TURKEY
ANATOLIA WATERSHED REHABILITATION PROJECT

REGIONAL ENVIRONMENTAL ASSESSMENT AND ENVIRONMENTAL MANAGEMENT FRAMEWORK

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27 January 2003

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REGIONAL ENVIRONMENTAL ASSESSMENT FOR THE AWRP.

Executive Summary.

A regional environmental assessment (REA) was undertaken for the Anatolia Watershed Rehabilitation Project, whose aim is to assess the micro and macro environmental impacts of the various components of the proposed project. The project will cover 60 micro-catchments of five principal watersheds in thirteen provinces of the Anatolia area in central Turkey. The total area of these micro-catchments is about 535,000 ha, but project interventions will be confined to approximately 154,000 ha. The principal rivers of these five watersheds are the Seyhan, Ceyhan and Goksu flowing into the Mediterranean and the Kizilirmak and Yesilirmak flowing into the Black Sea.

Various interventions will be undertaken in the forestry, rangeland and agricultural sectors, with the aim of reversing environmental degradation, by significantly reducing erosion, improving biodiversity and carbon sequestration and introducing or expanding environmentally friendly farming practices. In addition, as part of the project, there is a Global Environmental Facility (GEF) grant to improve the water quality of the two watersheds flowing into the Black Sea. Its ultimate aim is to reduce excessive eutrophication in streams, rivers, ponds, lakes and wetlands that flow to the Black Sea. This will be done through improved manure management on farms and in agro-industries and by demonstrating the appropriate and timely use of fertilizers, especially organic fertilizers, on farms together with improved arable and pastoral practices. The GEF sub-component is confined to four provinces, three of which are part of the main project. However, the lessons learnt from this sub-component will have wider applications throughout the project area and beyond.

A brief project description is given followed by an examination of institutional and policy issues. Five different government agencies of four ministries are directly involved in the project at the central and provincial levels and other government bodies such as the State Hydraulic Works and the State Institute of Statistics, as well as local authorities and NGOs have an interest in it. The policy issues covering the project deal with managing the land in a sustainable manner and protecting the biodiversity and waters for future generations. There is a legal framework for forestry and rangelands, but none directly for agriculture or water. However, some agricultural activities and most agro-industries are covered under the environmental act and are subject to initial environmental evaluations or environmental impact assessments.

As part of the REA, six micro-catchments were visited and baseline information was gathered about existing conditions and proposed interventions. All of these areas suffer from considerable environmental degradation and the present land use on much of the area is unsustainable, resulting in diminishing returns to the people living there. As part of the project preparation, these and other micro-catchments were visited and preliminary discussions were held with the villagers concerning the level and types of interventions required to reverse this degradation and to improve the standard of living standard. Plans

were then drawn up by the villagers, with the help of the various government agencies, to meet the dual goals of improved economic benefits and environmental sustainability.

From the baseline information, the environmental problems of these six micro-catchments were examined, together with the solutions as proposed by the villagers. The positive and negative environmental effects of the various interventions were examined. Overall, the environmental benefits vastly outweigh the drawbacks, and these latter can be alleviated with suitable prescriptions. The problems in the six micro-catchments are a microcosm of the watersheds as a whole and therefore, these MCs were used as a proxy when undertaking this REA.

This proposed project is a follow-up to the East Anatolia Watershed Rehabilitation Project (EAWRP). Thus, several lessons and pointers were learnt from the EAWRP as to the likely environmental impact on this proposed project. The overall benefits, both environmental and economic, were very positive, but the scale of the environmental impacts was not monitored under the EAWRP, hence one reason for this REA.

In order to gauge the impact of the project an environmental screening of all the proposed components and activities was undertaken. In particular, this looked at activities that could have negative and positive impacts. The overall components will result in positive environmental benefits, but some activities may have negative impacts unless precautions are taken to mitigate possible negative influences. A screening matrix was compiled of the important activities and this matrix examined the possible environmental effects of the individual activities and proposed prescriptions to mitigate possible negative effects. The matrix also listed the positive environmental effects of rehabilitation activities in forests and rangelands and through the promotion of appropriate farming practices.

As mentioned previously, while experience dictates that the AWRP will have an overwhelming environmental benefit, the scale of this benefit has to be monitored and evaluated. Hence, a monitoring and evaluation (M&E) plan was drawn up as part of an overall M&E programme for the project. This M&E plan devised a strategy to quantify the environmental benefits such as decreased erosion, increased biodiversity and carbon sequestration and improved water quality. Baseline survey and resurvey tables have been compiled for the forestry, rangeland, agricultural and miscellaneous sectors as well as the GEF sub-component. It is proposed to undertake sample surveys of these four sectors in twelve of the 60 watersheds. In addition, surveys will be carried out in the four provinces where the GEF sub-component is taking place.

Following these M&E proposals, an environmental management plan (EMP) was compiled, listing the likely environmental impacts and proposing appropriate mitigation measures including monitoring requirements. An action plan was drawn up to enact the EMP. A plan for baseline and resurveys was drawn up and costed together with requirements for training and equipment. The overall cost of assessing the environmental benefits of the project is estimated to be US$ 3.14 to 4.38 million. The benefits from carbon sequestration alone, if traded could be about US$ 4 million after five years and about US$ 13 million after fifteen years.

Acronyms

AGM	General Directorate for Reafforestation and Erosion Control (of MoF)
AWRP	Anatolian Watershed Rehabilitation Project
CCA	Chemical control agents (herbicides, insecticides and pesticides)
CGS	Competitive Grants System Process
CKOK	Gen. Directorate of Environmental Pollution Prevention & Control (MoE)
DSI	State Hydraulic Works
EAWRP	Eastern Anatolian Watershed Rehabilitation Project
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EU	European Union
FAO	The Food and Agricultural Organization of the UN
GDNP	General Directorate of National Parks, Game and Wildlife (of MoF)
GDRS	General Directorate of Rural Services
GEF	Global Environment Facility
GIS	Geographic Information System
GMZ	Gene Management Zone
GPS	Global Positioning System
ICR	Implementation Completion Report (WB document)
IEE	Initial Environmental Examination
IPM	Integrated Pest Management
KKGM	General Directorate for Protection and Control (of MARA)
KPI(s)	Key Performance Indicator(s)
M&E	Monitoring and Evaluation
MARA	Ministry of Agriculture and Rural Affairs
MC(s)	Micro Catchment(s)
MoE	Ministry of Environment
MoF	Ministry of Forestry
NGO(s)	Non-governmental Organization(s)
OVI(s)	Objectively Verifiable Indicator(s)
PCD	Project Concept Document (WB document)
PMG	Project Management Group
PPU	Project Preparation Unit
REA	Regional Environmental Assessment
SIS	State Institute of Statistics
SSAG	Special Studies Advisory Group
TOR	Terms of Reference
TUGEM	General Directorate for Production and Development (of MARA)
WB	World Bank

Anatolia Watershed Rehabilitation Project:
Regional Environmental Assessment.

A. Introduction.

Much of Turkey has highly degraded ecosystems, due to natural and anthropogenic influences, such as cultivation patterns, livestock grazing, and deforestation. These degraded areas cause major environmental damage and affect the livelihood of the rural population. The Anatolia region in central Turkey is one of the worst affected (an poorest) areas in Turkey, thus it has been selected as an area to demonstrate that ecosystems can be rehabilitated and made sustainable with the active participation of the local communities. The project area within the Anatolia region has 13 provinces and stretches from the Mediterranean to the Black Sea. It covers about 19 million ha[1], 24% of Turkey's areas with a 1997 population of about 11.6 million, 40% of which are in rural areas. It has five principal watersheds, namely the Seyhan, Ceyhan and Goksu flowing into the Mediterranean and the Kizilirmak and Yesilirmak flowing into the Black Sea.

B. Project Description.

The Anatolia Watershed Rehabilitation Project (AWRP) aims at arresting environmental (and economic) degradation in 60 micro-catchments (MC) of its five watersheds and implement community selected priority interventions to rehabilitate the MCs. The estimated area of the selected MCs is about 535,000 ha out of which 154,000 ha will be the physical implementation area. The AWRP is a follow-up to the recently completed Eastern Anatolia Watershed Rehabilitation Project (EAWRP). The interventions would be chosen from a menu of activities. Selection will be made after MC Development Plans have been prepared by the implementing agencies, in close collaboration with the communities. The implementing agencies are the General Directorate of Forestry (AGM), the General Directorate of Rural Services (GDRS), and the General Directorate of Production and Development (TUGEM) for the MCs. In addition the GEF component is under the control of the General Directorate of Protection and Control (KKGM) in the Ministry of Agriculture (MARA), and the Ministry of Environment (MoE).

Project activities will be financed with a World Bank loan, a Global Environmental Facility (GEF) grant and counterpart funds from the Turkish Government. The GEF funds would be used for activities that reduce nutrient loads into water and soil on the watersheds that flow into the Black Sea. This will be done by promoting the use of organic fertilizers on farms, demonstrating environmental friendly farming practices and increasing the monitoring and enforcement implementation capacities of the relevant institutions. The positive experiences from these activities will be promoted in other areas of the project and elsewhere throughout the country and beyond.

[1] The area of the 13 provinces in the AWRP is 18.8 million ha. However, the watershed boundaries do not necessarily correspond to the provincial areas.

The AWRP will include two main components that are of relevance for a Regional Environmental Assessment (REA).

1. *Rehabilitation of Degraded Natural Resources.* This component would protect degraded areas from further degradation, erosion and nutrient pollution. It would: (i) promote proven locally adopted vegetative technologies and mechanical structures to conserve water, reduce soil erosion, and alleviate fuel/fodder shortages; (ii) promote appropriate use of marginal agricultural land, (iii) promote environmentally-friendly agricultural practices, (iv) reduce land under fallow by introducing food and fodder legumes into the crop rotation; and (v) promote manure management and agro-industry pollution control. All these activities should have positive benefits on the environment, but the scale of the benefits is as yet unknown, hence the importance of monitoring the interventions and evaluating the outcomes.
2. *Income Raising Activities.* This component would raise rural income through activities such as small-scale irrigation, farm ponds, agricultural production on terraces, production of niche crops, grafting of wild fruit species, forage production, and bee-keeping. This component will provide immediate benefits to beneficiaries, and complements Component 1, which mainly provides global benefits. Some parts of these interventions may result in adverse environmental impacts. Thus, these will be highlighted and mitigation measures will be proposed to counter such impacts.

