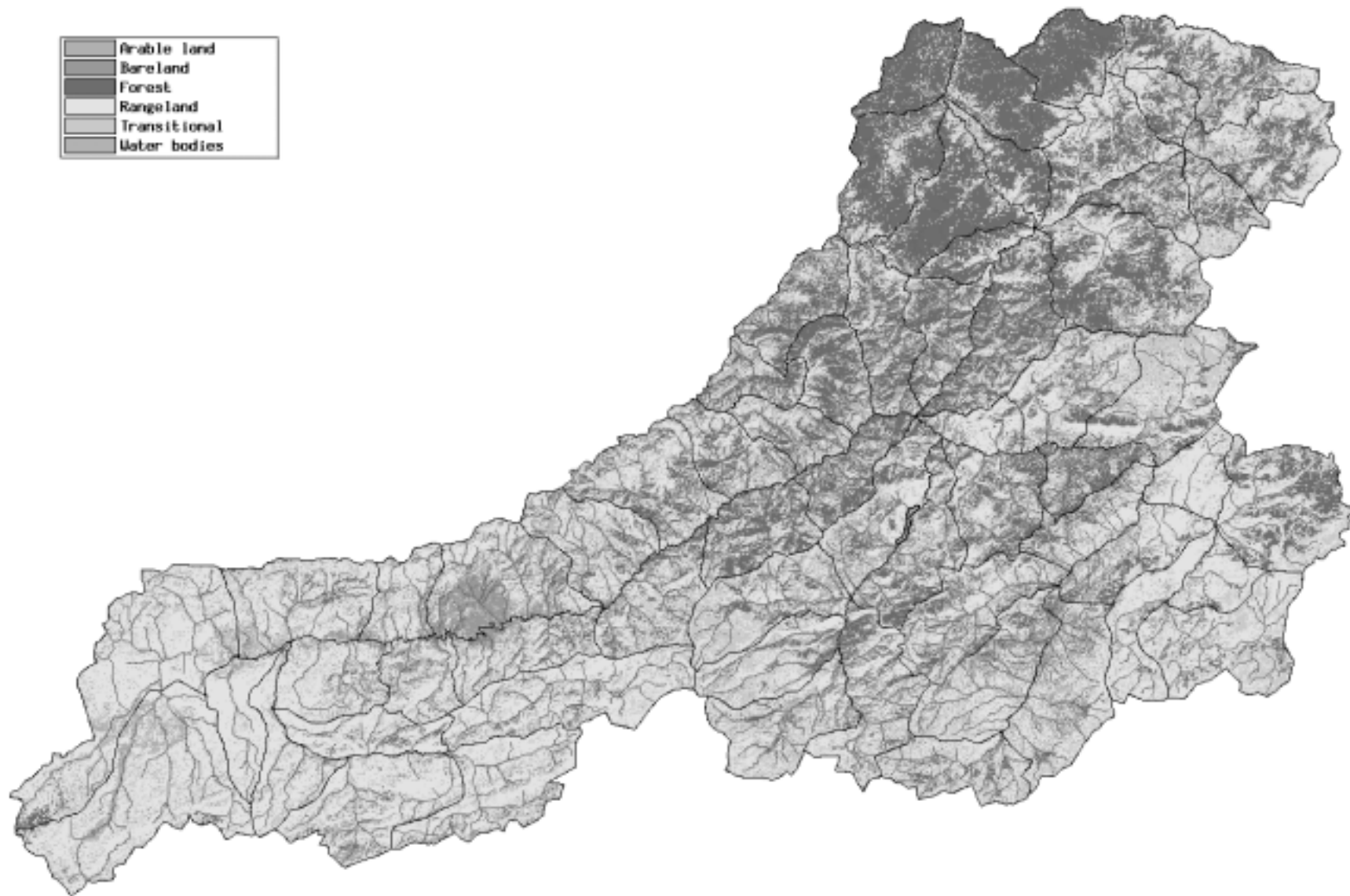


Figure 3.2-1 Distribution of Forest Villages



**Figure 3.3-1 Land Use Map (based on satellite data)**

## Chapter 4 Problems, Constraints and Potentials for Watershed Rehabilitation and Management in the Study Area

## CHAPTER 4

### PROBLEMS, CONSTRAINTS AND POTENTIALS FOR WATERSHED REHABILITATION AND MANAGEMENT IN THE STUDY AREA

#### 4.1 Problems and Constraints

Problems, constraints and potentials for watershed rehabilitation and management vary from village to village, but with several underlying common themes as summarized below.

##### (1) Natural Conditions

In most parts of the Coruh River catchment, the problems and constraints related to natural conditions and natural resource management include:

- i) Steep topography and southern aspects, which accelerate soil erosion and rapid runoff due to the shallow soils with poor water retention capacities, which in turn impedes re-vegetation.
- ii) Harsh climate, intensive storms and seasonal bias of rainfall, which restrict the growth of both naturally regenerated and planted trees, shrubs and herbaceous species, exacerbate soil erosion and promote flooding.
- iii) High erodibility of soils, due partly to the complex geological structures and intensive faulting and folding, and partly to shallow infertile soils and low canopy coverage by vegetation.
- iv) Rapid river flows and floods, due mainly to the “flashiness” of streams, intensive rainfalls during storms, rapid snowmelt, poor infiltration of water into soils and poor water retention capacity of soils.

##### (2) Social Conditions

In all parts of the Coruh River catchment, the problems and constraints related to social conditions make improvement of village livelihoods problematical. These include:

- i) Poverty, which leads to excessive dependence on the unsustainable exploitation of natural resources. Apart from pensions, the major sources of household income are livestock and crop production from small land holdings, both at modest scales and poor levels of productivity. Over-grazing of the free “commons” provided by the rangelands is the major cause of soil erosion in the uplands, and of downstream problems such as flooding. Forests are unsustainably exploited for fuel wood.
- ii) Uncertain land tenure is a result of incomplete delineation of cadastral boundaries and leads directly to illegal exploitation of land.

- iii) Limited employment opportunities other than agriculture lead to out-migration, which in turn limits the availability of an active young labor force in the villages. Demographic structures become skewed towards a predominance of older, more conservative, less active people. On the other hand, it appears that recent out-migration and the consequent depopulation (often at rates of 5% per annum or more over the last decade) have reduced some of the pressures on the natural resources, and have also provided additional funds (from working in the big cities) which might be available for re-investment in agriculture.
- iv) Poor social infrastructures such as roads, which limit access to markets, and poor water supplies and sewerage systems which, combined with poor health services, affect health of villagers.

### **(3) Economic Activities**

Problems and constraints related to economic activities include:

- i) Low agricultural productivity, due to poor soils, harsh climates, poor availability of extension advice, inadequate (and poorly operated and maintained) irrigation systems, low livestock productivity due to the predominance of unproductive local breeds, poor veterinary care and poor housing and feeding. All of these factors lead farmers to concentrate on agricultural production merely to satisfy home consumption, and they provide low quantities and poor qualities of surplus agricultural produce for sale.
- ii) Inadequate silvicultural practices, which eventually limit forest productivity. Forest management plans concentrate solely on production of roundwood and fuel wood and pay little attention to the other potential social, environmental and economic benefits which could be gained from a well-managed multi-purpose forest. For example, the values of such a forest in landscape protection, non-wood forest products, grazing and water regulation are rarely accorded any importance in current Forest Management Plans.
- iii) The potential benefits of other economic activities which might be developed in forest villages, such as aquaculture, apiculture and eco-tourism, have generally received too little support in the past.
- iv) Inconsistent marketing systems and poor market information for agricultural products have impeded the development of a flourishing chain of marketable products passing from farm to consumer. Poor roads and long distances to markets have not helped, but these constraints can generally be overcome if the will to do so is present.

### **(4) Organizations and Institutions**

Lastly, the organizations and institutions which have been charged with the responsibility of assisting the villagers in watershed rehabilitation and for improving their livelihoods have not always operated in the most effective ways. This has not always been the fault of the field-level organizations. Some important problems and constraints include:

- i) Lack of coordination between parts of any one agency, and between agencies. Examples include the four General Directorates within MEF, and the inadequate collaboration between MEF and MARA. Each agency tends to guard what it perceives as its own interests and administrative territories. This factor has been identified as perhaps the most important Risk Factor for the project.
- ii) In addition to the above factors, most agencies do not possess sufficient technical capacities and trained field staff. The latter should be playing important roles in diffusing the new techniques for watershed rehabilitation and management (in terms of farm management, controlled grazing, agricultural production, marketing, soil conservation and improvement, and other factors of production). Poor capabilities of agencies are clearly an important constraint for watershed rehabilitation of the Coruh River catchment.
- iii) Lack of information and, especially, applied on-farm and farmer-directed research are constraining agricultural productivity. Another serious problem is the complete absence of any valid, scientifically-based assessment of the technical- and cost-effectiveness of the long-continued erosion control activities in relation to the discharge of suspended sediments and coarse rocky debris (bedloads) from catchments into the streams and dams.
- iv) The use of participatory approaches in planning and implementation of watershed rehabilitation is slowly improving, but much more attention must be given to this aspect because the only really sustainable approach to improved watershed rehabilitation lies in first developing sufficient trust and confidence between the farmers and the agencies and then improving the environmental consciousness of the farmers so that they all become better “land managers”.

## **4.2 Problem Structure**

As is clear from the discussions in the former Section, the Coruh River catchment faces numerous interrelated and complicated problems and constraints, which could also be construed as opportunities for rehabilitation and better management. The whole body of problems described above can usefully be analyzed and depicted using a diagram called a Problem Structure, which is presented in Figure 4.2-1.

The problems depicted in Figure 4.2-1 can be categorized into three groups, depending on their position and inter-relationships within the problem structure. The three groups are:

- i) “Fundamental problems”, which are at the root of the problem structure.
- ii) “Problem factors”, which are caused by the “fundamental problems”.
- iii) “Major problem phenomena”, which are the visible results of the interactions between the problems seen in the field.

There are eight “fundamental problems”. Five of them are inherent problems: namely, harsh topography, shallow soils with low fertility, low precipitation and poor seasonal distribution, long winters with heavy snow and low sunlight, and long distances from markets. The

remaining three are technical problems (incomplete cadastral surveys and delineations) and institutional problems (weak local administrations and capacities, and inconsistent policies for watershed management).

These then lead to “problem factors”, which include the following linked influences:

- i) Accelerated soil erosion
- ii) Insufficient fodder production
- iii) Poor rural infrastructure
- iv) Uncertain land tenure
- v) Poor management of rangelands
- vi) Poor management of forests.

The inter-related effects of all these problems then produce four “major problem phenomena”:

- i) Environmental problems, including degradation of forest resources, accelerated soil erosion, reduction in biodiversity and floods.
- ii) Social problems, including rural poverty, dislocated families due to out-migration and limited employment opportunities.
- iii) Economic problems, including the limited opportunities for employment and productive use of labor, low productivity of the factors of production (land, labor and capital), all of which are expressed as rural poverty.
- iv) A “vicious spiral of poverty and natural resource degradation”, based on poverty leading to ever-increasing exploitation of natural resources, leading to degraded natural resources, which in turn leads to increasingly severe rural poverty.





