	1,206
3. Fodder Production Improvement	A= 733ha	170
4. Fruit Orchard Rehabilitation	A= 16ha	26
5.Agricultural Mechanization	14 sets	2408
6. Apiculture	69 units	28
Sub-total cost		**2,089**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		48
3. Research		100
4. Demonstration		80
5. Technical Assistance		75
Sub-total cost		**403**
Total Cost		**6,369**

J.5.7 Implementation Schedule

ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional arrangement							
Natural Resources							
1. Soil conservation	●						
2. Afforestation	●						
3. Rehabilitation of degraded high forest							
4. Rehabilitation of degraded coppice forest							
5. Energy forest plantation	●						
6. Rangeland improvement	●						
Livelihood Improvement							
1. Irrigation development	●						
2. Livestock development	●						
3. Fodder production	●						
4. Fruit orchard rehabilitation							
5. Agricultural mechanization							
6. Apiculture development							
Training, Awareness, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters							
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory							
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows	●						
- Crop production	●						
5. Technical assistance							
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

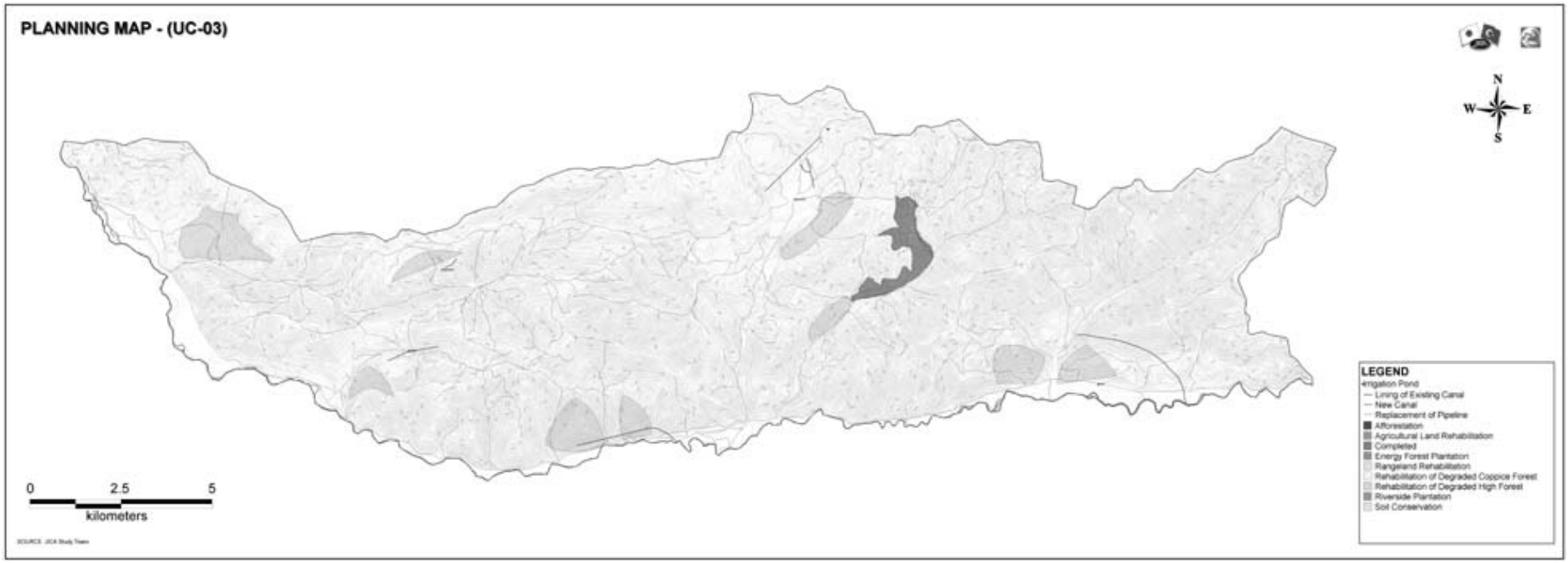
J.6 BAYBURT UC-03 MICRO-CATCHMENT PLAN

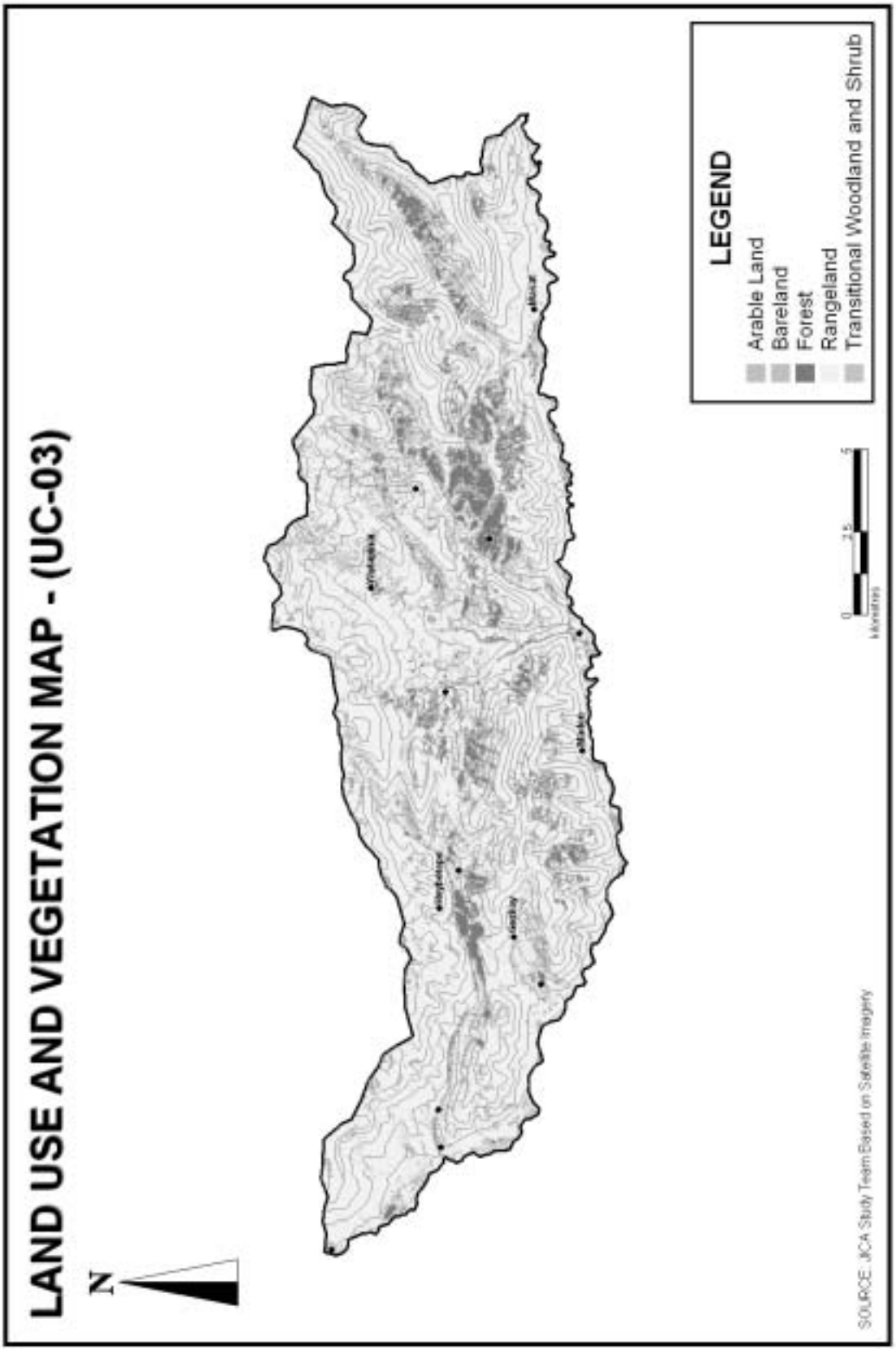
J.6.1 Overview of Bayburt UC-03 Micro-Catchment Plan

The Bayburt MC covers about 21,758 hectares due east of the main administrative centre of Bayburt, and is drained by several streams which flow southwards to join the Masat River and thence flow westwards to join the Coruh River at Bayburt. The MC is characterized by relatively gentle topography compared with the other five MCs, with 25% of its land less than 12% slope, 41% between 12% and 30% slope and only 33% steeper than 30% slope. The altitudinal range within the MC is from 1,300 m to 2,700 m above sea level. About 62% of the MC exhibits severe soil erosion (Erosion Class 3) and most of the rest has moderate soil erosion (Class 2). About 10% of the MC is classified in Land Capability Classes I to IV (cultivable) and all the rest is in Classes VI and VII, unsuitable for cultivation. The most common soils are Brown Soils, with High Mountain Pasture Soils covering 17% of the MC at higher altitudes in the northern part of the MC. The main land uses in the MC are 74% of rangelands, 11% of arable land and 6% of each of forest, and transitional forest and scrub. The MC has six villages with a total population of about 3,204. Five are Forest Villages and have been selected for this study, and they have a total population of 2,967 in 464 households. The population of these villages has declined during the last decade at a rate of about –2% *per annum*. The average annual household income in the selected villages in 2002 was about TL 6,646 million (about US$ 4,400), with considerable disparities between the highest (Maden, 8,890 million TL) and the lowest (Heybetepe, 4,250 million TL). Household incomes are largely derived from pensions, livestock and cropping. A significant feature of the livestock industry in the MC is the presence of nomadic herders with large flocks of sheep (up to 6,000) which graze rangelands for about four months each summer under contract with Masat village. They produce large quantities of cheese from sheep's milk.

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are poor village roads, inadequate sewerage systems, insufficient irrigation systems, low incomes, lack of employment and out-migration of young people, and high feed prices.

The proposed activities include: soil conservation and riverside plantations (for natural resource management); irrigation, livestock improvement, fodder crop production from irrigated lands, fruit orchard rehabilitation, agricultural mechanisation and apiculture (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 1,046, 709 and 355 Billion Turkish Lira (BTL), for a total cost of 2,110 BTL for the five selected villages of the MC.