In addition, the project will have the following three components.

3. *Strengthening Policy and Regulatory Capacity towards meeting European Union (EU) Environmental Standards.* This will reinforce the activities of the above components by ensuring that environmentally friendly interventions are promoted.
4. *Awareness Raising, Capacity Building and Replication Strategy.* This component will include environmental awareness and the best practices will be promoted throughout the country.
5. *Project Management and Support Services.*

As part of the AWRP, a Regional Environmental Assessment has been undertaken. The REA is a tool to help with and influence the proposed investment strategies and programs. Its primary objective is to present an overview of the major environmental conditions, baseline data, issues and trends in the 13 provinces of the five watersheds in which the project will be working[2]. Also, it has provided an analytical framework and comprehensive guidelines to better address environmental concerns through mitigation of adverse environmental impacts in the design, implementation, and monitoring of the menu of possible project interventions mentioned previously: this will be done through an Environmental Screening process. Finally, an Environmental Management Plan (EMP) has been prepared.

[2] The 13 Provinces are Adana, Amasya, Corum, Icel [Mercin], Kahramanmaras, Karaman, Kayseri, Konya, Nigde, Osmaniye, Samsun, Sivas, and Tokat. Amasya, Corum and Tokat have both Watershed and GEF initiatives. Samsun only has GEF initiatives.

The REA gives a description of the project provinces, as well as the institutional and legislation framework that are linked to the environment. It identifies the major environmental issues in the project provinces, such as water pollution, erosion, and quality of water. It then provides a description of the environmental risks associated with the various project activities, and proposes mitigating measures. It draws on experiences and lessons from the East Anatolia Watershed Rehabilitation Project (EAWRP). Necessary procedures and mechanisms for mitigation, as well as institutional arrangements and accountability are described in the EMP. The cumulative impact of proposed project activities is also assessed. All these activities have been or are to be discussed in stakeholder consultation meetings prior to the final draft of the REA. The Terms of Reference for the national and international consultants are given in Annex 1.

C. Institutional and Policy Issues.

Institutional Issues.

The Institutional issues will be first described and then policy issues will be highlighted. The government agencies and other bodies involved in the project are as follows.

Ministry of Forestry.

The Ministry of Forestry (MoF) is responsible for conservation, development, planning, management and utilization of forest resources. The Ministry targets the conservation and further extension of forested land and responds to the needs of people in terms of forest products as well as recreation.

The central organization of the Ministry consists of 3 main service units organized as general directorates (the General Directorate of Afforestation and Erosion Control (AGM), General Directorate of Forest Village Relations (ORKOY) and General Directorate of National Parks and Wild Life (MPG), one affiliated organization (General Directorate of Forestry [OGM]). AGM manages areas designated for reforestation, erosion control and range improvement. MPG is responsible for natural parks, nature reserves, national parks, nature monuments and recreation forest areas. ORKOY is responsible for providing some support to forest communities living within or adjacent to forest areas. OGM manages almost all forest land resources in Turkey, undertaking forest protection works (against fire, illegal cuttings, encroachment, insects and diseases, etc), silvicultural works for forest regeneration and improvement, road construction and maintenance, cadastral surveys, management planning, production and marketing of wood and other forest products. As to the peripheral organization of the ministry, it encompasses 9 regional directorates and 52 conservancies attached to these directorates, 143 local chief engineering and 543 engineering offices, 11 research directorates directly attached to the Ministry and 8 laboratories for soil analysis.

Ministry of Agriculture and Rural Affairs.

The mandate of the ministry (according to the Government Decree no. 441 in Force of Law) is to ensure the development of rural settlements in line with overall development plans and programs, construct infrastructure facilities so as to enhance crop farming and animal husbandry and to deliver public services in agricultural, economic and social fields. The ministry performs its related duties through its peripheral organization. The peripheral organization of the ministry consists of research institutes, provincial and district directorates, farms and supervision units. The ministry also has its agricultural consulting centres in some foreign countries.

The main service units of the ministry consist of various general directorates. Each of these units has distinct and specific responsibilities:

- General Directorate of Agricultural Production and Development (TUGEM).
- General Directorate of Preservation and Control (KKGM).
- General Directorate of Organization and Support (TEDGEM).
- General Directorate of Agricultural Research (TAGEM).
- Foreign Relations and European Union Coordination Department (DIATK).
- General Directorate of Agrarian Reform.
- General Directorate of Soil Products Office (TMO).
- General Directorate of Agricultural Enterprises (TIGEM).
- General Directorate of Ataturk Forestry Ranch (AOC).

The following are the KITs (State Economic Enterprises) not directly attached but related to the Ministry of Agriculture and Rural Affairs:

Turkish Sugar Plants Inc. (TSFAS).
General Directorate of Enterprises of Tobacco, Tobacco Products, Salt and Alcoholic Beverages (TEKEL).
General Directorate of Tea Enterprises (CAYKUR).
Fertilizer Industry of Turkey.

The "Board for Restructuring and Support in Agriculture" was established in order to coordinate the work carried out by the public institutions.

Ministry of Environment.

Within the framework of the Legislation on the Environment that lays down principles in relation to the protection and improvement of the environment and its transfer to future generations, the tasks of this ministry include the determination of principles of conservation and utilization in both rural and urban environments; drafting of environmental plans on the basis of development and regional plans so as to ensure the rational utilization of natural resources and make economic decisions compatible with ecological considerations in the context of balanced and sustainable resource utilization and to monitor the implementation of such plans whether developed by the ministry itself or commissioned to other agencies.

The Ministry of Environment is engaged in various activities including coordination and information flow in the context of international conventions to which Turkey is a Party including the UN Convention on Biological Diversity, Convention for the Prevention of Desertification, CITES Convention, Bern Convention, Convention on Long Range and Trans-boundary Pollution.

The Ministry of Environment has three main service units organized as General Directorates, namely General Directorate of Environmental Protection, General Directorate of Pollution Prevention and Control, General Directorate of EIA and Planning. Further organs of the ministry include 81 provincial directorates.

General Directorate of Rural Services.

The General Directorate of Rural Services took its present organizational structure in 1984 upon the enactment of Law no. 3202. It is an annex budget legal entity attached to the Office of the PM. Its basic objective is to eliminate redundancies in services extended to rural areas and to produce more comprehensive and efficient services.

The peripheral organization of the General Directorate consists of Regional Directorates existing in 22 centrally located provinces and 80 Provincial Directorates (a directorate in each administrative province). The General Directorate also has 11 Research Institutes, 5 Machinery-Equipment Directorates, 3 Project Directorates and 2 Training Directorates.

The General Directorate of Village Services tries to extend various services to rural areas and settlements including the construction, maintenance and repair of village roads and bridges; village drinking water supply works; construction of various facilities and premises in villages; rural sanitation; facilities relating to the use of surface and groundwater resources and small irrigation ponds.

General Directorate of State Hydraulic Works (DSI).

The General Directorate of DSI, is not a partner of the project. But it has some major roles in water resources management and it is one of the major beneficiaries of the project. One of the positive impacts of the project is lengthening the lifetime of the dams constructed by DSI in the relevant basins through reduced erosion. Its basic mandate is, in the context of water resources development, to manage surface and groundwater resources of the country, take measures to prevent any damage that may be caused by water and utilize these resources so as to be beneficial to overall development efforts and public welfare.

The peripheral organization of the DSI consists of 26 Regional Directorates, branch directorates instituted according to the needs of respective Regional Directorates and Chief Engineering Offices attached to these branch directorates.

Major tasks of the DSI include the following: to construct irrigation systems and protective facilities against floods; drain swamps; introduce drainage measures to

problematic areas; establish hydraulic power plants; carry out duties assigned under the Law no. 167 to provide drinking, use and industrial water to large cities; rehabilitate rivers and enhance water products in reservoirs; develop projects in relation to various tasks undertaken; examine, approve and supervise drinking water supply and sanitation projects of urban settlements and to cooperate with related organizations and agencies to control pollution in surface and groundwater reserves.

Village Administrations.

According to the 1997 General Census of Population there are 36,699 village settlements. The Law No. 442 (dated 1924) on Village Settlements foresees that villages should be self-sufficient with respect to some communal works and organizations. The Law divides village works in two parts as compulsory and voluntary. Compulsory works are those related to health, public works, sanitation, agriculture and education. Voluntary works, on the other hand, cover the construction or establishment of such communal facilities as laundries, baths, market places and village forests.

The existence of many villages on high, inclined and rough terrain as dispersed units independent of each other is one factor hindering their development. In fact, 71 percent of all villages in Turkey are located on slopes and hillsides.

Almost all villages in Turkey remain out of the scope of sewage networks. Transportation and access are both insufficient in qualitative and quantitative terms. The majority of villages still have no drinking water supply networks. Electricity and communication services need modernizing since frequent interruption pose many problems. The target at present is to ensure that each dwelling unit has its telephone connection. There are also some problems regarding the access to national TV channels. The physical growth of settlement units takes place in an unplanned manner. Constructions are made through traditional methods without any plan and consequently earthquakes still constitute a serious threat. Inadequate consideration of geographical characteristics while determining the administrative units to which individual villages are attached lead to many problems including lack of any connection between a village settlement and its administrative district. There are also problems in the fields of education and health. The problems of forest villages, which constitute about 25 percent (8,977) of all villages, are yet to be solved. Another leading problem is the absence of production-marketing organizations.

Irrigation Unions.

The General Directorate of DSI establishes its overall principles and policies in regard to operation and maintenance and delivers its services either directly through its own implementing units or delegates these functions to real and legal entities according to the provisions of the relevant legislation.

Under the legislation on the transfer of irrigation facilities to their beneficiaries, the main rule is that it is not the proprietorship, but the operation and maintenance of such facilities

that is transferred. Since 1993, organizations formed by beneficiaries and local governments have come to the fore as another way of irrigation management.

Small irrigation networks up to the coverage of 2,000 hectares had been gradually transferred to their users. The DSI encouraged participatory approaches by establishing Irrigation Groups with limited responsibilities in operation and maintenance. As a result of this policy line, irrigation on about 62,000 hectares of land was transferred to various other organizations. Starting from 1993, the "Accelerated Transfer Program" has been effectively implemented in pilot areas selected by the DSI. Transferees by 2000 include, 214 legal village entities, 135 municipalities, 304 unions and 42 irrigation cooperatives.