- ii) Over recent years AGM personnel have gained considerable experience in successful implementation of techniques for erosion control and afforestation. This is a promising basis for future expansion of such methodologies.
- iii) Similarly, some MEF personnel have gained both experience and confidence in participatory watershed rehabilitation, especially through involvement in projects such as the Eastern Anatolia Watershed Rehabilitation Project (supported by the World Bank) and the Community Forestry Project (supported by FAO and the Government of Switzerland). There is more trust and confidence between villagers and MEF personnel than there was a decade ago. These experiences and accumulated skills also provide a promising basis for rehabilitation in the Coruh River catchment.
- iv) The capability and interest of the local people in becoming actively involved in improving their own local natural resources and livelihoods varies widely around the Coruh River catchment, but represents a promising basis for better performance in the future. There are some indications that some villagers are starting to recognize the close inter-relationships between the state of the local natural resources and their own livelihoods. Some villagers are voluntarily protecting forest areas and are instituting village-directed forms of controlled grazing.
- v) Likewise, AGM has been contracting out soil conservation and afforestation work directly to villagers, which is a highly appreciated extra source of funds to individual villagers and to the village in general. It increases the levels of interest and awareness among villagers.
- vi) NGOs such as TEMA and TKV have been active in the Coruh River catchment for some years. TEMA is currently implementing a rural development project with support from the Government of Germany in five villages near Bayburt. In addition, several NGOs have been playing important roles in public education and awareness creation on environmental issues and natural resources conservation in Turkey.
- vii) There is still considerable scope for increasing incomes from intensifying agricultural production. A wide range of improvements, including better irrigation, better soil management, better livestock husbandry, controlled grazing of rangelands, better forage production and many other activities could be instituted under the project. Greenhouses, apiculture and horticulture could all produce much greater revenues, provided better marketing systems are instituted.
- viii) The wholesale vegetable and fruit markets in Erzurum could be better exploited by farmers in the Coruh River catchment. In 2001, these markets handled about 15,000 tons of produce, 80% of which was sourced from outside the Erzurum Province. Very little came from the Coruh River catchment. If ample and reliable quantities of produce of acceptable qualities could be assured, some farmers in the Coruh River catchment should be able to develop a competitive advantage in these markets.

#### **4.4 Key Issues for Watershed Rehabilitation**

The analysis of the Problem Structure indicates that the current situation of the Study Area consists of a vicious spiral of poverty and natural resource degradation. On the other hand, various potentials for watershed rehabilitation are also found, particularly for resource management by both state and forest villagers, and for forest village income generation, which would alleviate the problem of rural poverty.

While there are many problems contributing to the current situation in the Study Area, the composition of the development patterns, where villagers are highly dependent on local natural resources, particularly the forests, is one of the major factors promoting the configuration of the vicious spiral. Therefore, watershed rehabilitation should be directed towards comprehensive measures controlling this development pattern which intensively depends on forest and land resources, and towards making effective use of the potentials of forest villages and nature. Furthermore, considering that appropriate management of natural resources is also indispensable for the rehabilitation of the Study Area, the key issues for watershed rehabilitation in the Coruh River catchment are:

- i) Management and rehabilitation of the remaining and degraded forest areas (including rangeland) to conserve and restore/improve natural resources.
- ii) Poverty reduction among forest villagers, which is expected to lessen the pressure on forest resources.
- iii) Development of human resources including terms of building awareness and capacity of both local villagers and government staff for sustainable resource management.

## Chapter 5 Basic Concept for Participatory Watershed Rehabilitation in the Coruh River

## **CHAPTER 5**

### **BASIC CONCEPT FOR PARTICIPATORY WATERSHED REHABILITATION IN THE CORUH RIVER**

#### **5.1 Rationales for Watershed Rehabilitation**

##### **5.1.1 Importance of Watershed Rehabilitation**

The natural resources in the Coruh River catchment are under degradation particularly in terms of forest and soil resources. The visible evidence of the occurring degradation include: i) active soil erosion with extensive and deep gullies; ii) landslides and mass earth movements; iii) heavy loads of suspended sediments in the Coruh River and its tributaries; iv) profuse bedloads of coarse rocky debris in the streambeds; and v) loss of forest areas.

At the same time, the Coruh River catchment is one of the poorest regions in Turkey. The poverty in the area induces high dependency of forest villagers on local natural resources and thus further accelerates degradation of natural resources. On the other hand, the poor state of natural resources also work as factors accelerating rural poverty. These factors include: i) poor physical and chemical conditions of the rangeland, forest and arable soils; ii) poor productivity of all types of crops; iii) poor livestock quality and productivity; and iv) poor productivity of forests.

These factors are all closely interrelated, and as described in the previous Chapter, form a vicious spiral of poverty and natural resource degradation. Under these circumstances, the planning and implementation of comprehensive measures to cut off each side of the vicious spiral is crucial. Watershed rehabilitation in the Coruh River catchment needs to address all the issues above to realize improved livelihoods for forest villagers and natural resources conservation. In consideration of actual activities for watershed rehabilitation, is also important to propose ideal yet realistic organizations that enable effective implementation and to find prospective financial sources necessary for its execution.

Furthermore, watershed rehabilitation in the Coruh River catchment is expected to contribute to the attainment of several national goals, which are to rectify regional disparities between the east and west of the country and to conserve its natural resources. Also benefits for the lifespan of the series of hydroelectric dams which are under construction or being planned in the catchment.

##### **5.1.2 Importance of Participatory Approach**

Over many years, the forest villagers have cleared forests for fuel wood, animal fodder and timber, have overgrazed rangelands and have converted rangelands on steep slopes to arable

fields. They have been the major agents responsible for initiating and exacerbating accelerated soil erosion within many parts of the Coruh River catchment. On the other hand, it can be said that the villagers are the actual “managers” of these local natural resources, despite the efforts and intentions of the MEF and other Government agencies, and the legal status of the lands on which the resources occur. And therefore, strategies and tactics (project activities, or development instruments) for watershed rehabilitation must recognize their important managerial role.

In order to achieve sustainable and permanent improvement of the natural resources, local villagers must be involved as in "Co-Management Partnerships" for land management. For this purpose, it is crucial that the villagers understand the connections between their economic and social conditions and the environmental conditions around them, and realize that they have a vital stake in improving their natural resources. The keys for realizing such situations lie in demonstrating, with the villagers, the linkages between improved livelihood activities and improved management of the communal natural resources, and also in using these linkages as their incentives.

Furthermore, it is also important to understand that the villagers will not cooperate in any meaningful way with any proposed tactics for watershed rehabilitation unless they are convinced that this will be in their own best interests. Foremost among these interests is the need for immediate day-to-day income from income-generating activities, and therefore any proposed activity for watershed rehabilitation that leads to loss of income must be compensated for by some other activity which will produce equivalent (or better) income.

## **5.2 Overall Goals and Policies for Master Plan**

### **5.2.1 Overall Goals**

It has been addressed in the previous discussions that the current unfavorable situation in the Coruh River catchment is derived from the vicious spiral consisting of poverty and natural resource degradation. The key issues for watershed rehabilitation in the Coruh River catchment are to cut off each side of the vicious spiral by: i) management and rehabilitation of the remaining and degraded forest areas (including rangeland) to conserve and restore/improve natural resources; and ii) poverty reduction among forest villagers, which is expected to lessen the pressure on forest resources. In order to address this situation, the overall goal is established as follows:

**“To prevent further progression of the vicious spiral consisting of natural resources degradation and poverty of forest villagers”**

### **5.2.2 Policies**

In order to accomplish the overall goals, the following policies are recommended:

### **Policy - A: Natural Resource Rehabilitation and Management**

- 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 production, 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) Rehabilitation of streambeds and improving water resources utilization.

### **Policy - B: Livelihood Improvement**

- i) Strengthening of the livestock sector with regard to its comparative advantage. Since the livestock sector produces the largest proportion of agricultural income in most of the villages, the sector will be strengthened by increasing productivity mainly through securing winter feed and improved breeding.
- ii) Increasing income from crop production through improvement of productivity and introduction of high-profitability crops. In order to do this, the maintenance of agricultural infrastructures, mainly the expansion of agricultural water supply capacity, will be promoted.
- iii) Diversification of agricultural income sources, through promoting of products with high market values such as regional special products.

### **Policy - C: 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.

## **5.3 Strategies for Master Plan Policies**

The following strategies A-C are established in correspondence with Policies A-C, and “General strategies” are also established as the fundamental strategies which stress the participatory approach in order to secure sustainability and efficient performance of the Master Plan.

### **General strategies**

#### **(1) Participatory planning, implementation and assessment of development activities**

Development activities for watershed rehabilitation will 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 activities 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.

**(2) 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.

**(3) 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 areas with similar conditions, should also be given proper attention.

**Strategies for policy-A: Natural resources rehabilitation and management**

**(1) Appropriate and effective management of remaining forest resources with regard to needs of villagers.**

Protection and management of the remaining forest resources will be realized with ample consideration of the needs of local villagers. Preparation of multi-purpose forest management plans and appropriate management plans for protected areas and National Parks will be also examined.

**(2) Effective management and rehabilitation of rangelands emphasizing controlled grazing**

Controlled grazing and decrease of grazing periods will be emphasized as a fundamental strategy for rehabilitation and management of range resources, as these are the most cost-effective measures which do not require large inputs and construction work and can be realized through ample understanding and participation of villagers. Fertilization, re-seeding and water trough construction will be the other complementary activities to be implemented at suitable sites.

**(3) Erosion control and rehabilitation work with priority on high damage and risk areas**

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. For other areas wherever possible and appropriate, natural rehabilitation by protection will be preferably implemented. 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, and work on very small and scattered areas with little significant potential beneficial impact on the catchment will be

avoided. Scientific monitoring and evaluation to measure the effectiveness of these interventions will also be promoted.

**(4) Afforestation on sites with suitable conditions**

Afforestation will be implemented only on the areas with suitable site and soil conditions. On suitable rehabilitation sites, appropriate local and multipurpose plant species will be used in addition to local forest tree species.

**(5) Contracting out natural resources rehabilitation, management and utilization work to local village communities**

Wherever there are villagers who have interest and capacity, the work for natural resources rehabilitation, management and utilization, 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 villager opposition to expanding such activities to other sites, which might have been opposed by villagers previously.

**(6) Riverbank rehabilitation**

Riverbank stabilization will be realized by planting fast-growing tree species, which will also serve as provision of fuel wood to forest villagers.

**Strategies for policy-B: Livelihood improvement**

**(1) Development of agricultural productivity**

These activities will include expansion of irrigated agriculture, promoting crop diversification, improvement of horticultural varieties and practices, development of agricultural crop processing and marketing, and rehabilitation of suitable lands on colluvial fans for agricultural uses.

**(2) 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 with 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.

**(3) Development of other income generating activities**

This strategy will aim to increase agricultural income through the diversification of income-generating activities such as beekeeping.

**(4) Strengthening of support systems**

Agricultural, livestock and other income generation programs and activities will 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 promotion of a small scale mechanization development-assistance.



## **Strategies for policy-C: Human resource development**

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 areas and villages; 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 Coruh River catchment.

### **5.4 Programs and Projects for the Master Plan**

The strategies mentioned above need to be interpreted into practical program/projects. The following programs and projects are formulated as a means to execute the technical strategies A-C mentioned in the previous section.

#### **5.4.1 Programs for Natural Resources Rehabilitation, Management and Utilization**

##### **(1) Multipurpose (functional) forest management planning**

This project aims to prepare multipurpose forest management plan in pilot project area, which contribute to sustainable management and utilization of natural resources. In the project, comprehensive studies of natural resources conditions of the project area in combination with field reconnaissance and GIS / Remote Sensing analysis in the forest and rangeland area should be conducted first, and then multipurpose forest resource management plan will be formulated.

##### **(2) National Parks and protected areas management**

This project aims to accomplish the study of wildlife conditions (especially of endangered species) in National Park and wildlife protected area and their surroundings, and to formulate sustainable and effective management plans in both terms of conservation of natural values and satisfying forest villagers' needs.

##### **(3) Nursery Expansion and Improvement Project**

This project aims to enhance nursery facilities and their seedling production capacities, thereby producing and distributing tree seedlings necessary for the execution of the projects such as afforestation, erosion control, energy forest plantation. Among other nurseries, this project targets at Ardanuc and Bayburt nurseries as these two will play a key role in production and supply for the future projects.