PLANNING MAP - (UC-03)
N
W
E
S
LEGEND
Irrigation Pond
Lining of Existing Canal
New Canal
Replacement of Pipeline
Afforestation
Agricultural Land Rehabilitation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Rehabilitation of Degraded High Forest
Riverside Plantation
Soil Conservation
0
2.5
5
kilometers



TOPOGRAPHY AND LAND USE MAP

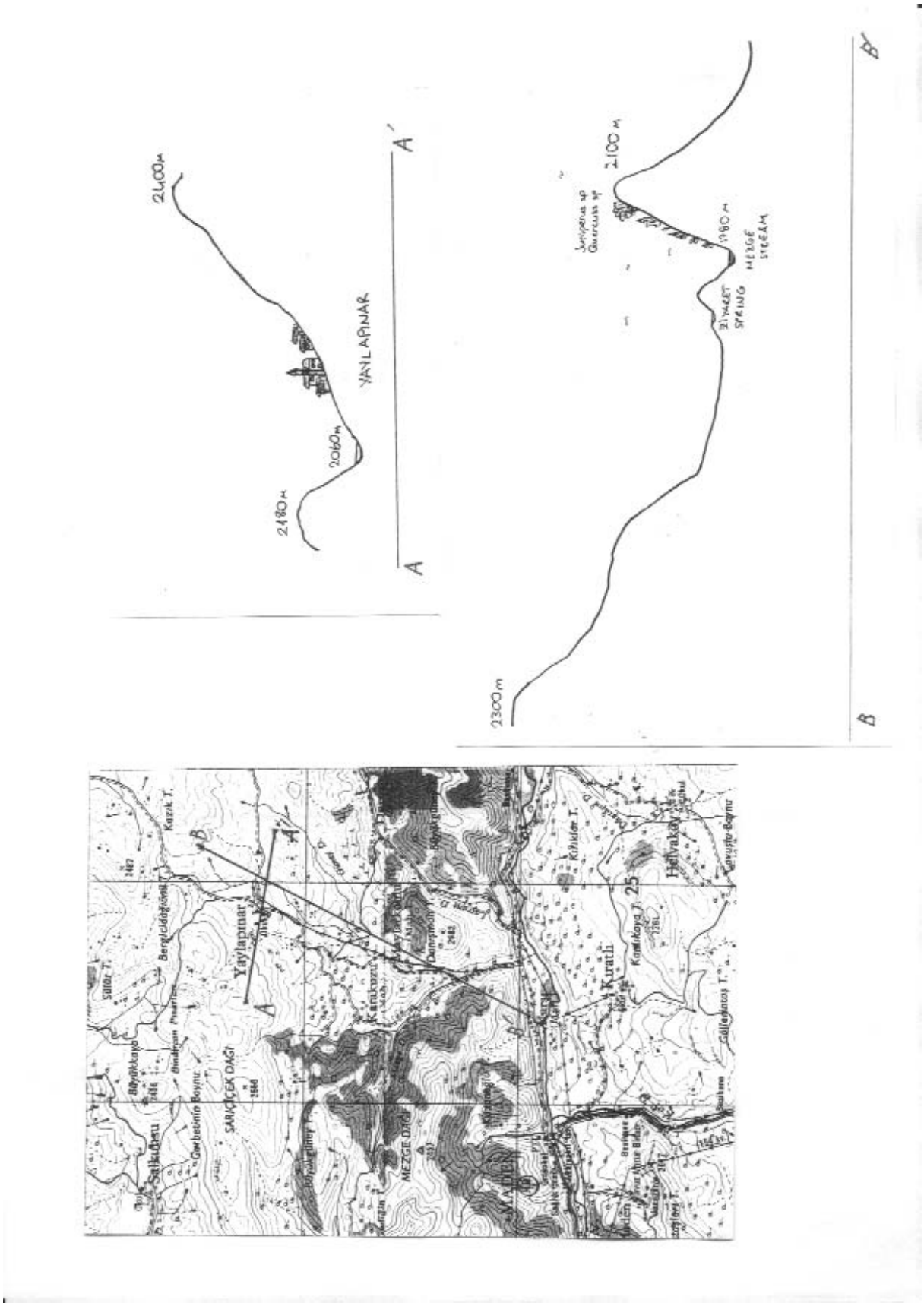


Figure J.6.1 Typical transects across the MC

Figure J.6.2: A Digital Elevation Model

J.6.2 Description of the Micro-Catchment

J.6.2.1 Location and Geographical Conditions

The MC is located due east of Bayburt town, which is the main administrative centre for the MC, and covers about 21,758 hectares. The MC is about 34 km long east to west and 10 km wide north to south, and the altitudes within the MC range from about 1,300 to 2,700 m above sea level. The major streams within the MC (the Buyuk, Latrans, Kuru, Gez and Ahsunicler streams) drain southwards to the Masat River, which eventually joins the Coruh River at Bayburt. The MC has much gentler topography than the other five selected MCs, with 25% of its land less than 12% slope, 41% between 12% and 30% slope, 25% between 30% and 45% slope, and only 8% of its land steeper than 45% slope. The climate is characteristically moderate in summer and very cold in winter, with heavy snowfalls, and the mean annual rainfall at Bayburt is about 430 mm. Access to most of the villages in the MC is quite good.

J.6.2.2 Natural Resources and Present Land Use

The dominant land use is rangeland (74% of the MC), followed by arable land (11%), and 6% of each of forest and transitional woodland and scrub. According to the Forest Management Plan, most of the forest is Degraded High Forest (type BK), and there are some areas of Coppice Forest and Degraded Coppice Forest. A notable feature of the MC is the natural regeneration of *Populus tremula* and other tree species over significant areas. There are no officially-designated Protected Areas in the MC at present, but a forest recreation area may be established southeast of Gezkoy. Some villages within the MC complain about damage to their crops by wild pigs.

The predominant geological types are Lower Cretaceous Volcanics in the southern part of the MC and Lias in the northern part. The most common soils are Brown Soils (75% of the MC), with High Mountain Pasture Soils covering 17% of the MC at higher altitudes in the northern part of the MC and a few small scattered areas of Alluvial Soils. About 62% of the MC exhibits severe soil erosion (Erosion Class 3) and most of the rest of the MC has moderately severe erosion (Class 2). About 10% of the MC is classified under Land Capability Classes I to IV, and all the rest is in Classes VI and VII.

J.6.2.3 Information about the Selected Villages

There are six villages within the MC, with a total population of about 3,204. Five are Forest Villages (Gezkoy, Heybetepe, Maden, Masat and Yaylapinar) with a total population of 2,967. Over the last decade all villages have experienced an average annual depopulation rate of about -2% *per annum*, with Maden losing people at double this rate. Two villages have households with about 40% dependency on pensions, two are 20% dependent and Heybetepe has no pensioners. The other sources of household incomes are livestock and crops, and the average annual income per household in 2002 was about 6,646 million TL (about US$ 4,400), with considerable disparities between the highest (Maden, 8,890 million TL) and the lowest (Heybetepe, 4,250 million TL).

The total number of farm households is 464. There are about 2,068 cattle, 1,800 sheep and only 210 goats (virtually all in Heybetepe and Yaylapinar) in the five villages. A significant feature of the livestock industry in the MC is the presence of nomadic herders with large flocks of sheep (up to 6,000) which graze rangelands for about four months each summer under contract with Masat village. They produce large quantities of cheese from sheep's milk. The total area of pasture and rangeland in the MC is about 6,500 ha, about two-thirds of which is in Masat and Yaylapinar villages. The total cultivated area is about 1,680 ha, with an average household landholding of 3.8 ha. Wheat, barley and fodder crops are the main agricultural products, mostly for home consumption. The irrigation coverage ranges from about 8% (two villages) to 20% (two villages) and is 33% in Yaylapinar. Basic infrastructures are present in all villages, although clinics are found in only three villages and are poorly staffed. Fuels are mostly fuelwood, cowdung and coal.

J.6.3 Major Problems, Constraints and Opportunities

J.6.3.1 Major Problems, Constraints and Opportunities in relation to Natural Resources

Major problems:

- Natural disaster (floods and soil slumping) and soil erosion due to fragile sites and the predominance of south-facing slopes, and degradation of forest and range resources
- Degradation of forests by local people to meet their energy needs for heating and cooking

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Natural disasters (e.g. floods) 2. Soil erosion, poor regulation and losses of water resources	• Soil conservation measures on degraded areas
3. Illicit cutting and degradation of forests 4. High costs and inadequate knowledge of alternative energy sources	• Improvement and reforestation of degraded forests, and establishment of village energy forests on suitable sites • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests • Encouragement of natural regeneration • Provision of coal at suitable prices • Assistance in development of other energy sources, such as bio-energy and solar energy
5. Degradation, low productivity and poor utilization of range resources	• Range improvement measures (water troughs, re-seeding, fertilization) • Development of forage production on suitable lands, and supporting the development of stall-feeding.