The transferee charges a specified annual fee for its irrigation services. This annual fee is determined on the basis of unit land either with respect to specific crops or number of times irrigation occurs regardless of crop or by some other method. These irrigation organizations may have other sources of revenue as well including subscription fees collected once, bank accounts, penalties and donations.

Cooperatives.

Mutual assistance, solidarity and cooperation are the underlying principles of a cooperative. Having these in mind, it is observed that the cooperative approach is a part and parcel of the daily life of Turkish people. In fact, the people of Turkey have the rather unique feature of cooperating and joining hands in difficult circumstances without any external pressure. For centuries, Turkish people had displayed internal support and solidarity through various ways including helping others (imece- voluntary joint work for common good) failing in their work for various reasons, keeping common shepherds for their animals or taking over work in rotation, constructing various facilities together, etc. Present cooperatives in Turkey have their roots in these historical tendencies. What follows is a brief account of cooperatives, which may be relevant to the present project and presently active in Turkey.

Cooperatives relevant to the project.

1) Agricultural Development Cooperatives. Agricultural development cooperatives are multi-purpose organizations active in various areas. The basic reason for this multi-purpose character of cooperatives is the dominance of a poly-culture in agriculture. In other words, farmers make their living by engaging in different activities. Consequently, inputs needs of the farmer extend over a rather wide range and also the processing or marketing of farm products require different activities.

2) Irrigation Cooperatives. Irrigation cooperatives are organizations established under the Law no. 1163 on Cooperatives. These cooperatives are established to operate small-scale irrigation facilities constructed by the state or to sustain and cover operating expenses of other facilities constructed by farmers themselves. Irrigation cooperatives may, therefore, play an important role in ensuring the rational operation of facilities

constructed at large costs. They can be regarded as "service cooperatives" since they try to sustain irrigation services.

3) Agricultural Credit Cooperatives. Agricultural credit cooperatives presently procure all kinds of agricultural inputs and extend them to their members. In this respect, cooperatives regulate the market and save farmers from having to pay extremely high prices for agricultural inputs. In cases where agricultural credit cooperatives fail to supply such inputs as fertilizers, chemicals, seeds, agricultural equipment, etc. farmers have no other choice but procuring them from markets at higher costs. When funds of cooperatives are limited, members cannot benefit properly from credit facilities. All these problems cause a falls in total agricultural output.

4) Agricultural Marketing Cooperatives. Agricultural Marketing Cooperatives and Unions conduct two purchases as 'routine' and 'support.' In normal purchases, unions or independent cooperatives determine and declare the price they will pay for different qualities of specific crops. These 'floor prices' are set before harvesting etc. by considering domestic and international markets and stocks in hand. Crops purchased by cooperatives and unions are processed and then sold in domestic or international markets; if any profit accrues it is distributed to members. Support purchases, on the other hand, are based on Article 27 of the Law no. 3186, which states that the Council of Ministers (CoM) or any specific ministry designated by the Council may authorize cooperatives and unions to purchase agricultural products on behalf of the State. Each year the CoM sets and announces floor prices for specific crops and assigns a specific union or unions (except independent cooperatives) the task of purchasing specific crops. The financing of this operation rests with the Agriculture Bank.

The law enacted on Agricultural Sales Cooperatives and Unions (ASU) was published in the Official Gazette No. 24081 of 16 June 2000. In order to carry out their activities in an efficient and sustainable manner, the law provides a structure that is both autonomous and financially independent. The Restructuring Board is carrying out studies and making recommendations for cooperatives and unions with a view to restructuring them and ensuring a sustainable structure that will allow these institutions to carry on their activities in line with the principles of economic efficiency and productivity. Operation credits required by cooperatives and unions are provided from the general budget and from the Support and Price Stabilization Fund upon the recommendation of the Restructuring Board. A transition period of four years is foreseen to privatise the ASU.

Chambers of Agriculture.

Chambers of Agriculture are the professional organizations of farmers. These organizations having public legal entity are based upon the Law no. 6964 passed in 1957. The objectives of the chambers of agriculture include the following: provision of professional services; assisting in the development of the sector of agriculture in all respects and in the implementation of state plans and programs in the field of agriculture; facilitation of professional activities; conservation of professional ethics, solidarity and discipline in the sector of agriculture and improvement of relationships between farmers and the rest of the people as well as farmers themselves.

Farmers' Unions and Associations.

These are professional unions formed by farmers with a specific enterprise size to defend and promote their interests. "Village promotion and upgrading associations" is another category of institution existing in almost all villages, though under different names, to respond to social and infrastructure needs of individual villages.

Beside the institutions depicted above, the State Institute of Statistics (SIS) is responsible for collecting, processing and disseminating the agricultural data. The Turkish Standards Institute sets the standards for sampling, measuring techniques, and product quality including agricultural activities and goods.

Policies.

The fundamentals of Turkish agricultural policy is determined according to commitments stemming from the World Trade Organization- Agreement on Agriculture, developments in the EU common agricultural policy (CAP) during the pre-accession period, and finally, developments in international trade. Turkey's VIIIth. Five-year Development Plan adopted in the year 2000 in the Grand Assembly, comprises agricultural policies to be implemented between 2001-2005. The relevant policies are listed below:

- Forests will be operated, preserved and developed within the eco-system approach, in line with the principles of continuity, multi-purpose use, participation, specialization, biodiversity, protection of water and wild life, and improvement of social stabilization, by taking into account the inhabitant conditions, interdependency between sectors, productivity and carrying capacity, forest health and landscaping, eco-tourism, productivity, pollution and factors such as fire, insects, landslides, snow, avalanche, flood, frost and drought.
- Regarding areas covered by the forestry regime, with the aim of ensuring site safety, securing effective protection, considering public interest and for the efficiency of investments, land cadastre-limitation activities will be carried out extensively by taking into consideration the protection of the unity of the forest areas, with priority given to the potential rejuvenation and forestation areas.
- Nature Protection Zones, National Parks and similar Protected Zones will be developed and made widespread, with a view to protecting bio-diversity, water and wild life, cultural and esthetical assets, to creating research opportunities concerning the benefits of the forests not yet discovered, to preventing land erosion, landslides and avalanches, and to developing eco-tourism.
- Forest, rangeland and water management plans will be reorganized in line with sustainable forestry principles, by considering the needs of the society, various functions of the eco-system, inhabitant inventories including wood and non-wood products and services, management objectives, the areas under protection and wild life and plant species under the threat of extinction. Rejuvenation activities will be carried out without delay, in line with silviculture plans based on natural tree species.
- Concerning the construction of buildings, plants, roads, mines, electrical overhead conveyors and similar activities carried out by various institutions, and wood

production activities in forest areas, the protection of the land, flora and fauna and care for water quality will be the basic principles and the necessary arrangements will be introduced by improving standards.

- With the aim of improving the status of forest farmers, social and agricultural forestry activities that cover oak, acacia, pine trees and similar beneficial species, and the production of medical, aromatic and decorative plants will be stimulated and energy forests will be made widespread. The activities of real and legal entities towards the establishment of private forests will be supported.
- Forestry research units and studies will be designed with an awareness of the need to integrate with the world and in a manner of including issues such as land use, biodiversity, environmental functions, social forestry, pollution, greenhouse effect, acid rain, water and wild life under the threat of extinction, production capacity and carriage capacity of the area and of producing value added and other economic data. Based on the uniqueness of the subject, cooperation will be established between researchers, implementing staff, NGOs and forest farmers.
- For the rational use of Turkey's inland water, their ecological and limnological features will be determined, and fish farming activities will be initiated to produce species with high economic value that are in harmony with the environment.
- The basic target is to establish an organized, highly competitive and sustainable agricultural sector, which considers the dimensions of economic, social, environmental and international development as a whole.
- A Land Use Plan will be prepared by carrying out detailed land studies and preparing maps, by enforcing a Law on the use and protection of the land, by completing land cadastre activities and preparing a land database.
- Forests will be managed, operated and preserved within the context of economic, social, environmental and ergonomic criteria, in line with society's requirements for forestry products and services, and within the principles of sustainable forestry, biological diversity, protection of wild life and multilateral use.
- In order to prevent disasters such as deforestation, desert-formation, land erosion, flood, landslide and avalanches in Turkey, activities such as forestation, erosion control, meadow improvement and social forestry will be developed and forestation efforts of real and legal entities will be supported.
- Priority will be given to alternative combat methods, particularly to the Integrated Pest Management (IPM) methods and biological control methods.
- Minimizing the negative environmental impacts of agricultural production will be one of the policy priorities. In addition to the measures that will be taken in this respect, for application of fertilizers, pesticides and irrigation will focus on being natural and environment friendly. Input subsidies for fertilizers and pesticides will gradually be decreased and phased out. In compliance with EU legislation, production of organic (ecological) products that respect plant, animal and human health will be encouraged.
- Farmers Register System, Title Deed- Cadastre System, Geographical Information System and Farm Accounting Data Network will be developed. Agricultural Information System using the agricultural database will also be set up. Cadastre work in the forestland will also be completed.
- The planning and management of participatory projects on all issues, levels and stages related to the agricultural sector will be taken as benchmark.

Farming. By the end of 2001, the Government removed fertilizer supports. Direct Income Support for Farmers in 2000, was enforced on 1 March 2000 as a new means of agricultural support with the aim of decreasing the burden of the agricultural sector on the budgetary outlays within the framework of the policies of "Restructuring and Support in Agriculture". Through this policy, 11.8 million ha land and 2,182,000 farmers have been registered. According to the Communiqué for the Direct Income Support for Farmers issued on 31 July 2002, the limitation for direct supports has been increased from 200 da holdings to 500 da holdings. Therefore, it is expected that the database for the registrations will be extended until 1 October 2002.

Turkey is a signature to the Rotterdam Convention covering the use of chemical control agents (CCM). In compliance with the National Environmental Action Plan (NEAP) of Turkey, the pesticide supports were differentiated according to the toxicity of active gradients of the pesticides with the issued communiqués, in order to phase out the use of pesticides, which are hazardous for the environment and human beings.[3] The aqua products law (No. 1380 of 1995) gives a list of pesticide concentrations allowed in inland water bodies. This list is given in Annex 3. There is a guideline on products for phyto-sanitation published by the MARA General Directorate of Protection and Control (Plant Protection Products 2002, MARA, TISIT, Istanbul, 2002). Also, there is legislation regulating the certification of pesticides and limitations to their use. These are:

- Directive On The Method And Principles Of Registration Of Pesticides And Similar Agents Used For Plant Protection.
- Regulation on Labelling of Pesticides.
- Instruction on Prospectus for Pesticides.
- Instruction for the Toxicological Classification of Pesticides.
- Directive on Whole and retail Sales of Agrochemicals.
- Directive on Control of Agrochemicals.
- Pricing of the Imported or Locally Formulated Products.