#### **(4) Soil conservation**

This project aims to prevent soil erosion by afforesting tree and herbaceous species, based on scientific consideration, in combination with the engineering works, or separately. Not only forest tree species (e.g. *Pinus sylvestris*, *Quercus* sp., *Robinia pseudoacacia*) but also local tree species (e.g. *Ostrya carpinifolia*, *Populus tremula*), local shrubs and grass species (e.g. *Astragalus gummifer*, *Berberis* sp.) should be recommended. “Nurse Block”, which is the soil block that has penetrated hole centrally to encourage the growth of the root system, can be applied. Simple engineering structures, such as stonewalls and brush walls for gully plugging, will be constructed with participation of local people. Closing up forest areas to effectively prevent forest villagers from entering and using the land can be useful in terms of getting rid of human and grazing pressures, while expecting spontaneous natural regeneration of vegetation, if village agreements for sustainable usage of these resources are established, along with income-substitution and compensation measures.

#### **(5) Afforestation**

This project aims to afforest seedlings of tree species (e.g. *Pinus sylvestris*, *Quercus* sp., *Robinia pseudoacacia*) or other suitable tree species on conventional terrace along contour lines. The appropriate sites should be carefully selected on the condition that the sites should be less than 30% inclination and the surface soil layer are comparatively thick.

#### **(6) Rehabilitation of degraded high forest**

This project aims to return Degraded Forests to a condition resembling Normal Forests, and thus to minimize the actual and potential erosion. The project also aims, to the greatest feasible extent, to improve the forest to a sound, healthy and vigorous condition, with the highest possible canopy coverage. The project should make every effort to follow the best practices in management and harvesting (rejuvenation cutting and thinning) and thus minimize soil erosion. In addition to the measures suggested above, enrichment planting might be feasible. Natural regeneration should be encouraged.

#### **(7) Rehabilitation of degraded coppice forest**

This project aims to adopt necessary rehabilitation measures for degraded coppice forest, such as restrictions on use by villagers and livestock intrusion, and by encouraging afforestation so that degraded coppice forest can be productive and serve protective functions. Coppicing and harvesting of branchwood (fuel wood) and foliage (fodder) should be carried out according to best feasible practices to maintain the highest possible canopy coverage and the least possible soil disturbance. Over-grazing must be avoided and the villagers must establish a rational grazing routine according to the capacity of the site to support grazing. On the other hand, enrichment planting such as oak planting and acorn seeding will contribute to the gradual improvement of such degraded coppice forests.

As the growth of oak trees is very slow in the Study Area, coppice forests needs to be carefully managed in sustainable manners over long periods.

#### **(8) Energy forest plantation**

This project aims to establish plantation of fast-growing and multipurpose tree species in order to supplement villager needs for charcoal and building-materials, based on villager understanding and participation.

#### **(9) Rangeland rehabilitation**

This project will protect the rangelands through promoting appropriate grazing strategies for different types of herds at different times and at different intensities of grazing. This project will promote the application of measures such as seeding and fertilizing to improve certain types of rangelands. After productivity is improved, the rangelands must be better managed, principally by improving grazing practices, to avoid preferential grazing. Gabion plugging (stone walls, brush walls) will also be constructed if necessary. Setting of water troughs and salt troughs are also effective.

#### **(10) Riverside plantation**

This project aims to stabilize riverbanks by zigzag planting of poplars, willows and other suitable species.

### **5.4.2 Program and Project for Livelihood Improvement**

#### **(1) Development of livestock productivity program**

This program is composed by the following projects: breeding improvement project by the conversion from local breed to pure breed variety. Increase of milk production and live weights will be expected by implementation of these projects. The improvement of the quality of milk and meat is promoted at the same time. Especially, the breeding improvement project is expected to contribute to reduction of pressure on natural resources.

#### **(2) Development of agricultural productivity program**

This program includes irrigation improvement, greenhouse promotion, fruits orchard rehabilitation, marketing improvement and fodder production improvement project. These projects will contribute to increase of agricultural income through the improvement productivity, promoting intensive agriculture and crop diversification. In particularly, irrigation development will contribute to natural resource rehabilitation through reducing grazing pressure on rangelands by increasing forage production for winter and stall-feeding, as well as to livelihood improvement through increasing the productivity of crops.

### **(3) Development of diversifying income-generating project**

The diversification of agricultural income and the expansion of the employment opportunities are to be promoted through the apiculture project with the possibility of production increase and increased marketability.

### **(4) Strengthening of support systems project**

Agricultural, livestock and other income generation projects will be supported respectively by provision of adequate agricultural extension services and technical assistance; provision of livestock extension services, technical assistance and veterinary services; and promotion of a small scale mechanization development-assistance.

### **5.4.3 Programs for Human Resource Development**

This program includes strengthening the capacities of both local villagers and MEF staff in terms of awareness creation, capability raising, training and applied research. The respective projects will include: training of engineers, nurserymen, forest guards, hunters and study tour for MC villagers; awareness creation through village meetings, lectures in primary schools and preparation of educational materials; various researches on subjects such as disaster mechanism, evaluation of past soil erosion control, local plant species, rangeland assessment, wildlife inventory, new energy development, eco-tourism potential; field demonstrations on livestock improvement and agricultural production using irrigation, and; technical assistance on soil erosion control, agricultural extension, veterinary service and pasture improvement.

### **5.4.4 Overview of Proposed Programs and Projects**

Proposed programs and projects are summarized below. Since the characteristics and of the respective area of the Coruh River catchment significantly vary in terms of natural conditions, quantity of forest resources, rural infrastructure, living standards of villagers, forms of farming and their abilities for watershed management and assuming cost burdens, these programs/projects are not to be uniformly implemented in all areas of the catchment, but will be selected in relation to the actual situations and needs of the respective area.

Moreover, since the sole effects of the individual programs/projects are not sufficient for realizing the overall goal of the Master Plan, the implementation of packages of programs/projects, where they are mutually combined and related, will be necessary.

## Summary of Proposed Programs and Projects

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### **A. Natural Resources Rehabilitation and Management**

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- A-1 Multipurpose (functional) forest management planning project
  - A-2 National Parks and protected areas management project
  - A-3 Nursery Expansion and Improvement project
  - A-4 Soil conservation project
  - A-5 Afforestation project
  - A-6 Rehabilitation of degraded high forest project
  - A-7 Rehabilitation of degraded coppice forest project
  - A-8 Energy forest plantation project
  - A-9 Rangeland rehabilitation project
  - A-10 Riverside Plantation project
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### **B. Livelihood Improvement**

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- B-1 Development of livestock productivity program
    - 1.1 Breed improvement project
    - 1.2 Transformed grazing system project
    - 1.3 Mechanized hay cutting project
  - B-2 Development of agricultural productivity program
    - 2.1 Irrigation improvement project
    - 2.2 Greenhouse promotion project
    - 2.3 Marketing improvement project
    - 2.4 Fodder production improvement project
    - 2.5 Fruits orchard rehabilitation project
  - B-3 Development of diversifying income generating program
    - 3.1 Apiculture promotion project
  - B-4 Strengthening of support system program
    - 4.1 Small scale mechanization development-assistance project
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### **C. Human Resources Development**

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- C-1 Training program
  - C-2 Awareness creation program
  - C-3 Research program
  - C-4 Demonstration program
  - C-5 Technical assistance program
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## Chapter 6 Micro-Catchment Planning

## CHAPTER 6

### MICRO-CATCHMENT PLANNING

#### 6.1 Concept of Micro-Catchment Planning

In order to achieve the overall planning goal, the strategies established in Chapter 5 must be efficiently enforced within necessary places of the Coruh River catchment with full understanding of its needs and potentials. In regard to the spatial variance of biophysical and socio-economical features which mostly regulate these needs and potentials, the application of uniform strategies for watershed rehabilitation is not sufficient for coping with the various problems within the catchment. Thus, the necessity of attaching ample consideration to implementing the “Right programs in the Right Micro-Catchment” is critical.

To cope with this issue, this Study introduces the concept of Micro-Catchment (MC) planning, which enables the consideration of both micro-scale local conditions and spatial expansion into large areas with diverse characteristics. The process consists of five stages: i) division of the Study Area into MCs; ii) classification of the MCs into groups in accordance to its biophysical and socio-economical features; iii) selection of representative MCs from each groups of MCs; iv) preparation of Micro-Catchment Plans (MC Plans) within the selected MCs, and v) expansion of these MC Plans to the groups of MCs having similar features.

While the basic concept of the Master Plan is formed by a “top-down” approach, the MC Plans also take into account “bottom-up” approaches, in view of reflecting the needs and ideas of local villagers through participatory methods. The MC Plans will be prepared among participatory workshops held in the selected MCs, together with participatory identification of major problems, possible solutions, potentials and the required activities.

On the other hand, while the expansion of MC Plans will effectively cover the whole catchment, it is important to note that these Plans only cover activities at MC levels, and do not examine activities with plural MC scope. Therefore, activities with plural MC scope such as multi-purpose forest management and National Park management are to be examined separately as “Cross-catchment plans”.

#### 6.2 Division into Micro-Catchments

As mentioned in Section 1.4, a “catchment” is the area determined by topographic features within which rainfall will contribute to runoff at a particular point. Based on this common recognition, the 6 Sub-Catchments (SCs) (namely, Upper Coruh SC, Middle Coruh SC, Lower Coruh SC, Berta SC, Oltu SC and Tortum SC) are further divided into many Micro-Catchments (MCs) by delineating the catchment boundaries on a topographic map.

It is important to appreciate that the MCs are recognized and delineated solely on topographic criteria, and that their sizes depend on the geographic features of the Study Area and not on some team-derived criteria. As the result of dividing the six SCs, a total of 63 MCs ranging from 10,000 to 80,000 ha are identified (Table 6.2-1 & Fig. 6.2-1).

**Table 6.2-1 Numbers and Sizes of Micro-Catchments**

Name of SCs	Number of MCs	Area (ha)		
		Average	Max	Min
Upper Coruh SC	17	32,647	60,975	13,629
Middle Coruh SC	10	25,443	36,559	12,483
Lower Coruh SC	7	25,939	44,507	16,543
Berta SC	7	31,393	48,846	13,417
Oltu SC	16	33,976	38,588	29,122
Tortum SC	6	38,367	80,504	19,064
Total	63	-	-	-

**6.3 Classification of Micro-Catchments**

**(1) Classification methodology (Classification criteria)**

As described in Section 6.1, the MCs classified in the same group represent similar features which relates to the various packages of interventions to be implemented. However, this means that the classification of these MCs must be done in accordance to the criteria indicating necessary information to make decisions based on the strategies of the Master Plan. This information is particularly important for “Strategies for policy-A: Natural resources rehabilitation, management and utilization”. Interventions under these strategies need ample consideration among what kind of interventions to be applied where, since the effectiveness of the interventions are strongly controlled by the biophysical and socio-economical conditions of the site. For example, afforestation is meaningless in areas not capable of growing trees, and controlled grazing will be more efficient in areas where overgrazing is prominent.

Interventions based on the “Strategies for policy-B: Livelihood improvement”, however, will emphasize bottom-up demands by the local villagers, since they may compensate for negative economic effects that may be brought by the interventions under “Strategies for policy-A: Natural resources rehabilitation, management and utilization”. Furthermore, interventions under “Strategies for policy-C: Human resources development” will be applied to all MCs, since it is a basic requirement for realizing the Master Plan.

Based on the above understandings, the criteria for the classification of MCs is established based on available quantitative information and in correspondence with the strategies described in Chapter 5. The established criteria are described below.



### **Criterion 1: Forest cover**

*Indicator: The rate of forest area within the MC*

Regarding the degraded conditions of forests and harsh natural conditions that severely limit their natural regeneration, the remaining forest resources should be conserved as much as possible. However, feasibilities of forest conservation must also be considered, as forest conservation in MCs without forests would be less cost/effective than in MCs with more forest coverage. In this context, forest cover is determined as one criterion with the share of forest area in MC as an indicator. “Forest management” and “Management of national parks and protected areas” will be emphasized for the MCs with more forest cover, while for the MCs with less forest coverage, “Rangeland management and rehabilitation” may be planned.