Constraints on rehabilitation and sustainable use of natural resources:

- A predominance of south facing slopes and shallow soils
- The large flocks of sheep owned by nomads, and poor control of grazing intensities
- Small gravel quarries along the main road which undermine unstable lower colluvial slopes
- Degraded conditions and low productivity of significant parts of the forest resources
- High dependency on excessive utilization of upland resources
- Inadequate attention to local needs during preparation of forest management plans
- Lack of confidence and trust between villagers and governmental agencies
- Insufficient staff capacities of the MEF and other relevant Government agencies
- Insufficient collaboration among different government agencies
- Lack of adequate awareness of local communities about causes and consequences of natural resource degradation and disasters
- Incomplete cadastral surveys and vague borders of the forests and rangelands
- Unclear rights of AGM for working on OT areas (“forest soils without trees”, as defined in Forest Management Plans)

Opportunities for rehabilitation and sustainable use of natural resources:

- Reduced pressures on upland utilization, resulting in reduced intensity of soil erosion and accelerated natural regeneration in many places
- High reversibility of degraded natural resources by adopting appropriate approaches and methods, including encouragement of natural regeneration
- Growing interest among the MC villagers in collaborating with AGM for undertaking collaborative soil conservation and afforestation activities
- Existence of wide variety of multipurpose local tree, shrub and grass species for technically successful and socially acceptable natural rehabilitation and affoestation

Level of interest in sustainable natural resources management: Medium to High

Current strategies and contributions of the government agencies:

- AGM has conducted some soil conservation activities on a modest scale in the MC along the Latrans stream near Yaylapinar
- Forest villagers in the MC are permitted to collect fuelwood from the forests near the village, depending on their capacity, by paying modest charges to OGM
- ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their incomes and for improving relations with MEF
- AGM has recently started to contract soil conservation work and tending of forest areas to the village communities that have interest and capacity for undertaking such activities
- Cadastre and border delineation of range areas is being undertaken by MARA
- Stream bed and bank rehabilitation activities are being taken by GDRS and DSI

J.6.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:

- Low incomes due to low productivity of crops and livestock which are the major income sources for most villagers
- Limited activities for income generation

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
<u>Livestock</u> 1. Expensive feed 2. Low productivity 3. Insufficient number of animals 4. No shepherds	• Forage production increase through irrigation • Forage production increase • Provision of ORKOY credit
<u>Crop production</u> 1. Insufficient irrigation water 2. Low productivity 3. Soil is infertile 4. Low price of agricultural products 5. Lack of information on agricultural technology 6. Marketing	• Construction of new irrigation canal with ponds • Irrigation development • Diversification of activities (bee keeping) • Provision of agricultural extension • Cooperative development

Constraints on livelihood improvement:

- A predominantly aged population in most villages
- Infertile soils
- Lack of technical information

Opportunities for livelihood improvement:

- Underutilized water resources
- Relatively large land holdings
- Existence of experienced farmers
- High potential for bee keeping

Level of interest in improving livelihoods: High

Current strategies and contributions of the government agencies

- Direct income support for the farmers (MARA; financed by World Bank)
- Subsidy for forage crop production (MARA; financed by Turkish Government)

J.6.4 Proposed Activities

J.6.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Soil Conservation			
(Activity 1): Natural regeneration	Upper Kuru, Latrans stream	193 ha	Implement Activities1, 3, 4, 5 , 6 and 7
(Activity 2): Afforestation (Type 1)	Upper Ahsunicler stream	150 ha	Implement Activities1, 3, 4, 6 and 7
(Activity 3): Afforestation (Type 2)	Middle Gez stream	100 ha	Implement Activities1, 3, 4, 6 and 7
(Activity 4): Re-greening (Type 1)	Downstream of Mitibey stream	350 ha	Implement Activities1, 3, 4, 6 and 7
(Activity 5): Re-greening (Type 2)	Downstream of Buyuk stream	200 ha	Implement Activities1, 3, 4, 6 and 7
(Activity 6): Gully plugging (gabion walls)			
(Activity 7): Gully plugging (brush walls)			
2. Riverside Plantations	Masat stream	1.4 ha	

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary by fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.6.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Gezkoy		
1.Irrigation Improvement		
-Canal rehabilitation	L= 1,000 m	Lining of existing canals
2.Livestock Improvement		
-Animal breeding	15 head of cattle	Local breed to pure breed
3.Crop Production Improvement		
-Forage production increase	A= 44 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 4 ha	Potatoes, strawberries, tomatoes
-Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of apple, sour cherry, cherry
4.Agricultural Mechanization	1 set	Tractor (including attachments) and mower
5.Apiculture	4 units	10% of households: 80 beehives
Heybetepe		
1.Irrigation Improvement		
-Canal rehabilitation	L= 500 m	Lining of existing canals
2.Livestock Improvement		
-Animal breeding	3 head of cattle	Local breed to pure breed
3.Crop Production Improvement		
-Forage production increase	A= 42 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 6 ha	Potatoes, strawberries, tomatoes
-Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of apple, sour cherry, cherry
4.Agricultural Mechanization	1 set	Tractor (including attachments) and mower
5.Apiculture	3 units	10% of households: 60 beehives
Maden		
1.Irrigation Improvement		
-Canal rehabilitation	L=2,500 m	Lining of existing canals
2.Livestock Improvement		
-Animal breeding	5 head of cattle	Local breed to pure breed
3.Crop Production Improvement		
-Forage production increase	A= 84 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 8 ha	Potatoes, strawberries, tomatoes
-Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of apple, sour cherry, cherry
4.Agricultural Mechanization	1 set	Tractor (including attachments) and mower
5.Apiculture	6 units	10% of households: 120 beehives
Masat		
1.Irrigation Improvement		
-Canal rehabilitation	L=3,800 m	Lining of existing canals
2.Livestock Improvement		
-Animal breeding	60 head of cattle	Local breed to pure breed
3.Crop Production Improvement		
-Forage production increase	A=306 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 22 ha	Potatoes, strawberries, tomatoes
-Fruit orchard rehabilitation	A= 11 ha	Replanting old trees of apple, sour cherry, cherry
4.Agricultural Mechanization	2 sets	Tractor (including attachments) and mower
5.Apiculture	24 units	10% of households: 480 beehives
Yaylapinar		
1.Irrigation Improvement		
-Canal rehabilitation	L=1,000 m	Lining of existing canal
-Construction of Irrigation Pond	V=600 m^3	Concrete pond
2.Livestock Improvement		
-Animal breeding	26 head of cattle	Local breed to pure breed
3.Crops production		
-Forage production increase	A=269 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 4 ha	Potatoes, strawberries, tomatoes
-Fruit orchard rehabilitation	A= 2 ha	Replanting old trees of apple, sour cherry, cherry
4.Agricultural Mechanization	2 sets	Tractor (including attachments) and mower
5.Apiculture	10 units	10% of households: 200 beehives

J.6.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula, Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.6.5 Activities, Effects, Benefits, Inputs and Costs

J.6.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Soil Conservation	-Decreasing soil erosion -Increasing vegetation coverage -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	993 ha	916	Activities include: 1. Natural regeneration 2. Afforestation 3. Re-greening 4. Gully plugging
2. Riverside Plantations	-Protection of inhabitant's livelihood and farmland -Environmental improvement -Ensuring employment -Increasing aesthetics value of the landscape.	1.4 ha	9	
Sub-total cost			**925**	

J.6.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Irrigation Improvement	-Increase of crop production & improvement of productivity -Expansion of irrigation area	Canal rehabilitation: L=8,800m Pond: V= 600m^3	101 50	Lining of existing canal Concrete pond
2. Livestock Improvement	-Increased of milk production and weight -Quality improvement	109 heads	209	Animal breeding
3. Fodder Production Irrigated Land	-Stable supply of forage for livestock -Livestock quality improvement	A= 745 ha	173	Increase forage production
4. Fruit Orchard Rehabilitation	-Improvement of productivity -Quality improvement	A= 19 ha	31	Replanting of old fruit trees
5. Agricultural Mechanization	-Improvement of work shortage -Improvement of cropping system according to the cultivation season	7 set	150	Tractor and mower
6. Apiculture	-Diversification of economic activity -Increase sub-income	47 units	18.8	940 beehives
Sub-total cost			**733**	

J.6.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training of engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of the natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lecture in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Video films, brochures, posters, etc.
3. Research (for whole MC)			100	
- Research on disaster mechanism	Provide mechanism of the occurrence of disaster	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control project	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management method	3 years,		Equipment; field test, analysis
- Wildlife inventory	Grasping the number of wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy	2 years,		Demo-plants construction, experiment by demo-plants
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding of various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water and farm management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practice on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**1,989**	

J.6.6 Total Project Cost in Bayburt Micro-Catchment (UC-03)

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)
1. Natural Resources Rehabilitation and Management (Area of MC: 21,758 ha)		
1. Soil Conservation	1,055 ha	1036
2. Riverside Plantations	1.6 ha	10
Sub-total cost		**1,046**
2. Livelihood Improvement (No. of forest villages: 5)		
1. Irrigation Improvement	Rehabilitation of canal: L=8,800m Pond: V= 600m3	151
2. Livestock Improvement	109 heads	209
3. Fodder Production Improvement	A= 745 ha	173
4. Fruit Orchard Rehabilitation	A= 19 ha	31
5. Agricultural Mechanization	7 set	150
6. Apiculture	47 units	19
Sub-total cost		**733**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		30
3. Research		100
4. Demonstration		50
5. Technical Assistance		75
Sub-total cost		**355**
Total Cost		**2,134**

J.6.7 Implementation Schedule

ACTIVITY	PRIOR-ITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional arrangement							
Natural Resources							
1. Soil conservation	●						
2. Riverside plantations							
Livelihood Improvement							
1. Irrigation development	●						
2. Livestock development	●						
3. Fodder production	●						
4. Fruit orchard rehabilitation							
5. Agricultural mechanization							
5. Apiculture development							
Training, Awareness, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters							
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory							
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows	●						
- Crop production	●						
5. Technical assistance							
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