Legal Framework for Anatolia Watershed Rehabilitation Project.

There is neither framework law on agriculture nor on water in Turkey. However, there are framework laws on forestry and environment. The basic legislation on agriculture, forestry and agricultural sector activities in Turkey are listed in Annex 3.

[3] The use of following pesticides is banned in Turkey: 2,4,5-T, Aldrin, Binapacryl, Captafol, Chlordane, Chlordimeform, Chlorobenzilate, DDT, Dieldrin, Dinoseb and its salts, HCH (mixed isomers), Heptachlor, Hexachlorobenzane, Lindane, Pentachlorophenol, Hg (Mercury) compounds, Endrin, Leptephos, As (Arsenic) compounds, Fluorodifen, Chlorpropylate, Daminozide (Alar 85), Taxophane, Zineb, Azinphos ethyl, Dibromochlorpropan (DBCP), Methylarsenic (MSMA). From the list of pesticides, which are subject to PIC (Prior Informed Consent) according to the international legislation only some preparatives, which are in compliance with the PIC limitations of the following CCA are not banned, and the rest are either banned or not licensed at all: Monocrotophos, Methamidophos, Phosphamidon, Methyl parathion, Parathion. See also Annex 3.

Law No 4342 on Rangelands was put into effect in 1998. The objective of the Law is to regulate designation, land use decisions, usage, conservation, renting, sustainability, management, and allocations to the village and municipal entities of the meadows, range, table, pasture and grasslands, which belong to the public.

Law No. 4572 on "Agricultural Sales Cooperatives and Unions" (ASC&U) has also been enforced. Through this law, the provisions on ASC&U have been regulated, a legal framework has been established for the restructuring process, and the efficient and sustainable autonomy and financial independence of the institutions have been ensured.

The current legal framework for forestry issues is the Forestry Law. The other laws and regulations relevant to the present project are listed in Annex 3. There are also some related laws like Law on Land Cadastre, Hunting Law, Tourism Encouragement Law, and Law for Protection of Cultural and Natural Assets.

Legal Framework for the GEF Component.

The framework Environment Act (1982) is the basis for environmental legislation. There are some other environmental and agricultural legislation related to the nutrients and pollution from agricultural activities. The objective of the Water Pollution Control Regulation (1988) is to maintain the quality of surface and underground water resources according to their allocated uses, to ensure best use of water resources, to set the technical and legislative rules for the control of water quality in order to prevent pollution in compliance with the economic and social development goals of the country. The provisions related to nutrient pollution control in the Regulation are given in Annex 3.

Industrial enterprises are allowed to discharge wastewater to the local sewerage system and to the deep sea, although firms may be required to pre-treat effluent prior to discharge into wastewater treatment plants. Discharge of hazardous substance to water is prohibited. The permitting procedure has been regulated since 1989 after the issuance of the Water Pollution Control Regulation. Principles for discharging effluent to ground and surface waters, and for treating wastewater, are also contained in the regulation. Effluent standards have been set for different types of industries and for the substances that may be discharged, along with basic principles to be followed. Discharge limits of pollutants listed for agro-industries do not include the nutrients. Discharge permits are subject to three-year renewable authorization. They may be refused or withdrawn in order to prevent any adverse environmental impact (e.g. direct discharge in areas, which have been highly polluted). Although the discharge standards are specified for each industrial sub-sector, they are fixed regardless of the receiving body. This means that the limits for pollutant parameters for a specific industrial discharge are the same whether it is discharged into a lake or the Black Sea.

For the protection of water for drinking and other purposes, the general principles and protection provisions are given in the Water Pollution Control Regulation (See Annex 3). Effluent discharges must be monitored by the enterprises themselves according to the Water Pollution Control Regulation. The frequency of monitoring is stated in the "discharge permission " which is granted by the Administration for all direct discharges of household and/or industrial wastewaters into water receptor media on the condition of

compliance with the principles of the Regulation. According to the Regulation on Water Pollution Control, "the relevant units of MARA shall specify in detail the method of calculating the required amounts of fertilizers and shall conduct inspections regarding their overuse." Nevertheless, the Ministry has rarely practised this yet.

The Solid Wastes Control Regulation (1991) regulates collection, transportation, disposal, composting, incineration, minimization, recycling and reuse of all kinds of household wastes, wastes from industrial plants other than hazardous wastes, wastes from commercial activities and construction debris, as well as rehabilitation of existing disposal sites. The Regulation also consists of an article regarding composting of organic wastes for fields and an article on using treatment plant sludge for agricultural activities.

Tolerable limits for nutrients in the receiving water bodies and hazardous substances, which are banned to be disposed into the production zones of aqua products in inland waters and seas are addressed in the Regulation on Aqua-products (1973) (Annex 3). The recently amended Environmental Impact Assessment (EIA) Regulation (2002) lists the agro-industries and agricultural activities, which are subject to an EIA or an Initial Environmental Examination (IEE) (see Annex 3).

The Soil Pollution Control Regulation was enacted by end 2001. It aims to regulate all activities, which cause soil pollution and delineate the technical, administrative principles as well as criminal sanctions related to discharging, throwing, leaking of hazardous substances and wastes into soil, use of sludge from industrial and sewage treatment plants and compost on soil. Limits of the heavy metals, sodium, chlorine ion, pesticides, PCBs and some aromatic hydrocarbons in the soil are listed in the Annexes of the regulation. Beside the above-mentioned environmental legislation, there is some agricultural legislation, which is related to nutrient and pesticide use: Inspection of Chemical Fertilizers, Permit Regulation for Pesticides Production, Storage and Sale.

The Regulation on Principles of Organic Agriculture and Implementation, endorsed in July 2002, aims at protecting plant, animal and human health by restoring the ecosystem balance. It covers the principles regarding production, processing, packaging, labelling, storing, transportation and marketing of all vegetative, animal and aquatic products.

The new sugar legislation adopted by the Turkish Parliament on 4th April. 2001 introduced new arrangements including quotas. In sugar beet cultivation, indirect subsidies mostly in the form of advances to farmers amount to 38%. Turkey's annual sugar harvest produces a surplus of 1 to 1.5 million tonnes, but the chances for exports are rather limited. In Turkey production costs are around US$ 650-700 per tonne while the international price is around US$ 200/t. Thus, the Treasury suffers an annual loss of about US$ 600 million. Beet production is only possible through subsidies and purchase without quotas. Sugar beet is a salt resistant crop thus, cultivation is rational in such regions as Central Anatolia where the soil is mostly saline. However, considering the surplus, sugar beet should not be grown in such fertile areas as Tokat, Carsamba, Bafra, Susurluk and Bursa where alternative crops such as vegetables and fruits can be grown.

D. Baseline Information.

According to 1997 census total population in the 13 provinces of AWRP is about 11.6 million of which 60% of the population lives in districts and villages (BI Table 1).

BI Table 1. 1997 Urban and Rural Population in the Project Provinces.

Province	Urban	Rural	Total	Urban %	Rural %
Adana	1,272,892	409,591	1,682,483	75.6	24.4
Amasya	182,978	163,213	346,191	52.8	47.2
Corum	289,629	288,558	578,187	50.1	49.9
İcel	955,563	552,669	1,508,232	63.3	36.7
Karaman	131,556	92,747	224,303	58.7	41.3
Kayseri	681,791	292,244	974,035	70.0	30.0
Konya	1,140,016	791,757	1,931,773	59.0	41.0
K. Maras	551,853	456,254	1,008,107	54.7	45.3
Nigde	119,297	196,628	315,925	37.8	62.2
Osmaniye	298,360	140,012	438,372	68.0	32.0
Samsun	590,399	563,364	1,153,763	51.2	48.8
Sivas	395,461	302,558	698,019	56.7	43.3
Tokat	335,060	360,802	695,862	48.2	51.8
Total	**6,944,855**	**4,610,397**	**11,555,252**	**60.0**	**40.0**

Source. SIS, 2000 Agricultural Statistics.

Climate.

Climatic features in the project area are variable because the area displays different characteristics from Samsun in the Black Sea Region to Adana and Icel provinces in the Mediterranean. In the heart of this zone, dry climatic features prevail, whereas in the coastal areas the climate is mild with increased precipitation. In the AWRP provinces, annual precipitation varies between 325 and 828 mm, with the number of days with precipitation ranging from 75-120, based on many years of data. Snow prevails in the Central Anatolian provinces particularly in spring, and winter but occasionally in autumn. The mean relative humidity is around 60 % with the lowest in Nigde province at 58 %. The highest humidity is in Samsun province with 75 %, closely followed by Icel with 74%. The average temperature in the project area oscillates round 10°C due to climatic diversity; a characteristics of a transition zone.

Soil/Land Resources.

Turkey is not replete in cultivable land. Only 24% of the land (19.3 million ha.) is suitable for arable agriculture (Class I, II or III), partly because the soil is not deep enough: 68% is less than 50 cm deep, and 40% is classified as very shallow, (BI Table 2). Another 9% can only be tilled after taking remedial measures (Class IV and V), while

64% cannot be cultivated at all (Class VI, VII, and VIII): 8% is *stony-rocky*, 7% has drainage problems, and 3% has salinity-alkalinity problems (TOPRAKSU, 1978).

BI Table 2. Regional Land Capacity for Agricultural Use (%).

Agricultural Regions	Land Classes by Agricultural Region (%)							
	I	II	III	IV	V	VI	VII	VIII
1) Aegean	6.28	8.38	7.36	5.81	0.12	14.74	53.50	3.82
2) Marmara	6.52	22.25	17.38	11.27	0.25	14.37	25.99	1.97
3) Mediterranean	7.75	6.78	5.69	5.03	0.42	8.72	57.53	8.07
4) East-North	3.81	7.12	9.02	14.02	0.07	17.29	43.00	5.67
5) East-South	8.35	9.13	9.23	8.38	0.19	11.97	48.50	4.24
6) Black Sea	2.96	3.13	5.95	9.55	0.02	13.06	61.50	3.84
7) Central-North	6.62	10.19	12.12	10.94	0.14	15.01	42.37	2.62
8) Central-East	4.90	6.31	10.12	8.90	0.08	12.40	54.09	3.20
9) Central-South	9.61	10.21	13.71	11.20	0.61	12.86	37.47	6.64

Source. TOPRAKSU, Turkiye Arazi Varligi, 1978, Ankara.