### **Criterion 2: Potential for rehabilitation in relation to reversibility**

*Indicator: soil erosion degree*

The potential and feasibility of rehabilitation, or in other words the reversibility of degradation, can be measured by the degree of soil erosion. This criterion will be used for determining the areas to execute cost effective rehabilitation measures to the maximum content, instead of concentrating efforts on areas where only low chances of rehabilitation can be expected.

Since it is obvious that “prevention is better than cure” regarding soil erosion, vegetative measures including proper rangeland management, pasture improvement and afforestation should be emphasized for the degraded areas considered *reversible*. On the other hand, in the severely eroded areas on steep slopes, where there is little possibility for rehabilitation by vegetative measures alone, low-cost engineering measures may also be necessary to supplement vegetative measures. Therefore, “Rangeland management and rehabilitation” and “Afforestation” will be emphasized for MCs with considerable areas classified as *reversible*, while complementing these measures with physical countermeasures where necessary.

### **Criterion 3: Susceptibility to forest/rangeland degradation by villager activities**

*Indicator: population density*

Susceptibility to forest/rangeland degradation is the third criterion, which indicates the present or probable pressure on forests and rangelands imposed by human interventions. Population density is used as the indicator, as higher the population density, the more pressure on forests and rangeland is likely to take place. For MCs with high population densities, appropriate management of remaining forests and improved rangeland management will be applied to protect these areas from human pressures. However, it must be noted that additional activities for supporting villager livelihood, such as income-generation and establishment of fuel wood plantations should be encouraged in cases where access to conventional resources are restricted by preservation measures.

Yet, even in areas with lower population density, the remaining forests and rangelands are still

exposed to critical degradation. Again, it should be noted that due to harsh natural conditions, it is very difficult to rehabilitate once degraded rangelands, even without grazing pressure. Thus, large areas under rehabilitation will be preferred as a way to prevent further degradation.

## **(2) Classification results**

By applying the chosen criteria, the 63 MCs of the Coruh River catchment are classified into 9 categories. These 9 categories were further consolidated into 6 groups (I to VI), by considering the necessary strategies and programs (Tables 6.3-1 and 6.3-2).

The direction of the programs to be applied to the MCs were selected in relation to the selection of criteria, considering the needs and characteristics of the respective groups. The strategies for livelihood improvement and human resources development are expected to be applied to all of the groups, in regard of their roles in watershed rehabilitation.

It is believed that with the ample understanding of the relations of their socio-economic conditions and the surrounding environment, and with the achievement of better livelihood as an incentive, forest villagers are more likely to manage the surrounding natural resources in better manners, consequently preventing and/or mitigating degradation. In this regard, the basic directions of the programs to be applied to the respective groups of MCs are selected as described below.

## **(3) Spatial distribution of classified Groups I ~ VI**

The spatial distribution of the groups of MCs indicates regional tendencies of the strategies to be implemented. Strategies emphasizing forest management tends to concentrate in the northern side of the Coruh River catchment, while rangeland management and erosion control is to be emphasized in the south. The understanding of this distribution is of great importance at the stage of spreading the implementation of the Master Plan components appropriately and equitably across the whole catchment. (Fig. 6.3-1)

## **6.4 Selection of Model Micro-Catchments**

In the course of MC planning, six “Model MCs” are selected among each group of MCs classified in the previous section. The geographical locations of selected MCs are shown in Figure 6.3-1. In consideration that these Model MCs are the prototypes of watershed rehabilitation in the Coruh River catchment, the following points are taken into consideration.

### **a) Exclusion of MCs without forest villages**

As the Master Plan is fundamentally concerned with sustainable management of natural resources in and around forest villages and improvement of forest villager livelihoods, MCs without forest villages are excluded from the selection.

- b) Clear ownership boundary and no occurrence of use conflicts (=Demarcation)  
As vague ownership boundaries may interfere with projects/programs implementation, priority is put on the MCs in which cadastral survey is finished, in regard of its meaning as a “model” project.
- c) Consideration of candidate priority MCs proposed by Regional Directorates of MEF  
As interests of implementing agencies (MEF, MARA, etc) and the potential for collaborative works are extremely important for the Master Plan to be effectively implemented, the candidate priority MCs proposed by Regional Directorates of MEF are considered in the selection. On the other hand, the intentions and wishes of the other stakeholders are also considered.
- d) Balance of presence among the three Provinces  
The Coruh River catchment covers the three Provinces of Artvin (23 MCs), Erzurum (30 MCs) and Bayburt (10 MCs). Since six Model MCs are to be selected, representation among Provinces in selection (2 “model” MCs in Artvin Province, 3 in Erzurum and 1 in Bayburt) is preferable.
- e) Representativeness within the group of MCs  
Since the *packages of programs* implemented in the Model MCs will eventually be applied within other MCs with similar features, MCs that represent the features of the classified groups of MCs must be selected.
- f) Accessibility to the MCs, especially in relation to accessibility by villagers to model projects for demonstration  
Geographical proximity to the Model MCs from other MCs will be considered in terms of villager knowledge and propagation of activities and techniques introduced by the Master Plan. Thus, the projects are expected to cause ripple effects to other MCs.

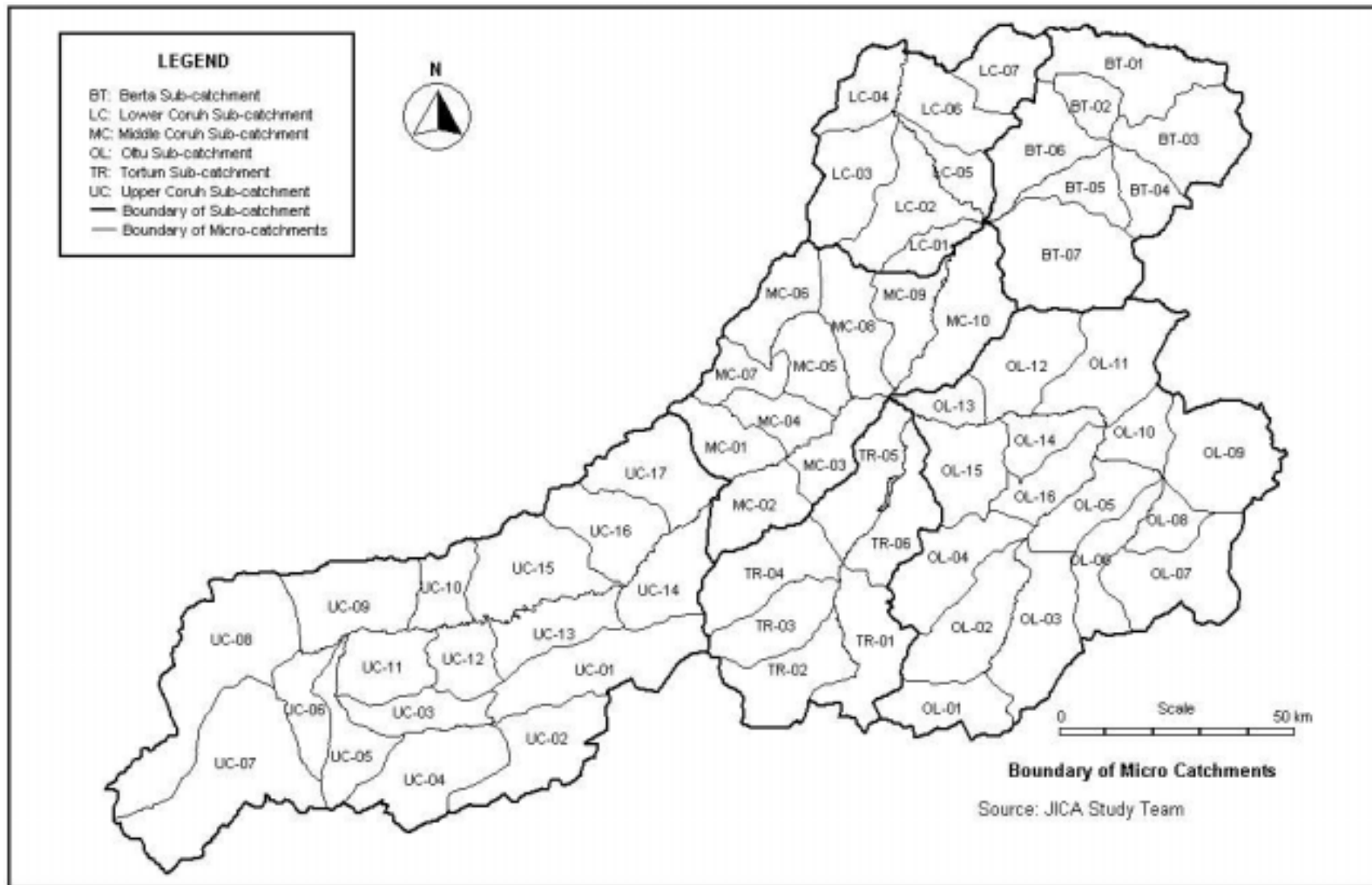


Figure 6.2-1 Micro-Catchments Map

**Table6.3-1 Characterization and Classification of Micro-Catchments**

1. Degree of Forest Degradation (Parameter: the area of the existing forests in MCs)	2. Potential for rehabilitation (Reversibility) (Parameter: erosion class in MCs)	3. Susceptibility to forest/rangeland degradation by villager activities (Parameter: population density in MCs)	Policy A Natural Resource Rehabilitation, Management and Utilization				Policy B Income Improvement	GROUP	PACKAGE OF STRATEGIES
			Multipurpose Forest Management	Management of National Parks, Protected Areas	Rangeland Management and Rehabilitation	Erosion Control			
Forest area >60%	High	/					Group I	[Multipurpose Forest Management] & [Management of National Parks and Protected Areas] & [Income Improvement]	
	Low								
Forest area 30-60%	High		High					Group II	[Multipurpose Forest Management] & [Rangeland Management] & [Afforestation] & [Income Improvement]
			Low						
	Low	High					Group III	[Forest Management] & [Rangeland Management] & [Erosion Control] & [Income Improvement]	
		Low							
Forest area <30%	High	High					Group IV	[Rangeland Management] & [Afforestation] & [Income Improvement]	
		Low					Group V	[Rangeland Management] & <b>【Income Improvement】</b>	
	Low	High					Group VI	[Rangeland Management]& [Erosion Control] & [Income Improvement]	
		Low							

**Table 6.3-2 Classification of Micro-Catchments**

1. Degree of forest degradation		2. Potential for rehabilitation (Reversibility)		3. Susceptibility to forest/rangeland degradation by villagers' activities		Group
Indicator: Forest Cover (%)		Indicator: Erosion Degree 4 (%)		Indicator: Population Density (person/ha)		
<b>Good</b> (forest area >60%)	BT-04, BT-05, BT-07, LC-01, LC-02, LC-03, LC-04, LC-05, LC-06, LC-07	<b>High</b>	BT-04, BT-05, BT-07, LC-01, LC-02, LC-03, LC-04, LC-05, LC-06, LC-07		BT-04, BT-05, <b>BT-07</b> , LC-01, LC-02, LC-03, LC-04, LC-05, LC-06, <b>LC-07</b>	Group
<b>Moderate</b> (forest area 30-60%)	BT-01, BT-02, BT-03, BT-06, MC-01, MC-02, MC-03, MC-04, MC-05, MC-06, MC-07, MC-08, MC-09, MC-10, OL-07, OL-09, OL-11, OL-14, OL-15, TR-04, TR-06, UC-17	<b>High</b>	BT-01, BT-02, BT-03, BT-06, MC-01, MC-03, MC-04, MC-05, MC-06, MC-07, MC-08, MC-09, MC-10, OL-09, OL-14, OL-15, UC-17	<b>High</b>	<b>BT-03</b> , MC-08	Group
				<b>Low</b>	BT-01, BT-02, <b>BT-06</b> , MC-01, <b>MC-03</b> , MC-04, MC-05, MC-06, MC-07, MC-09, MC-10, OL-09, OL-14, <b>OL-15</b> , UC-17	
		<b>Low</b>	MC-02, OL-07, OL-11, TR-04, TR-06	<b>High</b>	TR-04	Group
				<b>Low</b>	<b>MC-02</b> , <b>OL-07</b> , OL-11, <b>TR-06</b>	
<b>Poor</b> (forest area <30%)	OL-01, OL-02, OL-03, OL-04, OL-05, OL-06, OL-08, OL-10, OL-12, OL-13, OL-16, TR-01, TR-02, TR-03, TR-05, UC-01, UC-02, UC-03, UC-04, UC-05, UC-06, UC-07, UC-08, UC-09, UC-10, UC-11, UC-12, UC-13, UC-14, UC-15, UC-16	<b>High</b>	OL-01, OL-05, OL-08, OL-10, OL-13, OL-16, UC-03, UC-04, UC-05, UC-06, UC-07, UC-08, UC-11, UC-12, UC-14, UC-15, UC-16	<b>High</b>	OL-08, OL-10, UC-08, UC-11, <b>UC-14</b>	Group
				<b>Low</b>	OL-01, OL-05, OL-13, OL-16, <b>UC-03</b> , UC-04, UC-05, UC-06, UC-07, UC-12, UC-15, UC-16	
		<b>Low</b>	OL-02, OL-03, OL-04, OL-06, OL-12, TR-01, TR-02, TR-03, TR-05, UC-01, UC-02, UC-09, UC-10, UC-13	<b>High</b>	<b>OL-02</b> , OL-03, <b>OL-04</b> , <b>TR-01</b> , TR-03, <b>TR-05</b> , UC-09, <b>UC-13</b>	Group
				<b>Low</b>	<b>OL-06</b> , <b>OL-12</b> , TR-02, <b>UC-01</b> , UC-02, UC-10	

Note: Requested MCs from Regional MEF are shown in Bold and underlined.