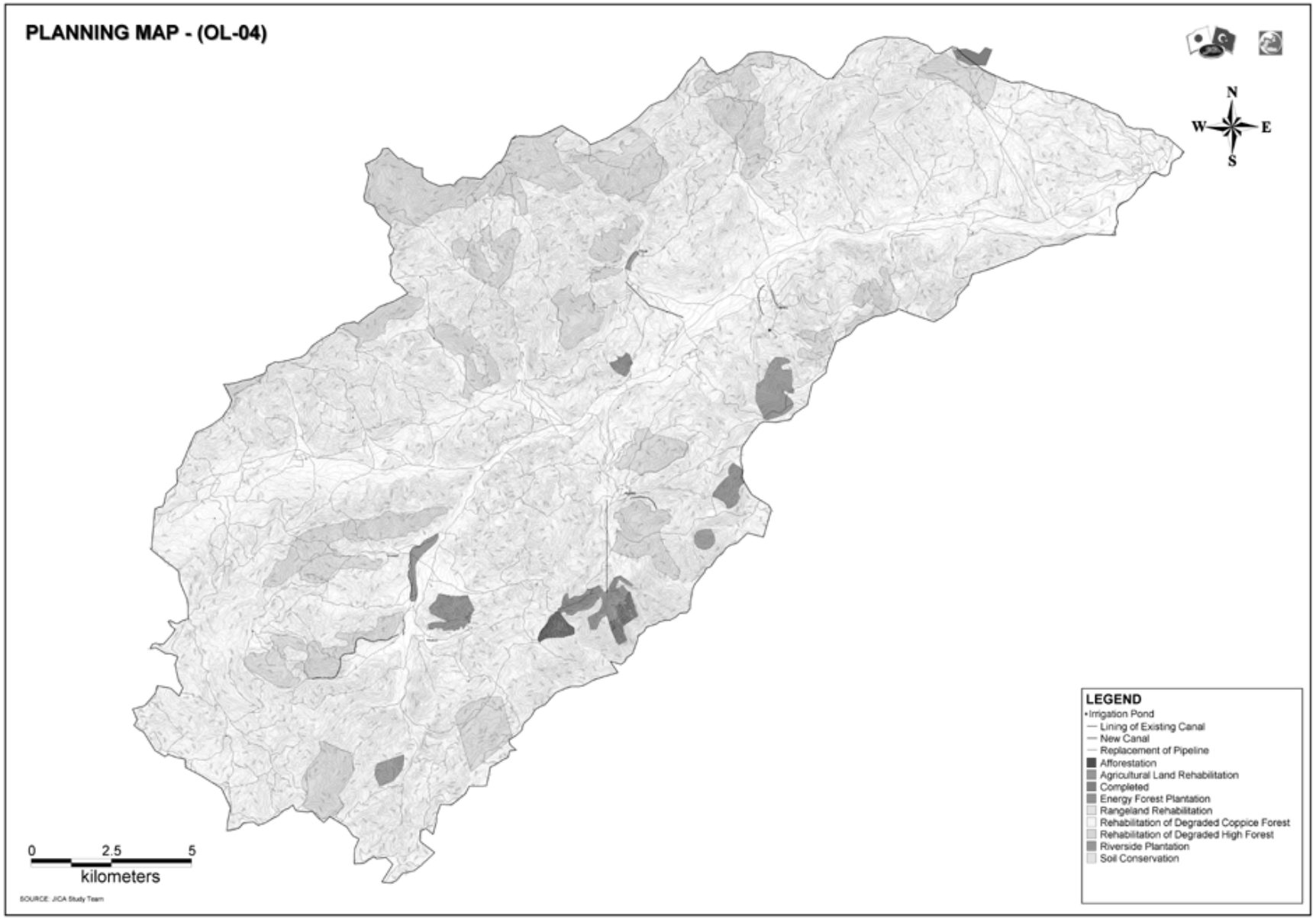
J.7 OLTU OL-04 MICRO-CATCHMENT PLAN

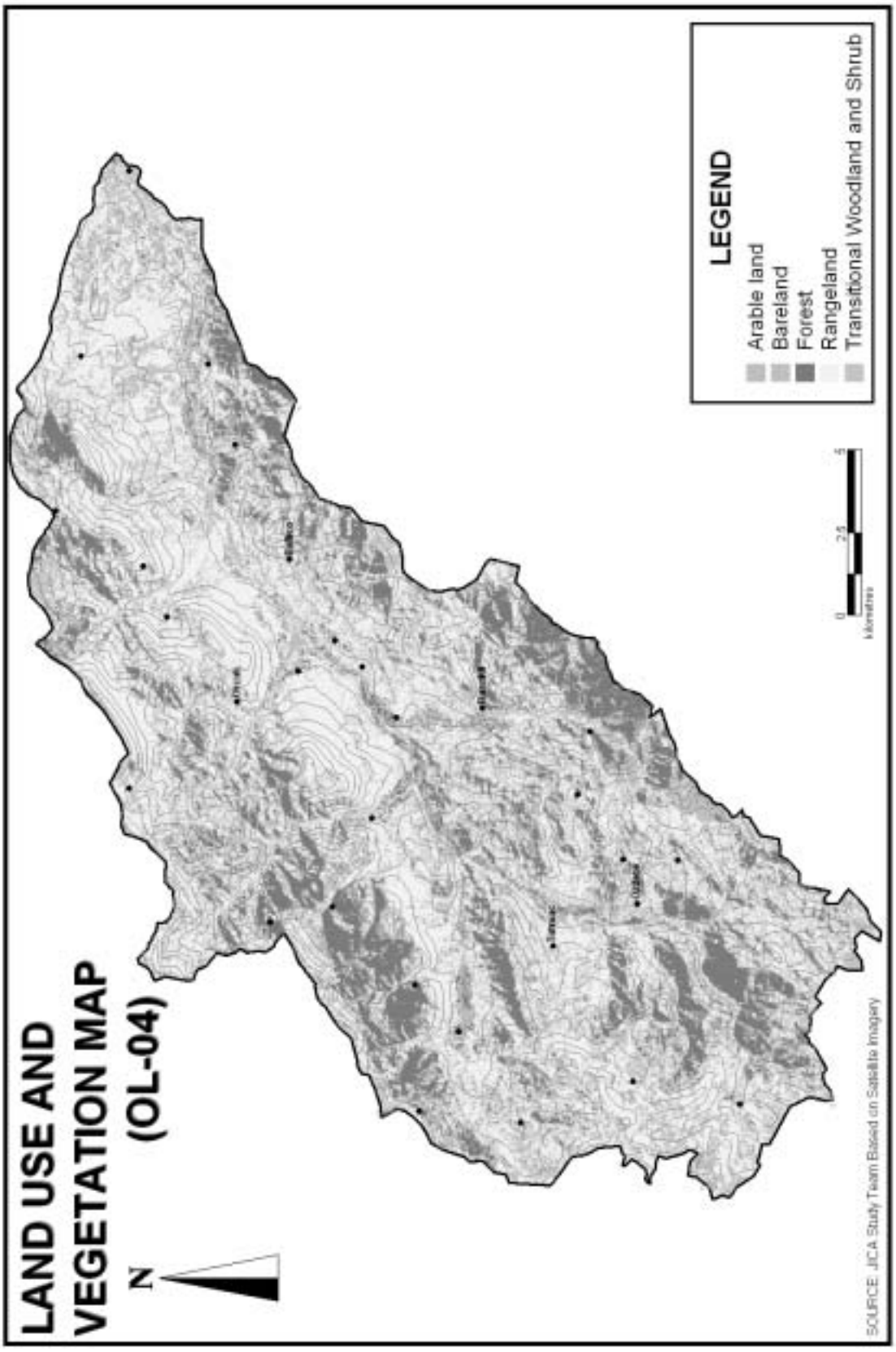
J.7.1 Overview of Oltu OL-04 Micro-Catchment Plan

The Oltu Micro-Catchment (MC) covers about 38,603 hectares southwest of the main administrative center of Oltu, and is drained by the Sivri Stream which joins the Oltu Cayi at Oltu . The MC has about 29% of gentle slopes, 42% of moderately steep land and 22% of steep land, with an altitudinal range from 1,300 m to 2,900 m above sea level. About 58% of the MC exhibits severe soil erosion (Erosion Class 3) and most of the rest has very severe erosion (Class 4). About 88% of the MC is in Land Capability Classes VI, VII and VIII, unsuitable for cultivation. The most common soils are infertile and shallow Brown Forest Soils, Brown Soils and Colluvial Soils. The main land uses in the MC are 48% of rangelands, 21% of arable land, 16% of forests and 8% under transitional woodland and scrub. The MC has 16 villages (14 forest villages) with a total population of 4,312, of which the five Forest Villages selected for detailed study have a total population of 2,235 with average household size of 5.1. The population of these villages has declined during the last decade at a rate of about –5% *per annum*. The average annual household income in the selected villages in 2002 was about TL 5,500 million (about US$ 3,700), derived from pensions, livestock, field crops and vegetables in order of importance.

Numerous participatory studies with villagers and other stakeholders indicate that the highest priority problems for the villagers are poor irrigation systems, poor village roads, low incomes, floods and insufficient fuelwood, in that order. Most of the problems are related to the degraded natural resources.

The proposed activities include: soil conservation, afforestation, energy forests, rangeland rehabilitation and riverside plantations (for natural resource management); irrigation, agricultural land rehabilitation, livestock improvement, crop production, fruit orchard rehabilitation and apiculture (for improvement of village livelihoods); and a series of activities for Human Resource Development (training, awareness raising, capacity building, applied research, demonstrations and technical assistance). The respective costs are 6,630, 1,596 and 499 Billion Turkish Lira (BTL), for a total cost of 8,725 BTL for the five selected villages of the MC for the five selected villages of the MC.


PLANNING MAP - (OL-04)
N
W
E
S
LEGEND
•Irrigation Pond
Lining of Existing Canal
New Canal
Replacement of Pipeline
Afforestation
Agricultural Land Rehabilitation
Completed
Energy Forest Plantation
Rangeland Rehabilitation
Rehabilitation of Degraded Coppice Forest
Rehabilitation of Degraded High Forest
Riverside Plantation
Soil Conservation
0
2.5
5
kilometers
SOURCE: JICA Study Team