Erosion is one of the most severe environmental problems affecting 81% of the total land surface of Turkey in varying degrees of severity. About 73% of cultivated land including 68% of prime agricultural land (Classes I-IV) is prone to erosion. BI Table 3 shows the degree of erosion in the AWRP and the impacts on the land quality.[4]

BI Table 3. AWRP: Degree of Erosion in Specific Provinces.

Problem	Water erosion. (% of soil)				Percentage of soil			
Province	Nil or Slight	Med-ium	Severe	Very Severe	Stony	Rocky	Wet	Barren
Adana[1]	25	13	37	25	13	21	9	6
Amasya	14	40	41	5	38	9	0.8	0.7
Corum	16.6	23.7	47	12.7	35	2	1.5	1
Kahramanmaras	12	20	26	42	26	48.5	1.6	+
Kayseri	11	28	34	27	36.5	12	7	5.4
Konya[2]*	26	26	15	24	22	3	8	5.6
Mersin	7	10	40	43	47	-	3.7	3
Nigde[3]**	30.5	29.5	19.5	20.5	26	1.3	13.6	11.7
Samsun	19	28	52	0.4	28.2	2.4	12.3	3.4
Sivas	9	22	30.5	38.5	21.4	1.1	1.2	0.8
Tokat	10	20	47	23	22.7	<0.1	0.4	0.02

Note. 1. Includes Osmaniye. 2. Includes Karaman. 3. Includes Aksaray.
* Wind erosion 1% slight, 2% medium, 4% severe.
** Wind erosion 0.2% slight, 3% medium, 4.5% severe.
Source. National Action Plan of Turkey for Combating Desertification (Draft).

[4] This Table was prepared when there were 67 provinces in Turkey.

Stream bank erosion affects 57.1 million ha in Turkey while wind erosion degrades another 466,000 ha. As a result, about one billion tonnes of soil are carried away each year and deposited in lowland areas or deltas. BI Table 4 shows the soil carried away by the rivers in the project area.

BI Table 4. AWRP: Estimates of Soil Erosion.

Basin Name	Precipitation Area (km^2)	Average Flow/yr. ($l/s/ km^2$)	Monitoring station	Average soil load ($t./km^2/yr.$)	Total soil load per yr. (million t.)
Yesilirmak	36,129	5.1	Carsamba	1,521	54.9
Kizilirmak	79,744	2.5	Inozu	923	44.9
Seyhan	20,731	11.1	Uctepe	563	7.8
Ceyhan	21,222	10.6	Yenikopru	922	19.6
			Karahacili	648	6.8
Turkey				**600**	**500**

Sources. National Environmental Action Plan 1997. SPO, Ankara. Gunay, Turhan. Orman Ormansizlasma Toprak Erozyon 1998. TEMA Vakfi Yayınlari, Istanbul, Turkey.

Much agricultural land is on erosion prone steep slopes where agricultural plots have been created through deforestation. The incidence of severe erosion is also relatively larger in areas where agriculture is practised without any soil conservation measures. Erosion has other negative impacts, such as reducing the life of dams through siltation and the inundation of lowland arable (and urban) areas with coarse materials.

Animal husbandry is mostly carried out on grasslands and ranges. According to the Rangeland Act (1998), 21.7 million ha is designated as *permanent pasture and rangeland.*[5] This figure covers only the rangeland, which are outside forestland. In the 1940s the pastoral area was given as 44.2 million hectares including forest rangeland. Today, this latter area, including its borders, is estimated to be around 1.5 million ha. The decrease in pastures has led to a concurrent increase in arable lands.

According to agricultural statistics[6] there are 10.7 million cattle and 35.3 million small livestock, 73% of which are sheep as well as many millions of poultry. This translates into 2.03 ha of *permanent grassland and pasture* per unit of cattle (PUC). When pastureland degradation is considered, the actual 'standard land available for grazing is about 12 million ha or 1.12 ha per PUC. Overgrazing as well as shrinkage in rangelands resulted in loss in fodder productivity and a decrease in meadow species from 26 to 5-6. [7]

Forests.

Forests cover about 27% of Turkey's surface area. However, according to recent surveys and estimates made by the Ministry of Forestry, productive forests only cover 48%, with

[5] "Ulusal Cevre Eylem Planı, Tarım ve Mera Arazilerinin Yonetimi", SPO, Ankara, Mart 1998.
[6] "Agricultural Structure 2000", SIS, Ankara, 2001.
[7] "Turkiye'nin Cevre Sorunlari '99", TCV, Ankara, Aralik 1998.

the remaining 52% being occupied by unproductive and/or degraded areas. BI Table 5 gives the current estimate of forest cover according to broad species categories or types and their productive state.

BI Table 5. Forest Area In Turkey.

Units: 000 hectares.

Forest state	High forest			Coppice	Total Forest Land (%)
	Conifers	Broadleaf	Total		
Productive	6,489	1,672	8,161	1,793	9,954 (48)
Unproductive	4,587	1,535	6,122	4,637	10,759 (52)
Total	11,066	3,207	14,283	6,430	20,713 (100)

Source. Konukcu, M June 1998. Statistical Profile of Turkish Forestry, SPO.

The forest mix is rich. Forty one percent consist of a mixture of five pine species, about 3% have four fir species, and 29% have up to 20 oak species. In addition beech covers 6.4%, oriental spruce 1.4% with the remaining 19% being occupied by one or two species. The annual sustainable yield (annual increment) is, on average, relatively low - 1.96 m^3/ha of stem wood or about 2.5 m^3/ha of total above ground volume. About 82% of what is considered productive area is found in high forests. Seventy-two percent of coppice is unproductive.

According to the 1997 census, there are 19,020 villages with a total of 7.1 million residents in or near a forest. There are 3,997 forest villages with a population of about one million in the provinces of the Anatolia Watershed Rehabilitation Project.

Studies reveal that from 1937 to 1995, as a result of illicit cutting and forest clearing for new farmland, unauthorized settlements and unofficial grazing, two million hectares of forest were converted to farmland and grazing areas etc. (or about ten per cent of all forest land). Although fuelwood consumption decreased by about one half between 1976 and 1999 from 27.8 million m^3 to 13.4 million m^3, the ratio of unlawful fuelwood cutting increased slightly from 44% in 1976 to 50% in 1999.[8]

Biodiversity.

The diverse climate, geology and soil structure have created a varied vegetative cover, in terms of species composition and characteristics, both spatially (horizontally) and by elevation (vertically). Southeastern Anatolia, the Mediterranean region, the area around the Salt Lake, and the Anatolian Transverse all have special importance in terms of plant varieties. There are three regions in terms of vegetation cover. The first is the "European-Siberian Region" which covers the Black Sea region and the central and northern parts of the Marmara region. Here, plants requiring moisture dominate along with forest trees. Second, is the Aegean-Mediterranean region, here vegetation consists of forest trees plus scrubs and a mixture of scrubs and steppe plants. Lastly is the Iran region where steppe plants dominate.

[8] "VIII. Bes Yillik Kalkinma Plani, Ormancilik Ozel Ihtisas Komisyonu Raporu", DPT, Ankara, Aralik 2001.

Turkey contains 75% of the plant species found in Europe. Cherries, apricots, almonds, figs, and tulips all originate in Turkey, as did the domestication of these and other plants. The flora includes many wild relatives of important commercial crops such as wheat, chickpeas, lentils, apples, pears, and pistachios. Among continental countries, Turkey ranks ninth in terms of biodiversity richness; over 33% of its flora are endemic. Studies indicate that there are 163 plant families covering 1,225 types, which in turn cover about 9,000 species. These grow naturally and about one third are endemic.

Turkey has about 120,000 invertebrates, 472 fish (192 of which are in inland waters), 426 birds, 8 turtles, 49 lizards, 36 snakes, about 20 frogs and 120 mammal species.

Population increase, overgrazing, allowing goats to enter forestlands, atmospheric pollution, alien species, climate change, unregulated gathering of plant and animal species, hunting, damage caused by pests, and forest fires all affect the structure of forest ecosystems and threaten biodiversity.

The meadows and range areas are an important component of the steppe ecosystem and they constitute 28% (21,745,000 ha) of the land. This figure was 44,300,000 ha in 1935 and 37,800,000 ha in 1950. Meadows have been destroyed by policies that encouraged these lands to be converted into farmland in order to meet the food demand of a growing population. Today, the total area covered by steppe ecosystems, which include meadows and marginal lands unsuitable for farming, is 28 million ha.

The reasons for the destruction of steppe lands and their ecosystems in Anatolia can be listed as follows. High population growth over the last 50 years with a consequent increase in consumption levels, overgrazing in the absence of meadow management, conversion of meadows into farmland, inappropriate agricultural practices, unregulated hunting, stubble burning, pollution, increased soil erosion, highway and dam construction, excessive gathering of plants of high economic value (especially medicinal plants) and poor or improper mining activities.

Nutrient Pollution.

The Black Sea is the largest anoxic sea in the world and is the sea most isolated from oceans. Today, the Black Sea is under threat from habitat loss, over fishing, pollution caused by sea transportation and land discharges, alien species, and eutrophication.

Pollutants carried by rivers flowing into the Black Sea are not caused by agriculture and animal husbandry alone. There are five main sources, although agricultural activities and the resultant application of fertilisers and pesticides comprise the most important components of the pollutant load to the Black Sea. The other sources of pollutants are domestic discharges, industry, solid waste disposal sites and the air.[9]

Chemical fertilizer demand for agriculture increased from 1,717 tonnes per year in 1995 to 2,207 tonnes per year in 1999. Sixty seven percent of this amount comprises

[9]. "Black Sea Environmental Priorities Study-Turkey," UNDP, N.Y. 1998.

nitrogenous fertilisers (100% N), 29% is phosphate fertilisers (100% P_2O_5) and 4% is potash fertilisers (100% K_2O). Due to (the recently abolished) agricultural subsidies, there was an increase in fertiliser consumption up to 2000.

Micro-catchments.