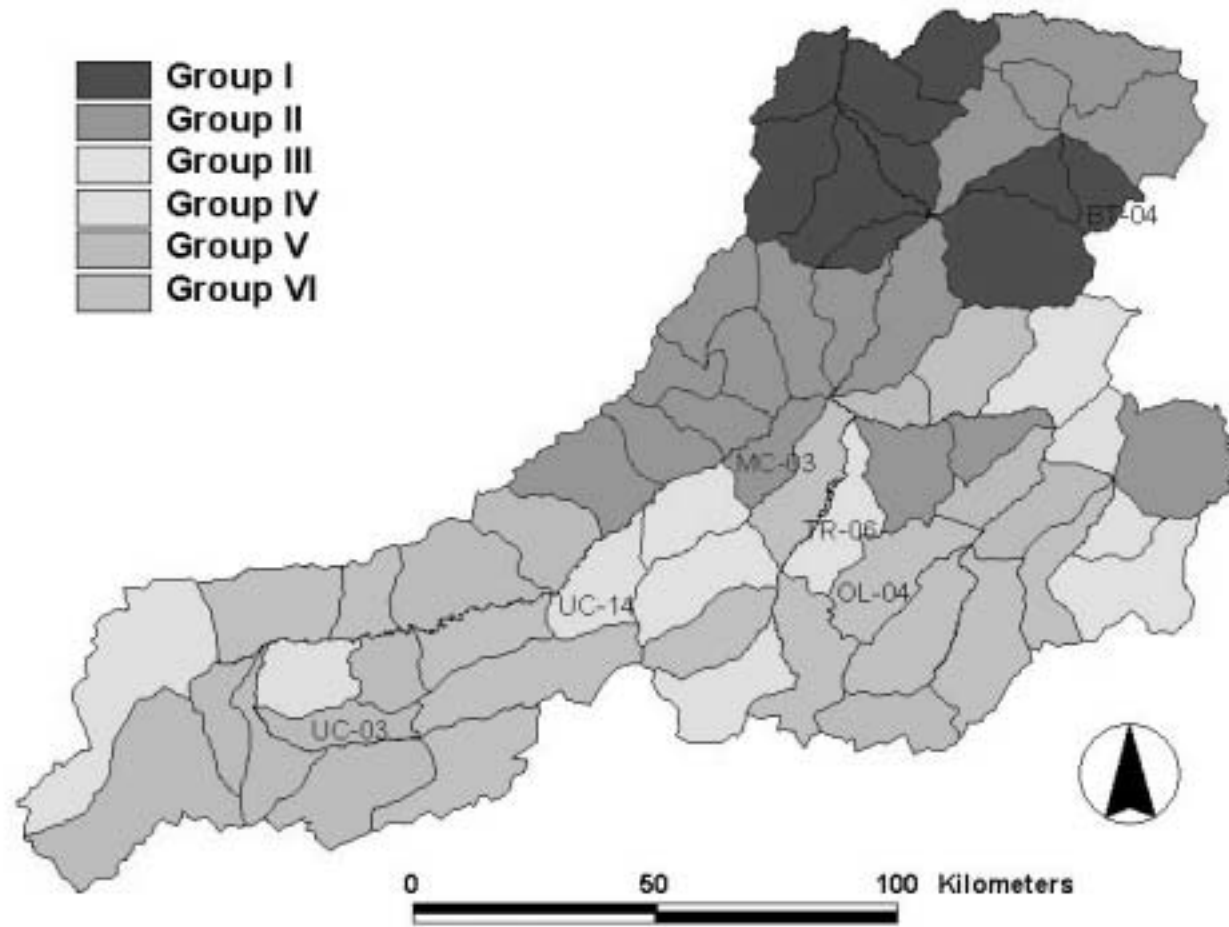


Figure 6.3-1 Location of Selected Micro-Catchments

## **6.5 Formulation of Micro-Catchment Plans**

### **6.5.1 Framework for Planning**

#### **(1) Planning approach**

The 6 Model MCs, which are selected as representatives of 6 groups (Group I ~ VI), are Savsat (BT-04): Group I, Yusufeli (MC-03): Group II, Uzundere (TR-06): Group III, Ispir (UC-14): Group IV, Bayburt (UC-03): Group V and Oltu (OL-04): Group VI. The detailed plans of these Model MCs have been formulated, taking the following three steps: i) socio-economic surveys in the selected forest villages in the MC; 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 potentials and the required improvement activities. The project area of the proposed activities for rehabilitation of local natural resources and village development have been determined, based on mainly Forest Management Map, prioritized planning area of MEF regional office, experts' judgment from field reconnaissance and suggestions from forest villagers in participatory workshops.

MC Plans formulated in the process are composed of the following three subjects, i) Natural resource rehabilitation and management; ii) Livelihood improvement and; iii) Human resource development.

#### **i) Natural resource rehabilitation and management**

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, on a sustainable basis, with particular attention to meeting the needs of local populations.

#### **ii) Livelihood improvement**

Improvement of agricultural practices, production and income.

Diversification of other income generation activities.

Improvement of livestock activities, production and income.

Combining livestock development, forage production and sustainable pasture management.

#### **iii) Human resources development**

Strengthening the capacities of the stakeholders to understand the linkages relating sustainable natural resource management to villager livelihoods, and implementation of effective village-level activities which simultaneously improve both. Projects of human resource development are suggested in the section 6.7.

However, considering that MEF is the main government agency concerned in the implementation of the proposed activities, activities concerning improvement and construction of roads, and provision of drinking water systems and riverside reinforcements are excluded from the MC Plan.



## **(2) Evaluation approach**

Project evaluation is to assess the investment efficiency of a given project. Tangible costs and benefits from the project are taken into consideration for the calculation of efficiency. Natural resource rehabilitation and management, one of the main activities of micro-catchment planning, would intangibly, yet inevitably, affect the benefits through its impact on prevention of soil erosion, forest conservation, and rehabilitation of overgrazed pasture and deforested areas. However, the intangible effects are not considered in the present evaluation.

The project costs and benefits in MCs used as the tangible costs and benefits are as follows:

- a. Project costs:       Costs for natural resources management  
                              Costs for livelihood improvement  
                              Costs for human resources development.
- b. Project benefits:   Increase of Income from livelihood improvement:
  - Increase in crops production
  - Increase in livestock production
  - Increase in honey production.

### **6.5.2 Savsat Micro-Catchment (BT-04): Group I**

#### **(1) Features of the MC**

The Savsat Micro-Catchment (MC), representing the MCs classified in Group I, 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 are 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 36% transitional woodland and scrub, 30% rangelands, 26% forests and 7% arable land.

The MC has 15 forest villages, with a total population of 3,509. 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.

#### **(2) Problems, constraints and opportunities**

##### **Natural resources rehabilitation and management**

**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.	<ul style="list-style-type: none"> <li>• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites.</li> <li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests.</li> <li>• Provision of coal at suitable prices.</li> <li>• Assistance in testing/development of other energy sources, such as bio-energy, solar energy.</li> </ul>

**Constraints 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.

**Current strategies and contributions of the government agencies:**

- Forest villagers in the MC are permitted to collect fuel wood 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.

## **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
<b>Livestock</b> 1. Low productivity of meat and milk 2. Inadequate marketing of livestock products 3. Insufficient credit support for livestock 4. Lack of veterinary services	<ul style="list-style-type: none"><li>• Rangeland rehabilitation</li><li>• Introduction of exotic breeds</li><li>• Provision of veterinary services</li><li>• Quality improvement</li><li>• Modernization of dairy industry</li><li>• Provision of credit</li><li>• Provision of periodic veterinary services</li></ul>
<b>Crop production</b> 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	<ul style="list-style-type: none"><li>• Irrigation development (rehabilitation and improvement of existing canal, construction of new irrigation system)</li><li>• Provision of adequate extension services</li><li>• Quality improvement</li><li>• Advertising</li><li>• Research and development (soil analysis)</li><li>• High value crop production (cherry, apple, pear, etc.)</li><li>• Provision of credit</li></ul>

### **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

### **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)

### **(3) Proposed activities for natural resource rehabilitation and livelihood improvement**

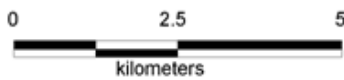
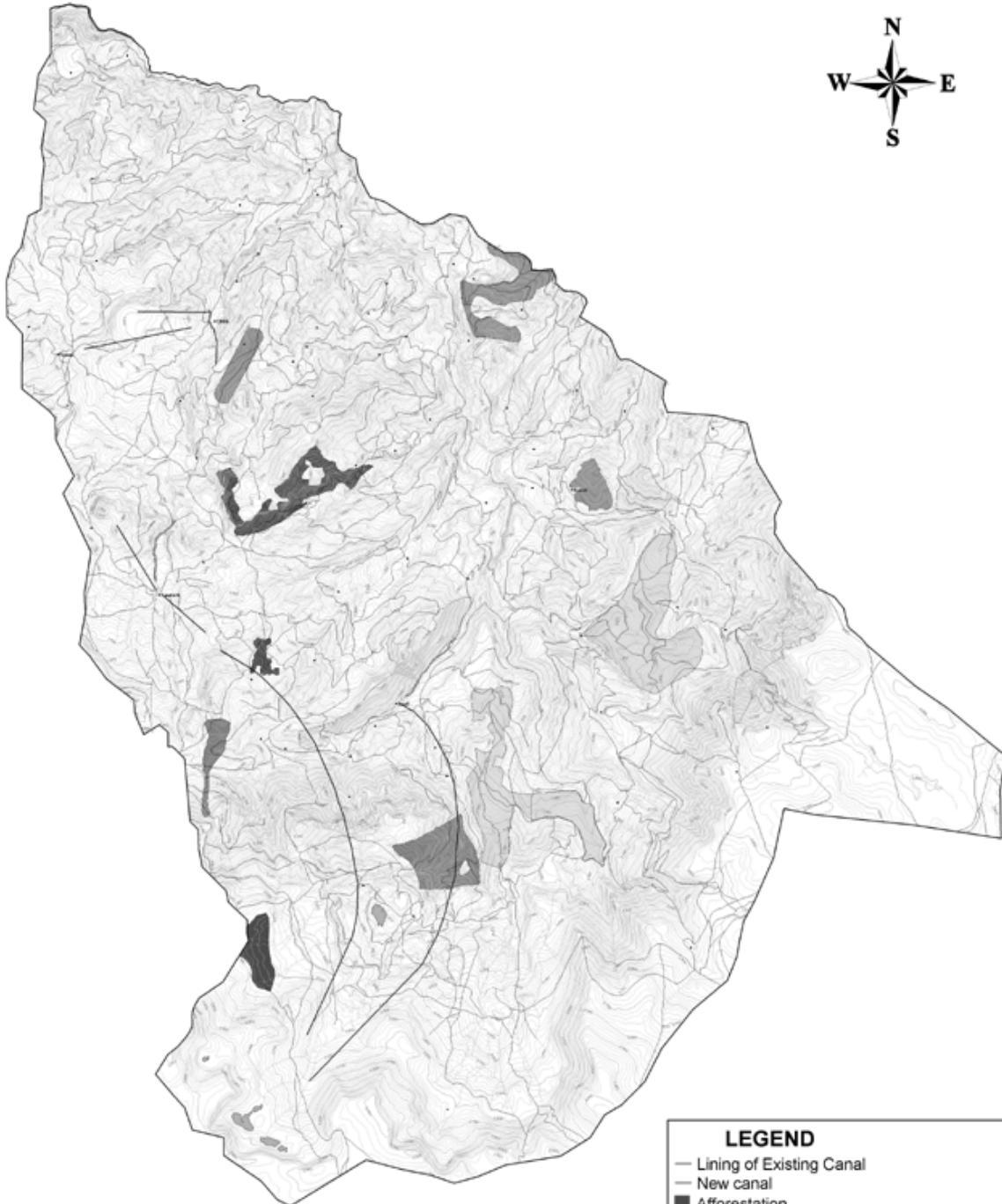
The activities are proposed based on the problems, constraints and opportunities in relation to natural resource rehabilitation and management, and livelihood improvement in the MC. The key activities for natural resource rehabilitation and management are energy forest plantation