TOPOGRAPHY AND LAND USE MAP

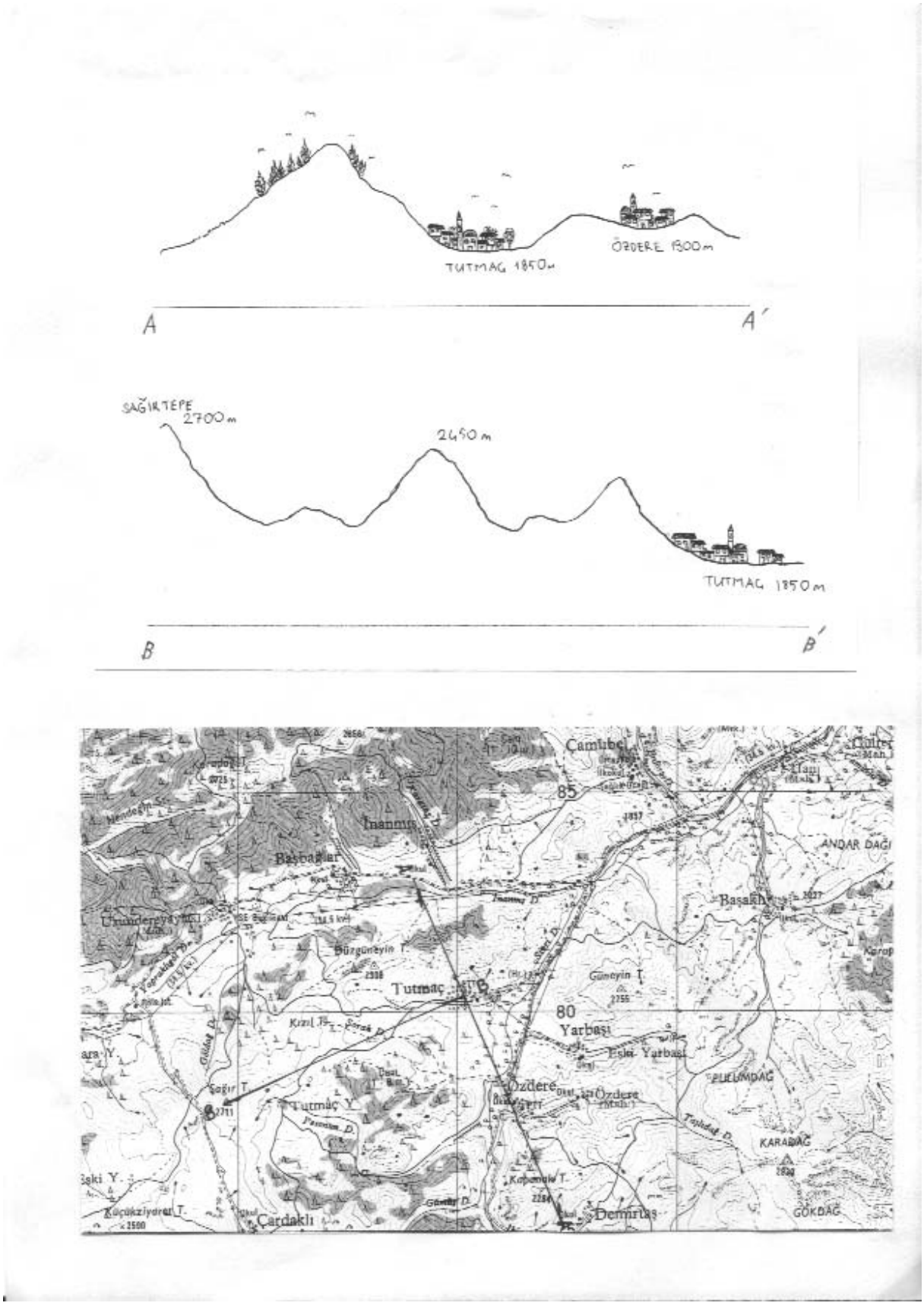


Figure J.7.1 Typical transects across the MC

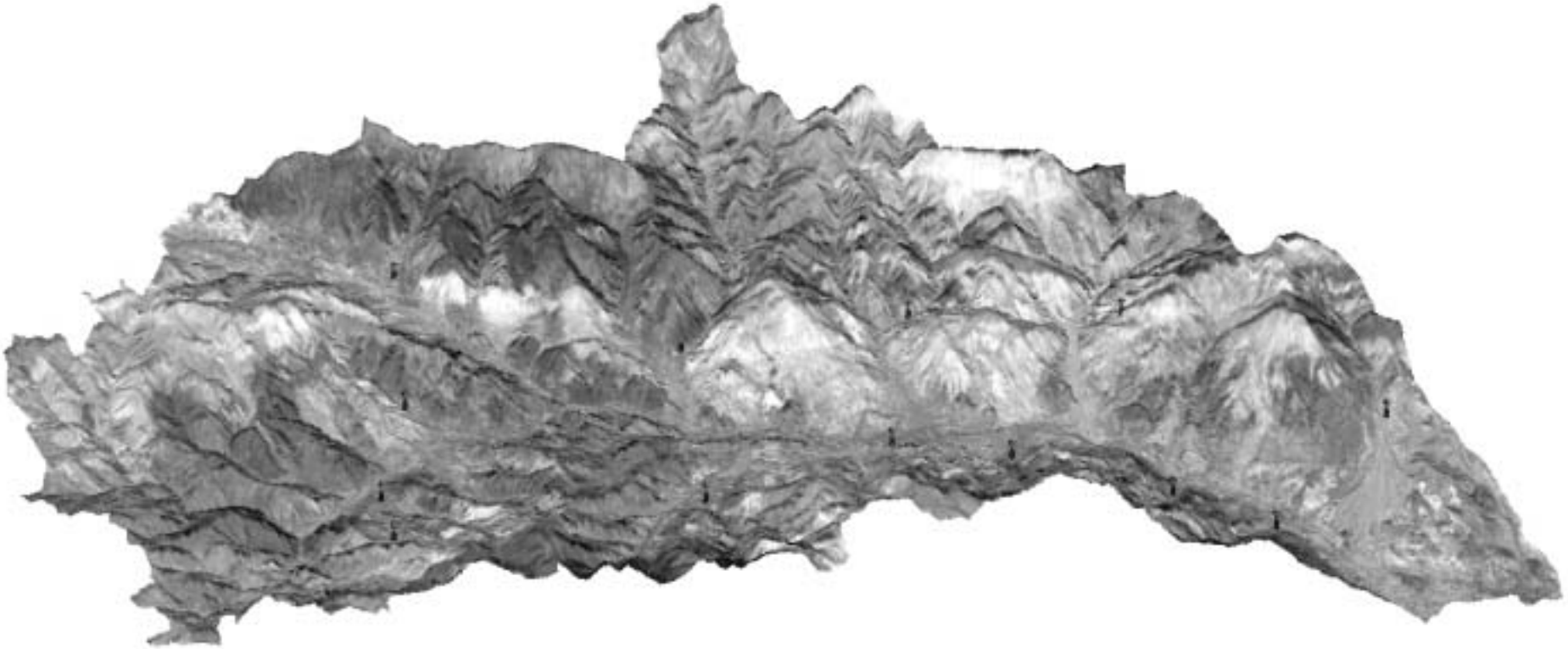


Figure J.7.2: A Digital Elevation Model

J.7.2 Description of the Micro-Catchment

J.7.2.1 Location and Geographical Conditions

The MC is located in the southeast of the Coruh River Basin and is part of the upper catchment of the Oltu River, which is a major tributary of the Coruh River. The total area is about 38,603 ha, extending southwest of the main administrative center of Oltu. The MC is about 31 km long east to west and 25 km wide north to south, with an altitudinal range from 1,300 m to 2,900 m. A main tributary of the Oltu River is the Sivri, which flows through the MC, and there are at least 11 main tributaries of the Sivri. The MC has about 29% of gentle slopes, 42% of moderately sloping land and 22% of steep land. The climate is hot and dry in summer and cold in winter, and the mean annual rainfall is about 380 mm. Access to most villages is reasonable.

J.7.2.2 Natural Resources and Present Land Use

The dominant land use is rangeland (48%), followed by arable land (21%), forest (16%) and transitional woodland and scrub (8%). The forest management plans show High Forest (type NK), and Degraded High Forest (BK). There are no areas of Normal (Bt) or Degraded Coppice Forest (BBt) in the MC. There are no officially-designated Protected Areas in the MC, but a Wildlife Conservation Area is found adjacent to the western end of the MC. Bears and wild pigs are sometimes a problem in most villages.

The predominant geological type is Upper Cretaceous Flysch and the northern part has Upper Cretaceous Volcanic Facies. The most common soils are Brown Forest Soils, Brown Soils and Colluvial Soils. About 58% of the MC is classified as Class 3 (severe) soil erosion and most of the rest is Class 4 (very severe). Most of the soil erosion is probably reversible, except around Orcuk where prevention of natural erosion is very difficult and removal of the coarse rocky debris covering some arable lands would be very expensive. About 88% of the MC is in Land Capability Classes VI, VII and VIII.

J.7.2.3 Information about the Selected Villages

There are 16 villages within the MC, with a total population of about 4,312. There are 14 Forest Villages, of which the five selected villages are Ballica, Basakli, Orcuk, Ozdere, and Tutmac, with a total population of 2,235. The annual average population growth rates during the decade from 1990 to 2000 were negative for all villages, with Ballica having the most significant rate of -8%. The proportion of the population dependent on pensions is least in Tutmac (25%) and greatest in Basakli (65%). The largest source of household incomes in Ballica, Basakli and Orcuk is pensions and in Ozdere and Tutmac is livestock. The average annual income per household (2002) in the selected villages is TL 5,496 m.

The average household size in the selected villages is 5.1. The main economic activity is raising livestock, normally 3 to 5 cows per household, except for Tutmac with 12 cows per household. While 60 to 70% of the households in Basakli and Orcuk raise sheep, only about 20% of the households in the other villages have sheep. All villages except Tutmac raise goats - in Basakli 300 goats are raised by one farmer. The average area of pasture and rangeland per village is 1,275 ha, ranging from Ozdere with 1,786 ha to Ballica with 628 ha. The total cultivated area of the selected villages is 1,072 ha, and average landholding per household is 1.8 ha. The main crops cultivated include wheat, fodder crops and potatoes. There is almost no rain during summer and agricultural production could be doubled by irrigation. Most of the crops are used for home consumption and sales are made only when there is a large surplus. Installation of irrigation facilities by GDRS and ORKOY credits (for dairy cow and beekeeping) are the major agricultural supports. AGM has implemented some soil erosion control activities. Basic rural infrastructures are present in all villages but clinics are usually unattended. Fuels include coal, cowdung and poplar wood.

J.7.3 Major Problems, Constraints and Opportunities

J.7.3.1 Major Problems, Constraints and Opportunities in relation to Natural Resources

After assessment of the whole set of identified problems, the major problems and possible solutions were identified.

Major problems:
- Natural disaster (e.g. floods) and soil erosion due to fragile site
- Destruction/degradation of range and forests by local people to meet their needs on livelihoods

Priority problems identified and possible solutions as suggested by the villagers

Problems	Solutions
1. Natural disasters (e.g. floods, avalanches, landslides). 2. Soil erosion, poor regulation and losses of water resources.	• Soil conservation measures on degraded area. • Riverbed rehabilitation (civil engineering measures), river bank rehabilitation (civil engineering structures, gallery plantations).
3. Illicit cutting and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites. • Provision of fuelwood needs of local people to the extent possible, within the capacity of forests. • Provision of coal at suitable prices. • Assistance in testing/development of other energy sources, such as bio-energy, solar energy.
5. Degradation, low productivity, under-utilization of range resources.	• Range improvement measures (e.g. water troughs, re-seeding, fertilization). • Development of forage production on suitable lands. • Supporting/development of stall-feeding.