As previously stated, sixty micro-catchment (MC) areas were chosen from the many hundreds in the five large river systems comprising the Anatolia catchment complex. These sixty MCs were chosen after discussions with government departments in Ankara and the regions, representative bodies and the people living in the areas. The MCs were selected as a result of examining environmental and economic problems and opportunities and obtaining the cooperation of the local population to participate in the project. Out of the sixty MCs, six were chosen for examination as part of this REA

A preliminary baseline survey was undertaken in July 2002, to assess six (6) micro-catchments in the project. These micro-catchments are: Ilyaslı (Bafra/Samsun); Baglicadere (Zile/Tokat); Kazova (Tokat); Kabaktepe (Kayseri/Pinarbasi-Sariz); Orcan Stream (Turkogu/Karamararas); and Gogden (Mut). Information was collected on location, population, topography, soils, climate, hydrology, land use, flora and fauna and environmental problems. The size of these micro-catchments ranged from about 5,000 ha to 8,000 ha. And the population of rural areas (excluding towns) varied from 500 to 12,000. All this information is detailed in Annex 4. Below is summary of the existing environmental problems, with proposed solutions that the AWRP have suggested. These problems and possible solutions were discussed during village meeting in all six micro-catchments (Annex 4). The villagers were involved from the start in problem solving and proposing interventions to improve the environment and their well-being.

Ilyasli (Bafra/Samsun) MC (Kizilirmak).

Environmental Problems.

Pollution. In Ilyasli catchment area no observation of significance could be made on any serious pollution problem that may affect Black Sea and Kizilirmak Delta. However, there are at least two sources of pollution: Agricultural and Organic.

Agricultural pollution. This is related to chemicals such as agricultural pesticides and fertilizers used in tobacco fields and nurseries. In this area, pesticides and fertilizers are not used in line with any scientific analysis.
Organic pollution. Organic pollution comes from dwellings and animal shelters. Each household in the area is engaged in animal husbandry. Every day, manure is taken out of shelters and piled nearby. This practice involves risk of pollution both for soil and water as well as a threat to human health. Water with a high chemical load coming from irrigated plots and intensive horticulture areas of the Delta is discharged partly to wetlands through drainage canals or directly to the Black Sea.

Degradation. *Erosion.* Agricultural plots have been split into smaller parcels as a result of inheritance. Farmers think that contour tilling is uneconomic on such small plots so they plough in the direction of inclination, thus aggravating erosion problems. Since soil wash also increases the amount of soil nutrients carried away in colloids, another side effect is pollution and even eutrophication of wetland to the south of the Delta.

Forest clearing. This is prevalent. Roughly, 60 % of the forest cover is damaged or degraded. Apparently, this deforestation accompanied by erosion further accelerates the loss of topsoil and indirectly contributes to pollution. Forests provide ecological corridors for fauna in the area's micro-catchments. Further forest clearing will obviously end this migratory route and consequently the habitat of some animals.

Alternatives and Analysis.

Some scenarios have been developed to ensure more efficient and sustainable resource utilization in the Ilyashı catchment area without damaging or destroying existing natural resources. Priority has been given to field observations when developing these scenarios. Besides the status quo, three different scenarios have been developed to utilise the natural resources in a sustainable manner.

Scenario 1. *(Without Project).* It is assumed the status quo is maintained.

Negative environmental impacts:

- Erosion will increase and there will be a decrease in the soil's water holding capacity.
- There will be increases in the load of organic pollutants from domestic and animal wastes and an increase in the negative impacts on other eco-systems in the delta.
- Pollution in surface and groundwater resources will seriously threaten the safety of drinking water. Also, there may be increases in the incidence of waterborne diseases.
- There will be more frequent and adverse environmental changes in the landscape.
- Negative impacts on the flora and fauna of the area.
- As farmland expands (from cleared forests), there will be increases in both water consumption and use of chemicals.
- Decrease in carbon store and sequestration potential.

Positive environmental impacts: No such impacts actually or potentially exist.

Scenario 2-a. *(With Project).* Implementation of a manure management plans, and improved methods of dung storage and use.

Negative environmental impacts.

- No reduction in soil washed away since forest clearing and uninformed tilling practices continue.
- Wash out of nutrients in soil will continue.
- There will be more water and chemical consumption as forests cleared for farmland.
- The improvement to animal shelters and manure management will not change tobacco and wheat farming practices. As a result, there will be an increased use of insecticides as the immunity of pests increases specially in tobacco cultivation.
- Decrease in carbon store and sequestration potential.

Positive environmental impacts.

- Little, if any, organic animal effluent seepage into surface and groundwater reserves.
- Local people will obtain safer water from their wells.
- Risk of disease will decrease.
- There will be less use of chemical fertilizers since manure is used more efficiently.

Scenario 2-b. (+Scenario 2-a). Awareness building and training for farmers in practices relating to tilling and erosion control including minimum tillage; clarity as to ownership from cadastral work in forests; fencing to delineate forests with effective control preventing clearing for farmland; more trees planted outside forest; forests rehabilitated.

Negative environmental impacts.

- Increased use of chemicals, especially insecticides as a result of multi-cultivation.

Positive environmental impacts.

- No more newly gained farmland since forest clearance will stop.
- Besides the positive impacts of Scenario 2-b, nutrient leaching that may negatively affect the Kizilirmak Delta will decrease as a result of declining sedimentation.
- Erosion control and forest protection will enhance flora and consequently fauna is expected to flourish. Enriched biological diversity depends upon the protection of ecologic corridors connecting the area to its neighbouring catchments.
- Gradual reduction and reversal of soil deterioration over time.
- Increase in biomass production.
- Carbon sequestration enhanced due to improved fertilizer management.

Scenario 2-c. *(+Scenario 2-b).* The distinguishing feature of this scenario is that it encourages greenhouse vegetable and strawberry cultivation, both having a potential for development, in line with the principles of integrated farming. In a pilot programme, tomato and cucumber cultivation in greenhouses and irrigation is by the drip system.

Negative environmental impacts.

- The only negative impact is the pollution load that may emerge from the intensive use of chemicals by not following integrated farming principles. Comparing greenhouse cultivation to tobacco farming, chemical use will be less in the latter.

Positive environmental impacts.

- In addition to the positive impacts of the other two scenarios, this practice will create the chance of diversifying crop composition.
- New opportunities for manure management and vegetable and strawberry cultivation.
- The pressure on forests should decrease resulting from market conditions changes.
- If revenues increase as a result of alternative crops, farmers may be able to invest more in animal husbandry and the sanitary disposal of pollutants.

Conclusion. The Ilyasli catchment area, together with some micro-catchments around it contributes to pollution in the Kizilirmak Delta. This is one of the most important and valuable wetland eco-systems in Turkey. This points to the need for integrated catchment management. Four key processes are manure management, erosion control, forest

protection and support for alternative farming. Practices in only one of these will be no solution for natural resource protection in catchments and on a large scale. Also, there is need for market intelligence, environmental training as well as training of trainers.

Baglicadere (Zile/Tokat) Micro-catchment (Yesilirmak Basin).

Environmental problems.

Habitat Destruction. In the Baglicadere catchment, the destruction of natural flora is the most important environmental problem. Increased habitation, pasture destruction and hunting, resulted in the departure of the great bustard. Its disappearance is an indicator of extreme human pressure. Another striking indicator is grassland destruction with the wide distribution and dominance of astragalus species (un-edible to sheep) and the rare presence of such plants as thyme, wild barley and couch grass. Also, the shrinking of oak coppices can also be explained by the demand for fuel and fodder. People state that there is tangible habitat improvement after the banning of goats from forests in 1980.

These cumulative factors of land mismanagement, loss of flora accompanied by severe erosion are an environmental disaster. Especially in the northern parts of the catchment, many spots on the hills and slopes are barren because of erosion; even the parent rock is visible in parts. It is meaningless to talk about any ecosystem restoration in these areas.

Also, there is need to attach importance to other negative impacts of erosion, both inside and outside of the catchment. Sediment reaches irrigation and drainage canals, increasing the amount of nutrients in these canals and filling them up rapidly. One major problem faced by the State Hydraulic Works (DSI) is the difficulty in operating irrigation systems efficiently because of heavy run off from such catchments as Baglicadere.

Alternatives and Analysis.
The following are possible scenario activities designed to ensure sustainable utilization of natural resources in Baglicadere MC without any damage to its resources.

***Scenario 1**: (Without project).* It is assumed the status quo is maintained.

Negative environmental impacts:
- Further erosion and decrease in water holding capacity of the soil.
- Faster loss of biological diversity and disappearance of wild life habitats.
- Change in the landscape parameters.
- Loss in the efficiency and productivity of such natural resources as water and land.

Positive environmental impacts: No such impact can be inferred.

Scenario 2. *(With Project).* Forestry activities: (rangeland improvement, rehabilitation of forest pastures, soil conservation and afforestation). Activities by Rural Affairs: (2 ponds for farms, 6.5 km long concrete irrigation canal, 7 km long service road, 1 water reservoir, terracing, check dams, walls for protecting stream banks).

Negative environmental impacts:

- These planned activities involve some risks. One is the introduction of invasive and exotic species during rehabilitation, but attention will be paid to planting native species in forests and rangelands. Another risk is the possible change in the surface-ground water balance as a result of irrigation-driven storage of already limited water resources. Water release from upper areas should be planned to account for the water needs of ecosystems downstream; storage facilities should be operated accordingly. The assessment of water requirements downstream can be done by a local consultant. And recommendations made accordingly. A budget is provided for such special studies: (Section J EMP Consultancy Services).
- Studies of the area assessed the farming potential of village land and concluded that with the exception of 0.3 hectares in Sarac there is no suitable land for vegetables. Expansion is only possible through horticulture on steep-sloped land, which may accelerate erosion and encourage over-use of water.

Positive environmental impacts:

- Irrigation is best for fruit trees and for pastures. The introduction of walnut and Mahaleb cherry has income generating potential. Such plants may reduce the pressure on forests and increase farmer's participation in conservation activities.
- Sixteen km of fencing of rangelands is planned. In such areas, the best management method may be to wait for natural succession. One typical proof is the growth of wild barley in place of astragalus. This shows that even with a simple measure like fencing, many plant species may flourish and expand quickly.
- Terracing and check dam construction are important in erosion control. But farmers require training in cultivation methods and experiments with alternative crops.