and afforestation, while the key activities for livelihood improvement are irrigation improvement, marketing improvement, agricultural mechanization, apiculture and irrigated fodder production. The total cost of input necessary for these activities is TL. 5,743 billion.

The total period of the project will be six years which will be divided in to the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning rehabilitation of degraded coppice forest, energy forest plantation and rangeland rehabilitation will be emphasized as priority during the implementation stage. Similarly, activities concerning improvement of irrigation, livestock, fodder production and agricultural mechanization will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)					
<b>1. Natural Resource Rehabilitation and Management (Area of MC: 19,203 ha)</b>							
1. Afforestation	246 ha		415				
2. Rehabilitation of Degraded Coppice Forest	505 ha		296				
3. Energy Forest Plantation	653 ha		1,101				
4. Rangeland Rehabilitation	498 ha		217				
5. Riverside Plantations	(1.5 ha)		9				
<b>Sub-total cost</b>			<b>2,038</b>				
<b>2. Livelihood Improvement (No. of forest villages: 15)</b>							
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 <sup>2</sup>		840				
<b>Sub-total cost</b>			<b>3,829</b>				
<b>Total Cost</b>			<b>5,867</b>				
ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Afforestation				■			
2. Rehabilitation of degraded coppice forest	●		■	■			
3. Energy forest plantation	●		■	■			
4. Rangeland rehabilitation	●		■	■	■	■	■
5. Riverside plantations					■		
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	■
2. Livestock	●		■	■	■	■	■
3. Fodder production	●		■	■	■	■	■
4. Fruit orchard rehabilitation			■				
5. Agricultural mechanization	●			■	■		
6. Apiculture				■	■		
7. Marketing improvement					■	■	■

# PLANNING MAP - (BT-04)



SOURCE: JICA Study Team

LEGEND	
—	Lining of Existing Canal
—	New canal
■	Afforestation
■	Completed
■	Energy Forest Plantation
■	Rangeland Rehabilitation
■	Rehabilitation of Degraded Coppice Forest
■	Riverside Plantation

#### **(4) Project Evaluation**

The project benefits in MC BT-04 are calculated from livelihood improvement activities: namely, crop production, livestock and apiculture. The benefit derived from crop production is the increase in production of wheat, fodder crops (alfalfa), vegetables and fruits. The benefit derived from livestock production is increase in cattle sale (steers, cull cows) and milk production. Apiculture will bare benefit through increased honey production. Net benefits are expected to be derived from the fifth year. The value of the net benefits may largely fluctuate until the eighth year but will stabilize from the ninth. The Internal Rate of Return (IRR) calculated from livelihood improvement projects is 11.5% and is judged to be economically valid.

#### **6.5.3 Yusufeli Micro-Catchment (MC-03): Group II**

##### **(1) Features of the MC**

The Yusufeli Micro-Catchment (MC), representing Group II, 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% forests, 21% rangelands and 18% arable land.

The MC has 3 forest villages and 1 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).

##### **(2) Problems, constraints and opportunities**

###### **Natural resources rehabilitation and management**

###### **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.	<ul style="list-style-type: none"> <li>• Soil conservation measures on degraded area.</li> </ul>
3. Illicit cuttings and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	<ul style="list-style-type: none"> <li>• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites.</li> <li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests.</li> <li>• Provision of coal at suitable prices.</li> <li>• Assistance in testing/development of other energy sources, such as bio-energy, solar energy.</li> </ul>
5. Degradation, low productivity, under-utilization of range resources.	<ul style="list-style-type: none"> <li>• Range improvement measures (e.g. water troughs, re-seeding, fertilization).</li> <li>• Development of forage production on suitable lands.</li> <li>• Supporting/development of stall-feeding.</li> </ul>

**Constraints 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.

**Current strategies and contributions of the government agencies:**

- Forest villagers in the MC are permitted to collect fuel wood 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.

### **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	<ul style="list-style-type: none"> <li>• Dairy processing plant</li> <li>• Cooperative establishment</li> <li>• Cattle breeding through artificial insemination</li> <li>• Fodder crop production increase</li> <li>• Pasture improvement (water troughs, re-seeding, fertilizer application, and controlled grazing)</li> <li>• Provision of veterinary service</li> </ul>
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	<ul style="list-style-type: none"> <li>• Rehabilitation of existing irrigation system</li> <li>• Irrigation supply</li> <li>• Provision of agricultural extension</li> <li>• Provision of agricultural extension</li> <li>• Provision of agricultural extension and credit</li> <li>• Provision of credit</li> </ul>
	Other activities to increase incomes, subject to proven economic feasibility <ul style="list-style-type: none"> <li>• Bee keeping</li> <li>• Handicrafts (Kilims and carpet weaving)</li> </ul>

#### **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



### 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)

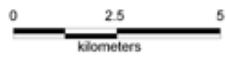
### (3) Proposed activities for natural resource rehabilitation and livelihood improvement

The activities are proposed based on the problems, constraints and opportunities in relation to natural resource rehabilitation and management, and livelihood improvement in the MC. The key activities for natural resource rehabilitation and management are soil conservation and rehabilitation of degraded high forest, while the key activities for livelihood improvement are irrigation improvement, livestock improvement, apiculture and irrigated fodder production. The total cost of input necessary for these activities is TL. 2,439 billion.

The total period of the project will be six years which will be divided in to the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning soil conservation, rehabilitation of degraded high forest, and rangeland rehabilitation will be emphasized as priority during the implementation stage. Similarly, activities concerning improvement of irrigation, livestock and fodder production will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)					
<b>1. Natural Resources Rehabilitation and Management (Area of MC: 22,643 ha)</b>							
1. Soil Conservation	921 ha	704					
2. Rehabilitation of Degraded High Forest	929 ha	342					
3. Rangeland Rehabilitation	437 ha	192					
<b>Sub-total cost</b>		<b>1,238</b>					
<b>2. Livelihood Improvement (No. of forest villages: 3)</b>							
1. Irrigation Improvement	Pond: V=1,200m <sup>3</sup> 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					
<b>Sub-total cost</b>		<b>1,261</b>					
<b>Total Cost</b>		<b>2,499</b>					
ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Soil conservation	●		■	■	■	■	
2. Rehabilitation of degraded high forest	●		■	■	■	■	
3. Rangeland rehabilitation	●		■	■	■	■	■
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	
2. Livestock	●		■	■	■	■	
3. Fodder production	●		■	■	■	■	
4. Fruit orchard rehabilitation				■	■		
5. Apiculture				■	■	■	■

**PLANNING MAP - (MC-03)**



SOURCE: JICA Study Team

**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

#### **(4) Project Evaluation**

For the results of the project evaluation, the IRR shows 11.6%. This figure indicates the validity of this project. The relatively high IRR is due to the high benefit derived from livestock production which is improved by increasing fodder crop production and conversion of local breed to pure breed. Moreover, the MC differs from the other MCs as it is capable of rice production. Installation/maintenance of irrigation facilities will contribute for bearing benefit through rice production increase.

#### **6.5.4 Uzundere Micro-Catchment (TR-06): Group III**

##### **(1) Features of the MC**

The Uzundere Micro-Catchment (MC), representing Group III, 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% rangelands, 19% arable land, 28% forests and 3% transitional woodland and scrub.

The MC has 5 forest 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 of greenhouses (133) and intensive vegetable production.

##### **(2) Problems, constraints and opportunities**

###### **Natural resources rehabilitation and management**

###### **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.	<ul style="list-style-type: none"><li>• Soil conservation measures on degraded area.</li></ul>

<p>3. Illicit cutting and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.</p>	<ul style="list-style-type: none"> <li>• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites.</li> <li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests.</li> <li>• Provision of coal at suitable prices.</li> <li>• Assistance in testing/development of other energy sources, such as bio-energy, solar energy.</li> </ul>
<p>5. Degradation, low productivity, under-utilization of range resources.</p>	<ul style="list-style-type: none"> <li>• Range improvement measures (e.g. water troughs, re-seeding, fertilization).</li> <li>• Development of forage production on suitable lands.</li> <li>• Supporting/development of stall-feeding.</li> </ul>

**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 streambeds.
- 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.

**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 fuel wood 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.

### **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	<ul style="list-style-type: none"> <li>• Cattle breeding</li> <li>• Forage production increase through irrigation</li> </ul>
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	<ul style="list-style-type: none"> <li>• Lining of earth canal portion and construction of new irrigation canal</li> <li>• Irrigation</li> <li>• Rehabilitation of orchards (new planting)</li> <li>• Diversified agricultural activities including various fruit trees (cherry, sour cherry, walnut, almond)</li> <li>• Improved marketing with cold storage facilities</li> </ul>