Constraints on rehabilitation and sustainable use of natural resources:
- Naturally unstable rocks and soils, harsh topographical conditions
- Degraded conditions and low productivity of significant parts of the forest resources
- High dependency on excessive utilization of upland resources
- Inadequate attention to local needs during preparation of forest management plans
- Lack of confidence between villagers and government agencies
- Insufficient staff capacities of the MEF and other relevant government agencies
- Insufficient collaboration among different government agencies
- Lack of adequate awareness of local communities about causes and consequences of natural resources degradation and disasters
- Incomplete cadastral surveys and vague borders of the forests and rangelands. Unclear rights of AGM for working on OT areas ("forest soil without trees", as in Forest Management Plans)

Opportunities for rehabilitation and sustainable use of natural resources:
- Natural resource degradation is reversible by adopting appropriate approaches and methods
- There is growing interest among the MC villagers for collaborating with AGM for undertaking collaborative activities in soil conservation and afforestation
- Existence of wide variety of multipurpose local tree, shrub and grass species for use in technically successful and socially acceptable rehabilitation activities

Level of interest in sustainable natural resources management: Medium

Current strategies and contributions of the government agencies:
- AGM has conducted some soil conservation activities on a modest scale in the MC areas, including Ballica, Basakli, and Ozdere villages during previous years. AGM has considerable experience and knowledge of erosion control work.
- Forest villagers in the MC are permitted to collect fuelwood from the forests depending on their

capacity in the village area by paying modest charges to OGM
- ORKOY provides low interest credit support to forest villagers and cooperatives for increasing their income and for improving relations with the forest organization
- AGM, OGM and MPG contract protection of forest and wildlife conservation areas to forest village communities by making certain payments to village budgets. AGM has also recently started contracting out soil conservation work and tending of such areas to the village communities that have interest and capacity for undertaking such activities
- Cadastre and border delineation work for range areas are being undertaken by MARA
- Streambed and bank rehabilitation activities are being undertaken by GDRS and DSI
- Increased interest and efforts to involve local people in natural resources conservation and rehabilitation in combination with livelihood development among different units of MEF

J.7.3.2 Major Problems, Constraints and Opportunities in relation to Livelihood Improvement

Major problems:
- Low household incomes due to low productivity of livestock and crops, which are the major sources of income of most villagers.
- Limited opportunities for income generation.

The priority problems identified and possible solutions, as suggested by the villagers

Problems	Solutions
<u>Livestock</u> 1. Low productivity 2. No water troughs and shelters in rangeland 3. Lack of veterinary services 4. Insufficient credit for livestock	• Increase forage production through irrigation • Construct water troughs and shelters • Provide veterinary services • Provide increased ORKOY credit
<u>Crop production</u> 1. Insufficient irrigation water due partly to water loss from canals and too few canals 2. Low productivity 3. Insufficient land 4. Infertile land 5. High costs of inputs such as fertilizer 6. Lack of agro-machinery 7. Lack of information on agricultural technology 8. Marketing	• Lining of earth canal, and construction of new canals • Irrigation expansion • Protection of riverbank to protect arable land • Rehabilitation of agricultural lands • Introduction of high value crops like strawberries • Provide agro-machinery • Provide agricultural extension services • Construct processing factories such as potato chips, fruit juice etc

Constraints on livelihood improvement:
- Predominantly aged population
- Limited land resources
- Threat of floods and erosion
- Lack of technical information
- Unsuccessful cooperative development in the past

Opportunities for livelihood improvement:
- Under-utilized irrigation water
- Potential for increasing crop and animal productivity
- Climatic advantage for strawberry production

Level of interest in improving livelihoods: High

Current strategies and contributions of the government agencies:
- Direct income support for the farmers (MARA, financed by the World Bank)
- Subsidy for forage crop production (MARA, financed by the Government)

J.7.4. Proposed Activities

J.7.4.1 Natural Resources Rehabilitation and Management

ACTIVITY**	LOCATION	APPROX. AREA	COMMENTS
1. Soil Conservation			
(Activity 1): Natural regeneration	Upper Sivri Stream	683 ha	Implement Activities 1, 3, 6 and 7
(Activity 2): Afforestation, (Type 1)	Upper Dagin Stream	407 ha	Implement Activities 1, 3, 6, and 7
(Activity 3): Afforestation (Type 2)			
(Activity 4): Re-greening (Type 1)			
(Activity 5): Re-greening (Type 2)			
(Activity 6): Gully plugging (stone walls)			
(Activity 7): Gully plugging (brush walls)			
2. Afforestation	Upper Sekincukin stream	126 ha	
3. Energy Forest Plantation	Upper Sivri stream	558 ha	
	Upper Sekincukin stream	186 ha	
4. Rangeland Rehabilitation			
(Activity 1): Natural regeneration	Upper Sivri Stream	1,632 ha	Implement Activities 1, 2, 3 and 4
(Activity 2): Rangeland improvement	Upper Dagin Stream	190 ha	Implement Activities 1, 2, 3 and 4
(Activity 3): Gully plugging (stone walls)	Upper Igdelinin Stream	358 ha	Implement Activities 1, 2, 3 and 4
(Activity 4): Gully plugging (brush walls)	Upper Sekincukin Stream	461 ha	Implement Activities 1, 2, 3 and 4
3. Riverside Plantations	Sivri Stream	0.2 ha	L=500 m x 2
	Dagin Stream	0.4 ha	L=1,000 m x 2

**DEFINITION OF ACTIVITIES:	
1. Soil Conservation	
Natural regeneration	Encourage natural regeneration, if necessary with fencing
Afforestation (Type 1)	Conventional terracing and planting of forest tree species
Afforestation (Type 2)	Plant local tree species, usually in a planting hole
Re-greening (Type 1)	Plant local shrub and grass species, usually in a planting hole
Re-greening (Type 2)	Plant *Quercus* species in a block
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
2. Afforestation	Conventional terracing and planting of forest tree species
3. Rehabilitation of Degraded High Forest	
Natural regeneration	Encourage natural regeneration, if necessary with fencing
Rehabilitation	Rejuvenation cutting, thinning and enrich by planting seedlings
4. Rehabilitation of Degraded Coppice Forest	
Natural regeneration	Encourage natural regeneration, if necessary with fencing
Rehabilitation	Rejuvenation cutting, thinning and distribute seed for enrichment
5. Energy Forest Plantation	Planting of fast-growing species for fuelwood production
6. Rangeland Rehabilitation	
Natural regeneration	Encourage natural regeneration, if necessary with fencing
Rangeland improvement	Controlled grazing, fertilizer application, seed sowing and water troughs
Gully plugging (stone walls)	Gully plugging using stone walls
Gully plugging (brush walls)	Gully plugging using brush walls
7. Riverside Plantations	Zigzag planting of poplars, willows and other suitable species to stabilize soils

J.7.4.2 Livelihood Improvement

Villages ACTIVITY	AREA OR QUANTITY	COMMENTS
Ballica		
1.Irrigation		
-Canal rehabilitation	L= 1,000 m	Lining of existing canals
-Farm pond	V= 600 m^3	Concrete pond
2.Livestock		
-Animal breeding	30 head	Local breed to pure breed
3.Crop production		
-Fodder crops	A= 15ha	Increase of area under alfalfa
-Introduction of high value crops	A= 5 ha	Strawberries, potatoes
-Fruit orchard rehabilitation	A= 1ha	Replanting old fruit trees
4.Apiculture	5 units	10% of the total households; 100 beehives
Basakli		
1.Irrigation		
-Canal rehabilitation	L= 6,000 m	Lining of existing canals
2.Crop production		
-Fodder crops	A= 169 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 13 ha	Strawberries, potatoes
-Fruit orchard rehabilitation	A= 9 ha	Replanting old fruit trees
3.Apiculture	5 units	10% of the total households; 100 beehives
Orcuk		
1.Irrigation		Removal of coarse rocky debris and fodder crop cultivation
-Canal rehabilitation	L= 3,000 m	
2.Agricultural land rehabilitation	A= 50 ha	Lining of existing canal
3.Crop production		
-Forage production increase	A= 55 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 18 ha	Potatoes, strawberries, tomatoes, dry beans
-Fruit orchard rehabilitation	A= 2 ha	Replanting old fruit trees
Ozdere		
1.Irrigation		
-Canal rehabilitation	L= 5,000 m	Lining of existing canal
2.Crop production		
-Forage production increase	A= 80 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 10 ha	Potatoes, Strawberries, Tomatoes, Cucumbers
-Fruit orchard rehabilitation	A= 4 ha	Replanting old fruit trees
Tutmac		
1.Irrigation		
-Canal rehabilitation	L= 1,500 m	Lining of existing canals
-New branch canal	L= 2,000 m	Branch canal extension by lining
-New canal	L= 5,000 m	Intake water from Cebet river
2.Agricultural land rehabilitation	A= 30 ha	Removal of coarse rocky debris and fodder crop cultivation
3.Crop production		
-Forage production increase	A= 56 ha	Increase of area under alfalfa
-Introduction of high value crops	A= 11 ha	Tomatoes, potatoes, strawberries
-Fruit orchard rehabilitation	A= 1 ha	Replanting old fruits trees