Conclusion. Animal husbandry is in steady decline, but it is not be difficult to restore ranges within 10 years with effective rangeland management. It is essential that local people take part in the process so as to adopt and internalise their practices. In sum, accounting for the risks involved in the second scenario, the project will make invaluable contributions to the area and its sustainable resource utilization.

Kazova (Tokat) Micro-catchment (Yesilimak Basin).

Environmental Problems.

There are two major environmental problems: pollution from agricultural activities and sedimentation caused by erosion in the upper parts of the catchment.

Agricultural Pollution. There is intensive farming in the area, mainly consisting of vegetable cultivation. Pesticides are also used haphazardly and fertilizer use is not based upon any soil analysis. According to local authority personnel, there are fish deaths in Yesilirmak, especially around Amasya. This usually takes place during sugar production period in Turhal, probably because of a drastic decrease in dissolved oxygen due to organic waste discharges. If the sugar factory fails to introduce a biological treatment facility and necessary measures are not taken to prevent pollution in the Yesilirmak upper reaches, it is inevitable that agricultural and domestic pollutants will have a cumulative

effect and create serious pollution problems in the Black Sea.

Erosion. Erosion as a problem does not originate in the Kazova micro-catchment. Sediment washed down from unprotected upper catchments creates problems in Kazova. Sediments fill and clog the drainage canals. Another erosion problem, according to the regional directorate of DSI, is caused by meanders in the Yesilirmak encouraging excessive sedimentation. Meanders, in turn, block river rehabilitation works. However, contrary to this assertion of the DSI, many practices in the world indicate that meanders play an important role in river rehabilitation.

Alternatives and Analysis.
Scenario 1: (Without Project). It is assumed present practices and habits are maintained.

Negative environmental impacts:
- Intensive farming, mainly vegetable cultivation, using considerable amounts of fertilizers and pesticides increases pollution in Yesilirmak.

Positive environmental impacts: No positive actual or potential impacts.

Scenario 2: (With Project). The following activities are proposed: Promoting the use of organic fertilizers especially animal dung; encouraging soil analyses and introducing fertilizer prescriptions based on these analyses; encouraging organic farming and establishing integrated agricultural action stations; control of sugar factory effluents.[10]
Negative environmental impacts: No negative impacts are anticipated.
Positive environmental impacts
- Reduction of agricultural chemicals mixing with surface and underground water.
- Preventing the excessive accumulation of plant nutrients and toxic chemicals in soil.
- Organic crop production and protection of insects not harmful to crops.
- Effluent control from sugar factory reducing pollution in the Yesilirmak/Black Sea.
- Shelterbelts and riverbank protection all improve the microclimate.

Conclusion. Activities envisaged in the Kazova MC should be based upon an integrated approach and the active cooperation of projects and stakeholders from different catchments and areas. The plans for animal shelters along Dazya brook is closely linked to the Kazova MC project. In the Kazova project, the involvement of the DSI and irrigation unions as partners will be useful. An important activity is the initiation of training and awareness programs in rational use of irrigation water, including water saving methods. Providing irrigation demonstrations, devising training activities and organizing study tours is essential. Positive environmental impacts will be forthcoming in the Kazova catchment area and the Yesilirmak River.

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[10] There is the existing Water Pollution Control Regulation for controlling effluents. The problem is compliance with the laws. This and many other sugar factories are State owned, but because these factories are at the end of their economic life, the government is reluctant to invest in proper treatment plants. The government is the conflicting position of being both the polluter and controller: also the MoE does not have the inspection capacity. Therefore, the problem is mentioned here, but it cannot be solved by the Project. However, the problem is great enough to be the subject of another, independent study.

Kabaktepe (Kayseri/Pinarbasi-Sariz) Micro-basin.

Environmental Problems.

Erosion. The causes of erosion in the Kabaktepe Micro-catchment, result from excessive fuelwood cutting by local people and nomads and forest clearing for agricultural land. In addition, the melting snow encourages slope wash, leading to gully erosion.
Forest clearing. The new fields are usually located on relatively steep slopes and have thin soils. Vertical tilling leave ruts, some of which turn into gullies. In addition sheet floods on the bare soil transports soil to the river basins.
Overgrazing on the pasture areas. Overgrazing on the pastures has been practised for ages without interference and any rehabilitation. When the fine-grained soil on the inclined pastures loses its vegetation, the soil is easily removed by sheet and gully erosion. Steps were taken to ban nomads and the pasture started to recover, but the ban has been reversed. Agreement needs to be made with nomads to restore the pastures.

Agricultural and Organic Pollution: The former is mainly derived from pesticides and fertilizers used in cereals and fodder fields. Organic pollution is derived from dwellings and from animal manure. In addition, there is no village sewage system. Pit seepage might cause groundwater, and in turn spring water, contamination.

Alternatives and Analysis.
Alternative scenarios have been projected for testing the feasibility of project proposals.

Scenario 1. *(Without Project).* It is assumed present practices and habits are maintained.

Negative environmental impacts:
- Erosion will accelerate on newly cleared forest areas as well as on forest pastures.
- The pastures will become more infertile and inedible species become abundant.
- Farmers keep growing wheat and barley, which are not as productive as fodder.
- Farmers keep fallowing, thus exposing soils to erosion.
- Villagers will keep harvesting grass once a year, which is insufficient for their own need. As a result, the goats will be fed on forest tree fodder.

Positive environmental impacts:
- No such impact actually or potentially exists, except the free flowing spring waters feed the natural vegetation in the valleys.

Scenario 2. *(With Project).* Forestry activities: (rangeland improvement, rehabilitation of in-forest pastures, soil conservation and various forestry initiatives). Activities by Rural Affairs: (7 ponds for farms, 15.7 km long concrete irrigation canal, terracing). Agricultural activities: (fallow reduction, fodder crop production, improvement of rangelands outside the forest, environmentally friendly agricultural practices, apiculture).

Negative Environmental Impacts.
- Soil loss might continue if the farmers do not alter their practices to contour tilling.

- Some natural vegetation in valley bottoms might be deprived of enough water. Again, a local consultant could undertake this risk assessment and make recommendations. Money is provided for such studies in the EMP (Section J)
- There might be an environmental risk at the northern foot of Kabaktepe hill, which is subject to landslides. However two irrigation ponds are planned in this zone to collect spring water and reduce the risk. But if the fields, which are located in the landslide zone, are irrigated by furrows they might trigger new slides. A solution is to use drip or sprinkler irrigation and this will be demonstrated.
- More fertilizers and pesticides will be used because irrigation will be expanded.

Positive Environmental Impacts.

- Erosion will be diminished since the fields on the upper slopes will be abandoned.
- The pastures will be more fertile and productive due to fertilizers and re-vegetation.
- Through covering the soil, sheet erosion by slope wash will decline to a minimum.
- Total annual agricultural production will increase due to a decrease in fallow land.
- Most fields will apply mixed farming methods -wheat/fodder or chickpea/fodder.
- Hybrid seeds will increase yields of grain and fodder, and maintain soil stability.
- Hybrid trifolium in the newly irrigated fields will allow up to three crops per year.
- Beekeeping will facilitate biodiversity enrichment.
- Through improving vegetative cover, carbon (C) sequestration will increase.

Orcan Stream (Turkoglu/Karamararas) Micro-catchment (Ceyhan Basin).

Environmental Problems.

Degradation. Forest/pasture degradation due to tree cutting, forest clearance and overgrazing are the major environmental problems.

Erosion. Severe erosion has resulted from over cutting of fuelwood especially on the southwest part of the micro-catchment. The rock composition also fosters erosion in this section. Thus, slope wash-water induces gully and rill erosion. The other parts of the basin erosion occurs in the unresisting and impermeable Paleozoic rocks. All these areas are planned as 'Forestation for Soil Prevention or for Maquis Rehabilitation.'

Alternatives and Analysis.

Alternative scenarios examine the enhanced conditions through project implementation.

Scenario 1. *(Without Project).* Assumed that present habits and activities are maintained.

Negative environmental impacts:

- Erosion will be accelerated in most areas.
- Pastures will gradually be unprofitable because of overgrazing.
- Degradation of forests will continue.
- Microclimate will change unfavourably and wild life habitats will shrink.
- Animal husbandry will decline because of insufficient fodder production.
- Annual production of cereals and fodder will not increase due to fallow.

- Quantity of water resources is likely to decrease.

Positive environmental impacts: No actual or potential exist under the present system.

Scenario 2. *(With Project)*: Forest activities: (forest and habitat rehabilitation, in 1/3 of the total catchment, pastureland rehabilitation, grafting of wild pistachios). Agricultural activities: (decrease in fallow land with alternate farming; apiculture; promotion of stall feeding; drip and sprinkler irrigation; promotion of sainfoin and vetch). Activities of GDRS: (2 ponds, irrigation ducts and pipes in 690 ha of fields).

Negative impacts.

- As irrigated land increased, intensive cultivation might lead to pollution.
- If no proper irrigation drainage, likely increase in salination and water logging etc.
- Cedar and red pines instead of original oaks might change the soil characteristics.

Positive impacts.

- Erosion will be reduced.
- In habitat rehabilitation areas, partridge and other bird population will increase.
- Farm trees and shrubs producing various products reduce the pressure on forests.
- Income generation through irrigation expected to reduce the pressure for fuelwood.
- C sequestration by woody biomass/grass and by soil increases over time.

Turkey feeding by grazing is already done in some villages. Turkey grazing in the fields will diminish burning of stubble; this is an issue on agricultural land.

Gogden (Mut) Micro-basin (Goksu Basin).

Environmental Problems.

The greatest problem in the area is accelerated erosion. More than 90% of the land in the MC is subject to severe erosion. Only about 4% of the river basin is productive forest while 33% is degraded. Pastures constitute about 30% and are severely degraded.

Alternatives and Analysis.

The following are possible scenarios that can be developed to ensure sustainable utilization of natural resources in Gogden MC without damaging the resources.

Scenario 1. *(Without Project).* It is assumed present practices and habits are maintained.

Negative environmental impacts:

- Further erosion and decrease in water holding capacity of soil.
- Faster loss of biological diversity resulting in the disappearance of wild life habitat.
- Loss of fertile soil, change in texture of soil.
- Decrease in water resources, (both surface and ground).
- Decrease in carbon sequestration potential.
- Accelerated siltation in Kayraktepe Dam, located downstream from Goksu River.

Positive environmental impacts: No such impacts can be inferred.