#### **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

#### **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)

### **(3) Proposed activities for natural resource rehabilitation and livelihood improvement**

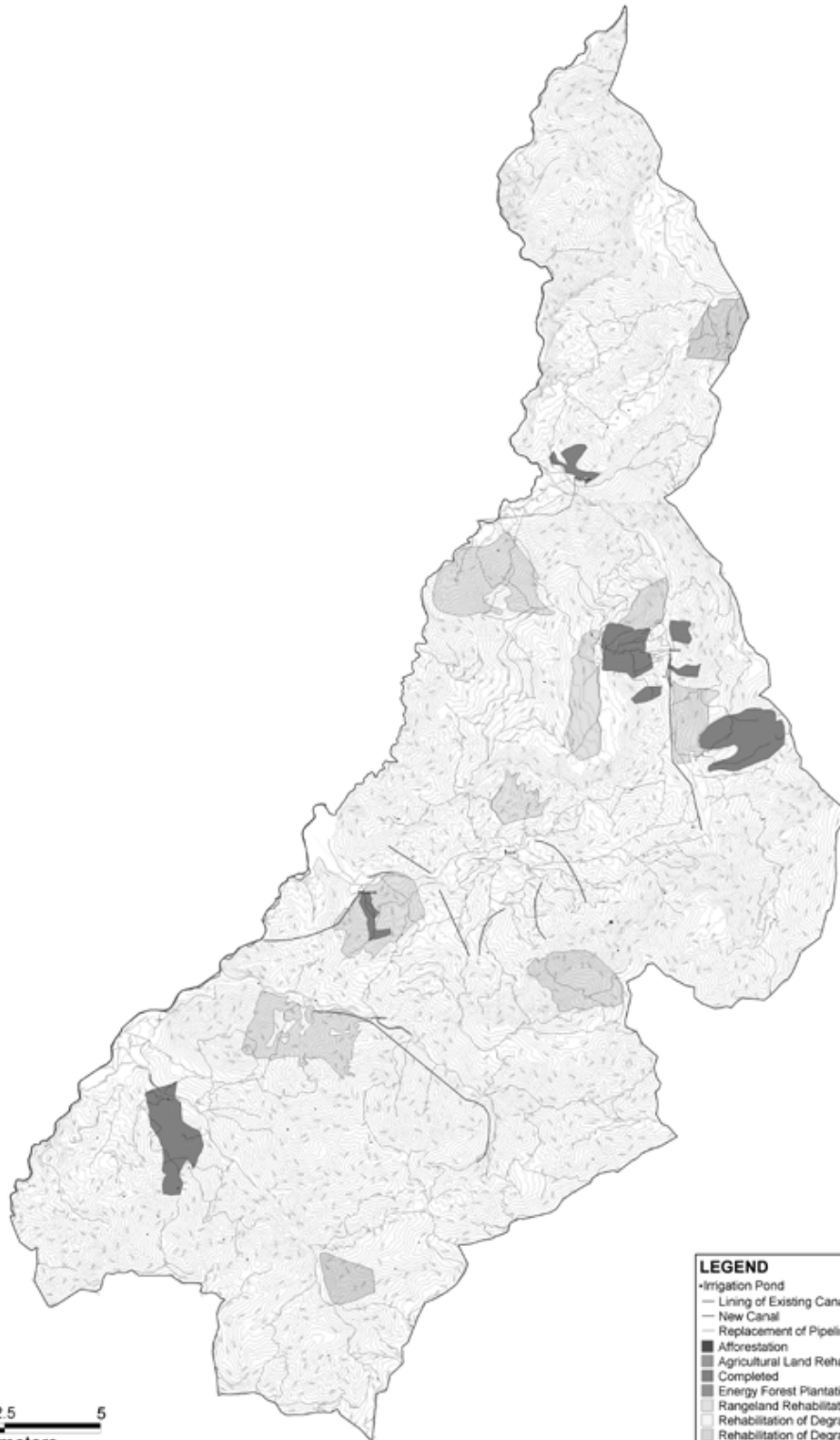
The activities are proposed based on the problems, constraints and opportunities in relation to

natural resource rehabilitation and management, and livelihood improvement in the MC. The key activity for natural resource rehabilitation and management is soil conservation. On the other hand, the key activities for livelihood improvement are irrigation improvement, greenhouse construction, marketing improvement, livestock improvement and irrigated fodder production. The total cost of input necessary for these activities is TL. 3,260 billion.

The total period of the project will be six years which will be divided in to the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning soil conservation, rehabilitation of degraded high forest and rangeland rehabilitation will be emphasized as priority during the implementation stage. Similarly, activities concerning improvement of irrigation, livestock and fodder production will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)					
<b>1. Natural Resource Rehabilitation and Management (Area of MC: 31,240 ha)</b>							
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					
<b>Sub-total cost</b>		<b>1,528</b>					
<b>2. Livelihood Improvement (No. of forest villages: 5)</b>							
1. Irrigation Improvement	Rehabilitation of canal: L=26,400 m Pipeline:L=3,600 m, Pond: V= 800 m <sup>3</sup>	443					
2. Greenhouse Construction	A= 46,500 m <sup>2</sup> (93 units)	1302					
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 <sup>2</sup>	300					
<b>Sub-total cost</b>		<b>2,790</b>					
<b>Total Cost</b>		<b>4,318</b>					
ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Soil conservation	●		■	■	■	■	■
2. Rehabilitation of degraded high forest	●		■	■	■	■	■
3. Rangeland improvement	●		■	■	■	■	■
4. Riverside plantations				■			
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	■
2. Greenhouse			■	■	■	■	■
3. Livestock	●		■	■	■	■	■
4. Fodder production	●		■	■	■	■	■
5. Fruit orchard rehabilitation				■	■	■	■
6. Marketing improvement				■	■	■	■

**PLANNING MAP - (TR-06)**



**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

#### **(4) Project Evaluation**

For the results of the project evaluation, the IRR shows 7.1%. This figure indicates the validity of this project. Promotion of crops such as cucumbers and tomatoes contribute to this relatively high IRR. Moreover, the realization of intensive agriculture with the use of irrigation and greenhouse is particularly effective.

#### **6.5.5 Ispir Micro-Catchment (UC-14): Group IV**

##### **(1) Features of the MC**

The Ispir Micro-Catchment (MC), representing Group IV, 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, and 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% rangelands, 22% arable land, 16% forests and 8% transitional woodland and scrub.

The MC has 8 forest villages and 16 normal 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.

##### **(2) Problems, constraints and opportunities**

###### **Natural resources rehabilitation and management**

###### **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.	<ul style="list-style-type: none"><li>• Soil conservation measures on degraded area.</li><li>• Riverbed rehabilitation (civil engineering measures), riverbank reinforcement (civil engineering structures, gallery plantation).</li></ul>
3. Illicit cuttings and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	<ul style="list-style-type: none"><li>• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites.</li></ul>



	<ul style="list-style-type: none"> <li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests.</li> <li>• Provision of coal at suitable prices.</li> </ul> <p>Assistance in testing/development of other energy sources, such as bio-energy, solar energy.</p>
5. Degradation, low productivity, under-utilization of range resources.	<ul style="list-style-type: none"> <li>• Range improvement measures (e.g. water troughs, re-seeding, fertilization).</li> <li>• Development of forage production on suitable lands.</li> <li>• Supporting/development of stall-feeding.</li> </ul>

**Constraints 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.

**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 fuel wood 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.

### **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
<b>Livestock</b> 1. Low productivity 2. No shepherds	<ul style="list-style-type: none"> <li>• Cattle breeding</li> <li>• Forage production increase through irrigation</li> </ul>
<b>Crop production</b> 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	<ul style="list-style-type: none"> <li>• Lining of earth canal portion and construction of new irrigation canal</li> <li>• Diversified agricultural activities including apiculture, aquaculture, fruit production, etc.</li> <li>• Terracing</li> <li>• Diversification of activities</li> <li>• Provision of agricultural extension</li> </ul>

#### **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

#### **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)

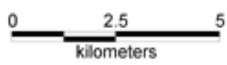
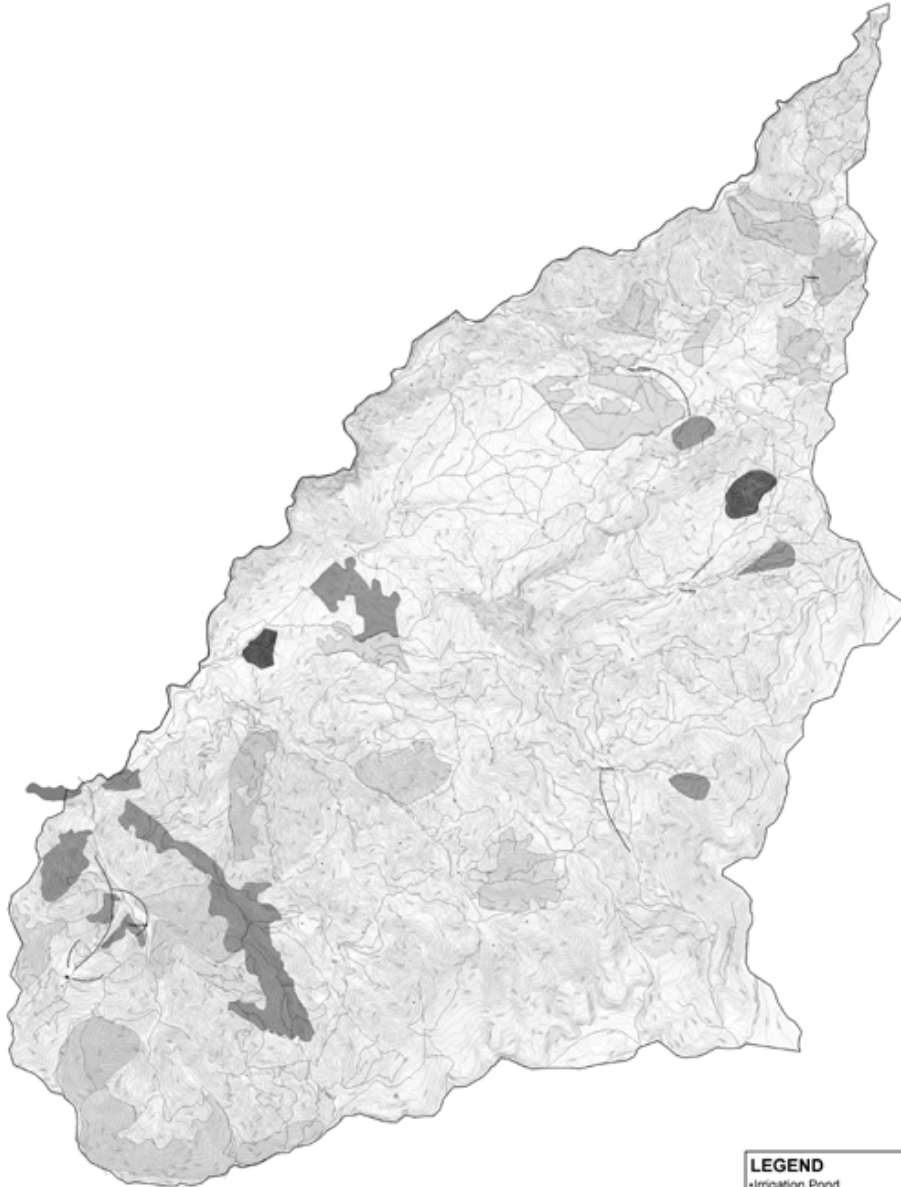
### **(3) Proposed activities for natural resource rehabilitation and livelihood improvement**

The activities are proposed based on the problems, constraints and opportunities in relation to natural resource rehabilitation and management, and livelihood improvement in the MC. The key activities for natural resource rehabilitation and management are energy forest plantation, soil conservation, and rangeland rehabilitation, while the key activities for livelihood improvement are livestock improvement, irrigation improvement, apiculture and agricultural mechanization. The total cost of input necessary for these activities is TL. 5,946 billion.

The total period of the project will be six years which will be divided in to the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning soil conservation, rehabilitation of degraded high forest, energy forest plantation and rangeland rehabilitation will be emphasized as priority during the implementation stage. Similarly, activities concerning improvement of irrigation, livestock and fodder production will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY OF INPUTS	COST OF INPUTS (Billion TL)					
<b>1. Rehabilitation and Management of the Natural Resources (Area of MC: 31,934 ha)</b>							
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					
<b>Sub-total cost</b>		<b>3,877</b>					
<b>2. Livelihood Improvement (No. of forest villages: 8)</b>							
1. Irrigation Improvement	Pond :V=800m <sup>3</sup> 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	240					
6. Apiculture	69 units	28					
<b>Sub-total cost</b>		<b>2,089</b>					
<b>Total Cost</b>		<b>5,966</b>					
ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Soil conservation	●		■	■	■	■	■
2. Afforestation	●		■				
3. Rehabilitation of degraded high forest				■	■		
4. Rehabilitation of degraded coppice forest				■	■		
5. Energy forest plantation	●		■	■			
6. Rangeland improvement	●		■	■	■	■	■
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	■
2. Livestock	●		■	■	■	■	■
3. Fodder production	●		■	■	■	■	■
4. Fruit orchard rehabilitation				■	■		
5. Agricultural mechanization					■	■	
6. Apiculture				■	■	■	■

**PLANNING MAP - (UC-14)**



SOURCE: JICA Study Team

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

#### **(4) Project Evaluation**

For the results of the project evaluation, the IRR shows 15.5%. This figure indicates the validity of this project. Livestock improvement projects particularly contribute to the benefit in this MC. Although the initial investment for livestock in this MC is higher than the other MCs, livestock production is expected to stably bare large benefits from the sixth year.