J.7.4.3 Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance

ACTIVITY	QUANTITY	COMMENTS
1. Training		
- Technical study tour for engineers	1 tour, 2 weeks, 4 engineers	Participatory watershed management and rehabilitation
- Training of engineers	10 people, 1 week	Participatory watershed management, community forestry
- Training of nurserymen	10 people, 1 week	Soil conservation, afforestation techniques and methods
- Training of forest guards	15 forest guards, 3 days	Participatory forest management, public relations
- Training for engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days	Range management, controlled grazing, forage production
- Study tours for MC villagers	2 tours, 3 days each, 15 villagers per tour	Visiting other villages to see watershed development and rural development activities and achievements
- Training course for hunters	20 hunters, one week	Wildlife conservation, sustainable hunting
2. Awareness creation		
- Village meeting	10 villages, one day each	Importance of natural resources management and its relationship with sustainable rural development
- Lecture in primary schools	10 schools, one day each	Relationship between nature and human activities
- Material preparation	Various video films, brochures and posters on watershed problems and natural resources management	Utilize for awareness creation activities and for project advertisement
3. Research		
- Research on disaster mechanism	2 years, one people and equipment	Rainfall pattern, river discharge, discharge of suspended sediment and bedloads
- Evaluation of past soil erosion control project	6 months	Measures applied, cost spent, monitoring methods, survival rate of trees, erosion amount, etc.
- Research on local plant species	2 years, one people and equipment	Characteristics of *Populus tremula*, *Ostrya carpinifolia* , native Q*uercus sp.*, other bush and shrub type plants to be applied for soil conservation measures.
- Rangeland assessment	3 years, one people and equipment	Prediction of carrying capacity, evaluation of rangeland pasture productivity
- Wildlife inventory	3 months	Inventory, assessment and planning
- New energy development	2 years, demo-plants	Solar energy, wind energy, bio-energy
- Eco-tourism potential	1 month	Inventory, assessment and planning
4. Demonstration		
- Field demonstration on livestock	2 controlled grazing sites and 2 forage production sites.	Effect of deferred grazing and early withdrawal; forage production under irrigation, timing of cutting, etc.
- Field demonstration on agriculture	5 crop production demonstration sites	Irrigated agriculture, water management, introduction of new crops, etc.
5. Technical assistance		
- Soil erosion control	5 years	Afforestation, terracing, gully plugging
- Agricultural extension	5 years	Water management, crop cultivation, farm management
- Veterinary service	5 years	Vaccination, internal parasite diagnosis, artificial insemination, treatment of other common diseases
- Pasture improvement	5 years	Controlled grazing, pasture improvement

J.7.5 Activities, Effects, Benefits, Inputs and Costs

J.7.5.1 Natural Resources Rehabilitation and Management

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Soil Conservation	-Decreasing soil erosion -Increasing vegetation coverage -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	1,090 ha	1,340	Activities include: 1.Natural regeneration 2. Afforestation 3. Re-greening 4. Gully plugging
2. Afforestation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing both quality and quantity of tree stock -Increasing biodiversity -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	126 ha	212	
3. Energy Forest Plantation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing both quality and quantity of tree stock -Increasing quantity of firewood subsidy -Decreasing illicit cutting for firewood -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of the landscape.	558 ha	939	
4. Rangeland Rehabilitation	-Decreasing soil erosion -Increasing vegetation coverage -Increasing fodder production -Ensuring better conditions for wildlife -Ensuring employment -Improving water balance -Increasing aesthetic value of landscape	2,641 ha	944	Activities include: 1. Natural regeneration 2. Rangeland improvement 3. Gully plugging
5.Riverside Plantations	-Protection of inhabitant's livelihood and farmland -Environmental improvement -Ensuring employment -Increasing aesthetics value of the landscape.	0.6 ha	4	
Sub-total cost			**3,439**	

J.7.5.2 Livelihood Improvement

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Irrigation Improvement	-Increase of crop production and enhancement of productivity -Expansion of irrigation area	L= 23,500 m V= 600 m^3	351 50	Lining of existing canal and Extension of new canal Concrete pond
2. Agricultural Land Rehabilitation	-Expansion of cultivated land	A= 80 ha	13	Removal of bed loads
3. Livestock Improvement	-Increase of milk production and live weight -Quality improvement of products	30 head	58	Animal breeding
4. Fodder Production Irrigated Land	-Stable supply of forage for livestock	A=375 ha	87	Alfalfa production
5. Fruit Orchard Rehabilitation	-Improvement of productivity -Quality improvement	A= 17 ha	28	Replanting of old fruit trees
6. Apiculture	-Diversification of economic activity -Increase sub-income	10 units	4	200 beehives
Sub-total cost			**591**	

J.7.5.3 Training, Awareness Creation, Capability Raising, Research, Demonstration, Technical Assistance

ACTIVITY	BENEFITS FOR VILLAGERS AND OTHER STAKEHOLDERS	QUANTITY	COST OF INPUTS (Billion TL.)	COMMENTS
1. Training (for whole MC)			100	
- Technical study tour for engineers	Capability raising of forest engineers	1 tour, 2 weeks, 4 engineers		Foreign tour
- Training of engineers, nurserymen, forest guards	Capability raising of forest engineers, nurserymen, forest guards	10 engineers, 1 week; 10 nurserymen, 1 week; 15 forest guards, 3 days;		Lecture, workshop and field visits on participatory forest management,
- Training for engineers and nurserymen	Capability raising of forest engineers and nurserymen	5 forest engineers and 10 nurserymen, 5 days		Lecture, workshop and field visits
- Study tours for MC villagers	Understanding the importance of natural resources management and livelihoods	2 tours, 3 days each, 15 villagers per tour		Tour to other villages in different MCs.
- Training course for hunters	Capability raising of hunters	20 hunters, one week		Lecture and workshop
2. Awareness creation			30	
- Village workshop	Increase awareness of local people on the importance of natural resources conservation	5 villages, one day each, 2 times		Workshop
- Lectures in primary schools	Increase awareness of children on the relationship between nature and human activities	5 schools, one day each, 2 times		Lecture
- Material preparation	Facilitate awareness creation			Vide films, brochures, posters, etc.

3. Research (for whole MC)			100	
- Research on disaster mechanisms	Study mechanisms of the occurrence of disasters	2 years,		Measuring equipment; field data collection, hearing,, measurement and analysis
- Evaluation of past soil erosion control projects	Provide ideas for cost-effective yet promising soil erosion control measures	6 months		Field investigation, measurement, hearing
- Research on local plant species	Provide ideas for effective soil erosion control measures using local plant species	2 years,		Equipment; seed collection, nursery work, measurement, etc.
- Rangeland assessment	Provide more accurate carrying capacity of rangeland and sustainable management methods	3 years,		Equipment; field test, analysis
- Wildlife inventories	Assessing the numbers and distributions of wild animals	3 months		Field survey, hearing
- New energy development	Understanding the feasibility of introducing new energy sources	2 years,		Demo-plants construction, experiment by demo-plants
- Eco-tourism potential	Provide basic data for tourism development	1 month		Field visit, hearing
4. Demonstration			50	
- Livestock	Understanding the effect of controlled grazing and technique for forage production	4 sites		Controlled grazing, forage production
- Agriculture	Understanding various cultivation technologies	5 sites		New crop cultivation, water management
5. Technical assistance (for whole MC)			75	
- Soil erosion control	Help to execute effective soil erosion control measures	5 years		Afforestation, terracing, use of local plants, etc.
- Agricultural extension	Help to increase agricultural productivity and income	5 years		Water and farm management, crop cultivation
- Veterinary services	Help to increase productivity of livestock and income	5 years		Vaccination, internal parasite diagnosis, treatment of other common diseases
- Pasture improvement	Effective management practices on pastureland	5 years		Controlled grazing, pasture improvement
Sub-total cost			**355**	
Total Cost			**4,385**	

J.7.6 Total Project Cost in Oltu Micro-Catchment (OL-04)

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)
1. Natural Resources Rehabilitation and Management (Area of MC: 38,603 ha)		
1. Soil Conservation	2,101 ha	2,583
2. Afforestation	243 ha	409
3. Energy Forest Plantation	1,073 ha	1810
4. Rangeland Rehabilitation	5,091 ha	1820
5. Riverside Plantations	1.2 ha	8
Sub-total cost		**6,630**
2. Livelihood Improvement (No. of forest villages: 14)		
1. Irrigation Improvement	Rehabilitation of canal: L=65,800m Pond: V=1,680 m^3 (pond)	1,123
2. Agricultural Land Rehabilitation	224 ha	36
3. Livestock Improvement	84 head	162
4. Fodder Production Improvement	1,050 ha	244
5. Fruit Orchard Rehabilitation	48 ha	79
6. Apiculture	28 units	11
Sub-total cost		**1,655**
3. Human Resource Development		
1. Training		100
2. Awareness Creation		84
3. Research		100
4. Demonstration		140
5. Technical Assistance		75
Sub-total cost		**499**
Total Cost		**8,784**

J.7.7 Implementation Schedule

ACTIVITY	PRIOR-ITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
Project Preparation							
1. Detailed planning							
2. Dialogue with villagers							
3. Institutional setup							
Natural Resources							
1. Soil conservation	●						
2. Afforestation	●						
3. Energy forest plantation	●						
4. Rangeland improvement	●						
5. Riverside plantation							
Livelihood Improvement							
1. Irrigation development	●						
2. Agricultural land rehabilitation	●						
3. Livestock development	●						
4. Fodder production	●						
5. Fruit orchard rehabilitation							
6. Apiculture							
Training, Awareness, Capability Raising, Research, Demonstrations, Technical Assistance							
1. Training							
- Training of national project staff	●						
- Training of field forestry staff	●						
- Training of MC villagers	●						
- Training of hunters	●						
2. Awareness creation							
- Natural resources management	●						
3. Research							
- Disaster mechanism	●						
- Evaluation of past soil erosion control project	●						
- Characteristics of local plants	●						
- Rangeland assessment	●						
- Wildlife inventory	●						
- Alternative energy development	●						
- Eco-tourism potential							
4. Demonstration							
- Rangeland and meadows							
- Crop production							
5. Technical assistance	●						
- Soil erosion control	●						
- Agricultural extension	●						
- Pasture improvement extension	●						
- Veterinary services	●						

J.8 ASSESSMENTS OF THE ENVIRONMENTAL, SOCIAL AND ECONOMIC IMPACTS OF THE PROPOSED ACTIVITIES

+3: Significant positive impact (will improve the situation to desirable states)
+2: Moderate positive impact (will contribute to improving a situation to a limited extent)
+1: Possible positive impact (may contribute to improving the situation, probably reinforced by other activities)
0: Negligible, no impact or not applicable
-1: Possible negative impact (may cause slight negative impact)
-2: Moderate negative impact (will cause negative impact to a limited extent)
-3: Significant negative impact