#### **6.5.6 Bayburt Micro-Catchment (UC-03): Group V**

##### **(1) Features of the MC**

The Bayburt MC, representing Group V, covers about 21,758 hectares due east of the main administrative center 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% rangelands, 11% arable land and 6% each of forest, and transitional forest and scrub.

The MC has 5 forest villages and 1 normal village, with a total population of about 3,204. Five forest villages 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 milk.

##### **(2) Problems, constraints and opportunities**

###### **Natural resources rehabilitation and management**

###### **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	<ul style="list-style-type: none"> <li>• Soil conservation measures on degraded areas</li> </ul>
3. Illicit cutting and degradation of forests 4. High costs and inadequate knowledge of alternative energy sources	<ul style="list-style-type: none"> <li>• Improvement and reforestation of degraded forests, and establishment of village energy forests on suitable sites</li> <li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests</li> <li>• Encouragement of natural regeneration</li> <li>• Provision of coal at suitable prices</li> <li>• Assistance in development of other energy sources, such as bio-energy and solar energy</li> </ul>
5. Degradation, low productivity and poor utilization of range resources	<ul style="list-style-type: none"> <li>• Range improvement measures (water troughs, re-seeding, fertilization)</li> <li>• Development of forage production on suitable lands, and supporting the development of stall-feeding.</li> </ul>

#### 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 afforestation

#### 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 fuel wood 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

### **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
Livestock 1. Expensive feed 2. Low productivity 3. Insufficient number of animals 4. No shepherds	<ul style="list-style-type: none"> <li>• Forage production increase through irrigation</li> <li>• Forage production increase</li> <li>• Provision of ORKOY credit</li> </ul>
Crop production 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	<ul style="list-style-type: none"> <li>• Construction of new irrigation canal with ponds</li> <li>• Irrigation development</li> <li>• Diversification of activities (bee keeping)</li> <li>• Provision of agricultural extension</li> <li>• Cooperative development</li> </ul>

#### **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

#### **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)

### **(3) Proposed activities for natural resource rehabilitation and livelihood improvement**

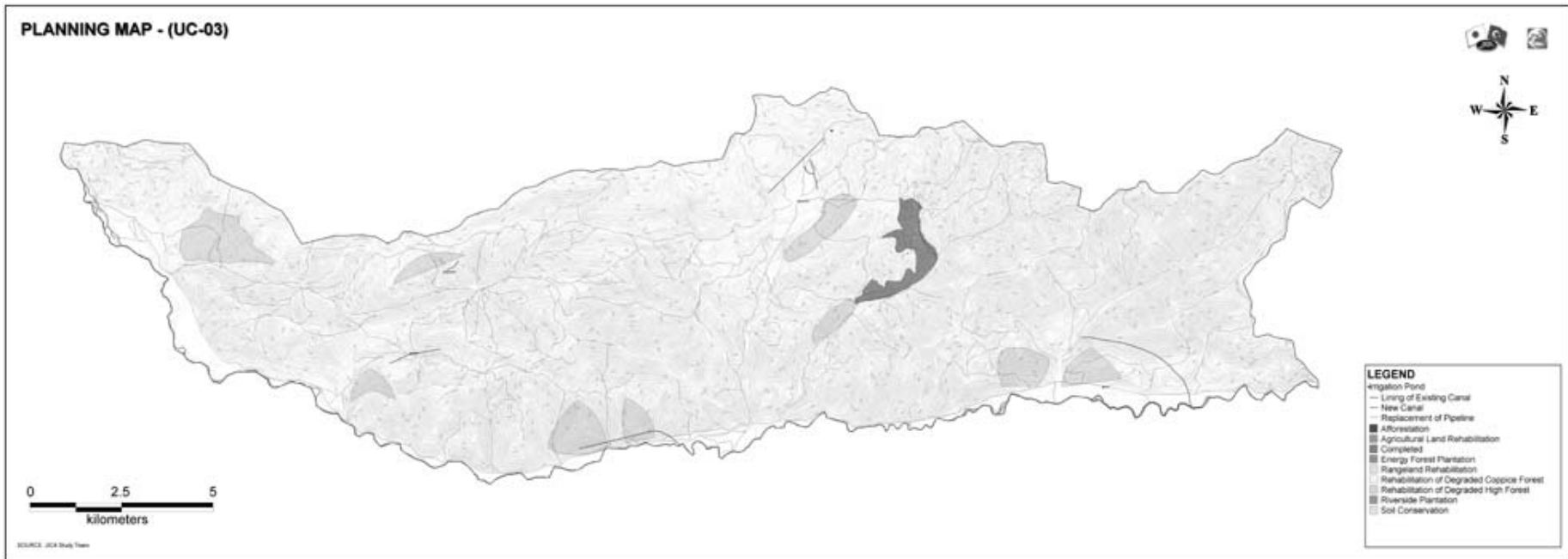
The activities are proposed based on the problems, constraints and opportunities in relation to natural resource rehabilitation and management, and livelihood improvement in the MC. The key activities for natural resource rehabilitation and management is soil conservation. On the

other hand, the key activities for livelihood improvement are agricultural mechanization, irrigation improvement and irrigated fodder production. The total cost of input necessary for these activities is TL. 1,755 billion.

The total period of the project will be six years which will be divided in to the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning soil conservation will be emphasized as the priority during the implementation stage. Similarly, activities concerning improvement of irrigation, livestock and fodder production will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)					
<b>1. Natural Resources Rehabilitation and Management (Area of MC: 21,758 ha)</b>							
1. Soil Conservation	1,055 ha	1036					
2. Riverside Plantations	1.6 ha	10					
<b>Sub-total cost</b>		<b>1,046</b>					
<b>2. Livelihood Improvement (No. of forest villages: 5)</b>							
1. Irrigation Improvement	Rehabilitation of canal: L=8,800m Pond: V=600m <sup>3</sup>	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					
<b>Sub-total cost</b>		<b>733</b>					
<b>Total Cost</b>		<b>1,779</b>					
ACTIVITY	PRIORITY	PROJECT YEAR 1	PROJECT YEAR 2	PROJECT YEAR 3	PROJECT YEAR 4	PROJECT YEAR 5	PROJECT YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Soil conservation	●		■	■	■	■	■
2. Riverside plantations			■				
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	■
2. Livestock	●		■	■	■	■	■
3. Fodder production	●		■	■	■	■	■
4. Fruit orchard rehabilitation			■				
5. Agricultural mechanization				■	■	■	■
6. Apiculture				■	■	■	■





#### **(4) Project Evaluation**

For the results of the project evaluation, the IRR shows 9.8%. This figure indicates the validity of this project. The relatively high IRR is due to the high benefit derived from livestock production which is improved by increasing fodder crop production and conversion of local breed to pure breed.

#### **6.5.7 Oltu Micro-Catchment (OL-04): Group VI**

##### **(1) Features of the MC**

The Oltu Micro-Catchment (MC), representing Group VI, 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 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% rangelands, 21% arable land, 16% forests and 8% transitional woodland and scrub.

The MC has 14 forest villages and 2 normal 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 TL 5,500 million (US\$ 3,700), derived from pensions, livestock, field crops and vegetables in order of importance.

##### **(2) Problems, constraints and opportunities**

###### **Natural resources rehabilitation and management**

###### **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.	<ul style="list-style-type: none"><li>• Soil conservation measures on degraded area.</li><li>• Riverbed rehabilitation (civil engineering measures), river bank rehabilitation (civil engineering structures, gallery plantations).</li></ul>
3. Illicit cutting and degradation of forests. 4. High costs and inadequate knowledge of alternative energy sources.	<ul style="list-style-type: none"><li>• Improvement and reforestation of degraded forests, establishment of village energy forests on suitable sites.</li><li>• Provision of fuel wood needs of local people to the extent possible, within the capacity of forests.</li></ul>

	<ul style="list-style-type: none"> <li>• Provision of coal at suitable prices.</li> <li>• Assistance in testing/development of other energy sources, such as bio-energy, solar energy.</li> </ul>
5. Degradation, low productivity, under-utilization of range resources.	<ul style="list-style-type: none"> <li>• Range improvement measures (e.g. water troughs, re-seeding, fertilization).</li> <li>• Development of forage production on suitable lands.</li> <li>• Supporting/development of stall-feeding.</li> </ul>

**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

**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 fuel wood 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

**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
Livestock 1. Low productivity 2. No water troughs and shelters in rangeland 3. Lack of veterinary services 4. Insufficient credit for livestock	<ul style="list-style-type: none"> <li>Increase forage production through irrigation</li> <li>Construct water troughs and shelters</li> <li>Provide veterinary services</li> <li>Provide increased ORKOY credit</li> </ul>
Crop production 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	<ul style="list-style-type: none"> <li>Lining of earth canal, and construction of new canals</li> <li>Irrigation expansion</li> <li>Protection of riverbank to protect arable land</li> <li>Rehabilitation of agricultural lands</li> <li>Introduction of high value crops like strawberries</li> <li>Provide agro-machinery</li> <li>Provide agricultural extension services</li> <li>Construct processing factories such as potato chips, fruit juice etc</li> </ul>

**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

**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)

**(3) Proposed activities for natural resource rehabilitation and livelihood improvement**

The activities are proposed based on the problems, constraints and opportunities in relation to natural resource rehabilitation and management, and livelihood improvement in the MC. The key activities for natural resources rehabilitation and management are soil conservation, rangeland rehabilitation and energy forest plantation. On the other hand, the key activity for livelihood improvement is irrigation improvement, aiming at the improvement of productivity and diversification of agricultural practices. The total cost of input necessary for these activities is TL. 8,266 billion.

The total period of the project will be six years which will be divided into the preparatory stage and the implementation stage. During the preparatory stage, detailed design, dialogue with villagers, institutional arrangements will be done. For the natural resources rehabilitation and management, activities concerning soil conservation and rangeland rehabilitation will be emphasized as priority during the implementation stage.

Similarly, activities concerning improvement of irrigation, livestock, fodder production and agricultural land rehabilitation will be the priority for the livelihood improvement.

ACTIVITY	QUANTITY	COST OF INPUTS (Billion TL.)					
<b>1. Natural Resources Rehabilitation and Management (Area of MC: 38,603 ha)</b>							
1. Soil Conservation	2,101 ha	2,583					
2. Afforestation	243 ha	409					
3. Energy Forest Plantation	1073 ha	1810					
4. Rangeland Rehabilitation	5,091 ha	1820					
5. Riverside Plantations	1.2 ha	8					
<b>Sub-total cost</b>		<b>6,630</b>					
<b>2. Livelihood Improvement (No. of forest villages: 14)</b>							
1. Irrigation Improvement	Rehabilitation of canal: L=65,800 m, Pond: V=1,680 m <sup>3</sup>	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					
<b>Sub-total cost</b>		<b>1,655</b>					
<b>Total Cost</b>		<b>8,285</b>					
ACTIVITY	PRIORITY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6
<b>Project Preparation</b>							
1. Detailed design		■					
2. Dialogue with villagers		■					
3. Institutional arrangement		■					
<b>Natural Resources</b>							
1. Soil conservation	●		■	■	■	■	■
2. Afforestation	●		■	■	■	■	■
3. Energy forest plantation	●		■	■	■	■	■
4. Rangeland improvement	●		■	■	■	■	■
5. Riverside plantation	●		■	■	■	■	■
6. Riverbank reinforcement	●		■	■	■	■	■
<b>Livelihood Improvement</b>							
1. Irrigation	●		■	■	■	■	■
2. Agricultural land rehabilitation	●		■	■	■	■	■
3. Livestock	●		■	■	■	■	■
4. Fodder production	●		■	■	■	■	■
5. Fruit orchard rehabilitation				■	■	■	■
6. Apiculture				■	■	■	■