Proposed activities in this MC / Affected environmental and socio-economic elements		Water pollution	Soil pollution	Air pollution	Sediments and coarse rocky debris	Mass earth movements	Natural disasters (floods, landslides)	Waste	Water yield regulation	Biodiversity conservation	Wildlife	Agricultural productivity	Range productivity	Forest productivity	Landscape	Employment creation	Income generation	Social and demographic stability	Economic sustainability
Activities for Natural Resources Rehabilitation, Management and Utilization	Controlled grazing with watering troughs	0	0	0	+2	+2	+2	0	+1	0	+1	+1	+3	+1	+1	0	+2	+1	+2
	Natural regeneration	0	0	0	+2	+2	+2	0	+2	+2	+2	+1	+1	+2	+2	0	0	+1	+2
	Gully plugging	0	0	0	+2	+1	+1	0	+1	+1	0	+1	+2	0	+1	+1	0	+1	+1
	Erosion control by affor-estation (Forest tree sp.)	0	0	0	+2	+2	+2	0	+2	+1	+1	0	0	+1	+2	+2	0	+1	+1
	Erosion control by affor-estation (Local tree sp.)	0	0	0	+2	+2	+2	0	+2	+2	+1	+1	0	+1	+2	+2	0	+1	+1
	Natural rehabilitation by protection	0	0	0	+2	+2	+2	0	+2	+2	+1	0	0	+1	+2	0	0	+1	+2
	Revegetation with herbaceous species	0	0	0	+2	+2	+2	0	+1	+1	+1	0	0	+1	+2	+1	0	+1	+2
	Forest protection	0	0	0	+1	+1	+1	0	+2	+1	+1	+1	0	+2	+1	+1	+2	+1	+1
	Riverside plantations	0	0	0	+2	+1	+2	0	+1	0	0	+2	0	0	+2	+1	+2	+1	+1
	Stream bank protection by gabions	0	0	0	+2	+1	+2	0	+1	0	0	+2	0	0	-1	+1	+1	+1	+1

Proposed activities in this MC	Affected environmental and socio-economic elements	Water pollution	Soil pollution	Air pollution	Sediments and coarse rocky debris	Mass earth movements	Natural disasters (floods, landslides)	Waste	Water yield regulation	Biodiversity conservation	Wildlife	Agricultural productivity	Range productivity	Forest productivity	Landscape	Employment creation	Income generation	Social and demographic stability	Economic sustainability
	Small-scale irrigation	-1	-1	0	0	0	0	0	+2	0	0	+3	0	0	-1	+1	+3	+2	+3
	Organic agriculture	+1	0	0	0	0	0	+1	0	+1	0	+2	0	0	0	0	+2	+2	+3
	Inorganic fertilizers	-2	0	0	0	0	0	0	0	0	0	+2	0	0	0	0	+2	+2	+2
	Greenhouses	0	0	0	0	0	0	0	0	0	0	+2	0	0	0	0	+2	+2	+2
	Fruit orchards	0	0	0	+1	0	0	0	0	0	0	+2	0	0	+1	0	+2	+1	+2
	Bee-keeping	0	0	0	0	0	0	0	0	+1	0	0	0	0	0	0	+2	+1	+2
	Forage production	0	0	0	0	0	0	0	0	0	0	+2	0	0	0	0	+2	+2	+2
	Rehabilitation of arable land on colluvial and alluvial fans	0	0	0	+1	0	0	0	0	0	0	+2	0	0	+1	+1	+2	+2	+2
	Animal breeding	-1	0	-1	0	0	0	-1	0	-1	0	+2	0	0	0	0	+2	+2	+2
	Promotion of high value crops	0	0	0	0	0	0	0	0	-1	0	+2	0	0	0	0	+2	+2	+2

Training, Awareness Creation, Capability Raising, Research, Demonstrations, Technical Assistance	• Participatory NRM, community forestry, range management, controlled grazing. • Forage production	All training, awareness creation, capability raising, research, demonstrations and technical assistance will be designed to enhance the benefits from the proposed activities, and will not be provided for any activities which are likely to have negative environmental, social or economic impacts. The positive impacts of training (*etc*.) will enhance the effectiveness of the activity, mitigating possible negative environmental impacts and securing economic sustainability. Positive impacts will be created and maintained only if the farmers' enthusiasm, participation and understanding is maintained and strengthened. Conversely, negative impacts on the environment and socio-economic conditions will not be created by training and similar activities, but may be mitigated from the levels assessed for the original activities.
	• Training on Controlled grazing	
	• Bee keeping	
	• Linkages between NRM and livelihood improvement • Irrigation	
	• Animal feeding	
	• Agriculture (organic)	
	• Agriculture (inorganic)	
	• Installation of demonstration farm • Controlled grazing, forage production	
	• Management of irrigation facilities	

Within the activities proposed for this MC, activities for natural resource conservation and rehabilitation aim to improve the natural environment of the MC through rehabilitating forest resources and preventing soil erosion. Though these activities are not likely to cause adverse effects on the environment, there is a possibility of them limiting the economic activities of certain stakeholders. Thus sufficient consensus must be re-confirmed at the stage of detailed planning to avoid factors such as social conflicts within and between villages.

Income generating activities will generally have little adverse impact on the environment as they mostly consist of rehabilitation and enhancement of existing facilities and activities. However, as excessive usage of inorganic fertilizers and manure may have adverse environmental effects such as eutrophication of water bodies, these effects (and those of any other project activities) must be minimized through training and extension in appropriate application techniques and proper storage. Some facilities may also have adverse impact at the construction stage, and thus require careful attention during detailed planning.

J.9 Assumptions and Risk Assessment

The significant risks to the project under categories of Institutional, Social, and Economic and Financial, Risks are illustrated in the following Table. Environmental Risks and Adverse Impacts, which are considered to be minor, are comprehensively analysed in Section 8.

Explanations of Codes used for Likelihood of Occurrence, Impact if it Occurs and Combined Risk:
Likelihood of Occurrence: L = Low, M = Moderate, H = High
Impact on Project if it Occurs: L = Low, M = Moderate, H = High
Combined Risk. Calculated as L+L = 1, L+M = 2, L+H = 3; M+L = 3, M+M = 4, M+H = 5; H+L = 3, H+M = 4, H+H = 5
Any Combined Score of 3, 4 or 5 requires further examination

Comments about high risk activities with Combined Risks of 3, 4 or 5:

Risk 2: Although the Combined Risk is 4, the probability of successful mitigation is High. The Risk is considered manageable.

Risk 4: Project success depends heavily on the ability and willingness of Government agencies other than MEF to assist in implementation, especially with activities much needed by villagers such as road maintenance, irrigation and drinking water systems, river protection and rangeland management. Every effort must be taken to mitigate this Risk.

Risk 5: Although the Combined Risk is 4, the probability of successful mitigation is High and the Risk is considered manageable.

Risk 6: Although the Combined Risk is 3, the probability of successful mitigation is High and the Risk is considered manageable.

Risk 7: The high rates of out-migration during the last decade do appear to be reducing pressures on the natural resources, but the demographic structures of many villages are becoming skewed towards an unusually high proportion of older people who are less active, less able to undertake heavy labour and less receptive to new ways of managing the village resources. The high rates of out-migration may continue or may reverse in the next decade. The Risk is considered manageable

Risk 10: Project success depends partly upon demonstrating that the proposed new activities, especially in income generation and livelihood improvement, are profitable for villagers under improved farming conditions and normal climatic conditions. If the villagers are not convinced this is so, they might be less willing to be involved in some project activities. The probability of successful mitigation is Moderate, and the Risk is considered manageable.

ASSUMPTION AND RISK	LIKELIHOOD OF OCCURRENCE (L, M or H)	IMPACT ON PROJECT IF IT OCCURS (L, M or H)	COMBINED RISK (1 to 5, with 5 as the highest risk)	POSSIBLE MITIGATING ACTIONS TO REDUCE RISK	AGENCY RESPONSIBLE FOR MITIGATION
INSTITUTIONAL RISKS					
1: Insufficient trained MEF staff (engineers, nurserymen) at field units and frequent staff turnovers.	L	M	2	Appoint field staff and avoid frequent turnovers (probability of this is M)	MEF
2: Inadequate institutional capacity of ORKOY to undertake rural development activities.	M	M	4	Employ qualified ORKOY staff using the project budget (probability of this is H)	MEF
3: Insufficient interest of different MEF units in joint project planning and implementation	L	M	2	Integrate joint planning and implementation (probability of this is H)	MEF
4: Inability and/or unwillingness of other Government agencies (GDRS, MARA, DSI) to cooperate in project implementation.	M	H	5	Establish effective dialogue and cooperation with these agencies (probability of this is L)	MEF, GDRS, MARA, DSI, Governors
SOCIAL RISKS					
5: Lack of confidence and trust between villagers and MEF (and other) Government staff	M	M	4	Establish confidence and trust through frequent and friendly relations between villagers and agency staff, especially in income generating activities and natural resource management (probability of this is H)	Villagers, MEF, other agencies
6: Inability and unwillingness of the villagers, including the different types of stakeholders in the village, to participate and cooperate effectively in project implementation, especially natural resource management.	L	H	3	Create awareness, undertake participatory planning and implementation, many different forms of training, especially in income-generating activities (probability of this is H)	Villagers, MEF, other agencies
7: Out-migration from the villages, leading to insufficient young labourers for project implementation.	M	M	4	Reduce migration and encourage return of villagers by creating employment and income opportunities (probability of this is M)	Villagers, MEF, other agencies
8: Severe conflicts and poor collaboration in the village.	L	M	2	Create mechanisms for resolving conflicts within the village.	Villagers, MEF
ECONOMIC AND FINANCIAL RISKS					
9: The willingness of the Japanese and Turkish Governments to provide and continue their financial support for project implementation for and beyond the duration of the project.	L	M	2	Prepare a technically and institutionally sound project, and ensure regular monitoring and evaluation of progress (probability of this is H).	Governments, project management
10: Unconvincing profitability (cost-benefit ratios) of livelihood improvement activities, and long payback periods for natural resource management activities.	M	M	4	Participatory planning and implementation, integrating natural resource management and livelihood improvement (probability of this is M)	MEF, project management, villagers