Scenario 2. *(With Project).* Forest rehabilitation (cedar and oak), pasture rehabilitation, land reforested for soil conservation. Agricultural initiatives include irrigation, environmentally friendly agricultural practices, i.e. ecological agriculture, pastureland management, fallow reduction, horticulture, appropriate use of marginal lands, increased silage production, demonstrations on the introduction of new crops.

Negative environmental impacts:

- Invasive and exotic species may be introduced during forest and rangeland rehabilitation activities. But emphasis will be placed on promoting native species.

Positive environmental impacts:

- Erosion will be reduced due to reforestation and regeneration of rangelands.
- The pastures will be more fertile and more productive due to fertilizers and re-vegetation. Through re-vegetation, sheet erosion will decline to a minimum.
- Fertile soil loss will be reduced since vegetative cover will prevail yearlong.
- Production of silage will keep the livestock in barns instead of grazing pasturelands.
- Irrigated hybrid trifolium will give three yearly crops and reduce grazing pressures.
- Improved beekeeping will allow for biodiversity enrichment.
- C sequestration will increase both in woody plants/grassland and in soils.

The Project will draw up management plans for each micro-catchment. The plans for four of the above six MCs that were visited are being complied at present by GDRS and these will be inserted into this document at the end of the main report. These plans are for Bagicadere, Goden, Kabaktepe and Orcan.

The above examination of six micro-catchments brings out several environmental issues that are common throughout the area and in other watershed areas in the country. They can act as a guide when tackling the various environmental problems that confront the project team. These issues are summarized below in BI Table 6.

BI Table 6. Major Environmental Issues and Proposed Mitigation Measures in the 6 MCs visited by the national Consultant.

Issues	Causes	Effects on Environment	Actions or Mitigation Measures
Habitat destruction: forests.	Clearing land for agriculture, over cutting of trees for fuel, poles and timber, over-grazing of farm animals in forest areas.	Loss of biodiversity, wind and water erosion, excess surface water run-off in spring, diminution of water retention capacity, intermittent stream flow, reduction of carbon sequestration, loss of migration routes for animals.	Reclaiming forest areas through restoration of ground cover, especially with indigenous tree species, improved management of existing forest areas, limiting grazing by rotation and exclusion, and where appropriate terracing etc. Determine production capacity of wood and non-wood products and limit off-take to sustainable supply. Reclaiming farmed areas on steep slopes or putting them under permanent crops. Increase agricultural productivity through improved rainfed farming and expanded/improved irrigation farming, thus decreasing pressure to clear forests. For irrigation storage in forest areas, plan system and ponds/reservoirs to negate any possible damage.

BI Table 6 cont. Major Environmental Issues and Proposed Mitigation Measures in the 6 MCs visited by the national Consultant.

Issues	Causes	Effects on Environment	Actions or Mitigation Measures
Habitat Destruction: rangelands.	Clearing land for agriculture, over cutting of shrubs for fuel, over-grazing of farm animals.	Loss of biodiversity, wind and water erosion, excess surface water run-off in spring, diminution of water retention capacity, intermittent stream flow, reduction of carbon sequestration.	Reclaiming restoration areas through restoration of ground cover, especially by exclusion of animals with fencing or other means until area recovers, but also some limited re-seeding. Improved management of existing areas, by limiting grazing to carrying capacity and through rotation of animals. Training & demonstration. Reclaiming farmed areas on steep slopes or putting them under permanent crops. For irrigation storage in rangeland areas, plan system and ponds/reservoirs to negate possible damage.
Erosion at the farm level.	Poor farming practices such as farming on steep slopes, ploughing up and down the hill, poor or inappropriate crop choice, leaving land without cover during periods of high precipitation. Furrow irrigation, especially on slopes. Poorly maintained canals/channels.	Wind and water erosion, gully formation, loss of topsoil, habitat destruction down stream through flooding and inundation with soil, sand and coarse materials.	Environmentally friendly farm practices such as contour ploughing, minimum tillage, correct species choice. Putting steep slopes under grass or perennial crops. Drip or sprinkler irrigation used. Provide training and demonstrations. Provide training and demonstrations in above practices and in land-use planning. Promote farm visits etc.
Incorrect use of CCA (pesticides, herbicides and insecticides) .	Poor and variable application of CCAs. Some banned CCAs may be used. Poor spraying methods and the inappropriate disposal of CCA containers	Excessive CCA in soil and water can adversely affect flora and fauna (including human beings). This can have a chain reaction on plant and animal life. Residues from excess use on plants and animals can affect human health through food chain. Poor spraying methods can affect person applying the CCA. In appropriate disposal can affect the soil and/or surface and ground water.	Only use internationally approved CCAs. Apply correct dosages using suitable dispensers and wearing correct clothing. Store CCA in appropriate places and dispose of containers in recommended ways. Practice alternatives to CCA such as integrated pest management (IPM). Provide timely training and demonstrations in all the above aspects.
Incorrect use or overuse of fertilizers	Overuse or incorrect use of inorganic and organic fertilizers affects ground water including well water and surface water.	Ground and surface water may contain high levels of N & P and colloids. High levels of N in well water may have adverse health effects. Lakes and the delta region could suffer from eutrophication. Irrigation canals could become clogged with waterweeds.	Soil testing facilities available for farmers. Advice given on the correct application of fertilizers. The use of organic fertilizers demonstrated and encouraged. Crop rotations with green manure demonstrated. Appropriate fertilizer and application time(s) recommended. Training given.

BI Table 6cont. Major Environmental Issues and Proposed Mitigation Measures in the 6 MCs visited by the national Consultant.

Issues	Causes	Effects on Environment	Actions or Mitigation Measures
Organic pollution from farms, beef fattening sheds, chicken enterprises etc.	Poor and inappropriate storage and disposal of solid and liquid manure and chicken waste, especially along watercourses.	Seepage of liquid and solid animal waste into streams, rivers and ground water including well water. Pollution of water bodies, leading to eutrophication. Some methane venting Noxious smells at times. Can encourage communicable diseases.	Demonstrate proper storage and disposal of liquid and solid animal wastes. Promote the use of organic fertilizers. Train farmers Try to get funding to demonstrate biogas digesters at chicken farms and in beef fattening enterprises
Pollution from Agro-industries (excluding cattle sheds and chicken farms).	Poor or lack of effluent control measures. Little if any inspection of factories. Non-compliance with the law. Effluents discharged into water bodies or dumped by roadside.	Affects surface water, leads to eutrophication. Some seepage into ground water. Noxious smells at times. Can encourage communicable diseases	Assist MoE in drawing up plan to enforce existing laws. Look for funding to recruit and train MoE personnel. Look for sources of funds to assist industries to introduce effluent control measures.

E. Lessons from Previous Ongoing Projects & Studies.

The present project is built upon lessons from the East Anatolia Watershed Rehabilitation project, (WB Implementation Completion Report [ICR] - March 2002a). This project covered eleven (originally 3) provinces in the upper Euphrates watershed. The specific objectives were to help restore sustainable range, forest and farm activities in 54 selected micro catchment, covering a total of about 400,000 ha. This should lead to reduced soil degradation, erosion and sedimentation in three major reservoirs as well as increasing productivity and income of the people. A participatory approach was used, designed to strengthen farmers' planning and implementation capacity, while improving the responsiveness of rural service agencies to farmers' needs. The expansion of the project enabled the Borrower to test the "Participatory Watershed Management" approach in different socio-economic settings and to expose more provincial agencies to the approach. The total project cost was US$ 77 million with a lifetime of 8 years from July 1993 to September 2001. In addition, there was a sister GEF grant funded project of US$ 5.1 million on the "*In-situ* Conservation of Genetic Diversity." This commenced in July 1993 and finished in September 1998. It will be discussed separately.

From studying the relevant documents and from a consultative meeting held in Malatya in October 2000, the lessons learnt from the EAWRP cover a range of proposals. These are summarized below.

1. A participatory project cannot be target driven.
2. Major government ministries can collaborate effectively in delivering services at the field level.
3. The project should operate in unambiguous legal conditions.
4. Land ownership problems should be solved before the start of intervention.

5. Local community participation in the activities (cash and/or in kind) is crucial for the sustainability of the initiative.
6. Design and implementation should build on existing local technology and capacity.
7. A project of this kind needs social and extension skills.
8. All stakeholders need to be included.
9. One of the best training methods for AWRP staff would be site visits to EWRP areas to obtain information from provincial staff and beneficiaries on appropriate practices.
10. Training should be timely and appropriate.
11. The project design must ensure that the time allowed for participatory planning and implementation is sufficient and likely to be efficiently utilized.
12. The project design should be such as to facilitate the inclusion of all necessary sources of expertise.
13. Before participatory planning, social, financial and technical opportunities and constraints should be thoroughly identified by the project/provincial staff.
14. There must be adequate time allowed for an integrated and participatory planning process to identify environmentally and cost effective practices appropriate to the local circumstances, i.e. cultural, financial, physical and social.
15. Sufficient time should be devoted to tapping indigenous knowledge.
16. Appropriate demonstrations are of prime importance for new methods or applications to be introduced at specific locations.
17. Monitoring and evaluation should be sustainable and include data on outcomes.
18. Technical lessons learnt included:
    - cost-saving innovations in soil conservation and irrigation technology;
    - rangeland improvement by simple enclosure and protection as compared to mechanical interventions plus re-seeding and fertilizer application;
    - fruit tree upgrading by grafting rather than planting; and
    - the need for good seed stock for direct sowing and tree seedling production.

From an environmental viewpoint, the goals of the project were to:

i) increase the plant cover in forests and rangelands to at least 40% from an estimated 10% so as to decrease soil erosion and reduce siltation in the large reservoirs;
ii) improve farming practices, again to reduce erosion and improve soil quality; and
iii) make the various land uses more productive and ensure sustainability by at least matching supply to demand.

One of the M&E recommendations was to include data on outcomes. Provision was made to monitor water quality, but this was not undertaken. It is therefore of concern that in the World Bank's EAWRPs Staff Appraisal Report (WB 1993) it is stated that *"the measurement of **secondary benefits** in terms of run off, soil loss, stream flows and sediment discharge is beyond the scope of the project at this stage."* (Annex 7 Page 1 Paragraph 2). A principal concern when formulating the project was to decrease erosion and therefore the measuring the above indicators should have been of **primary importance**, for this would point to the degree of success of the project.

This new project must monitor the above indicators from the outset in order to determine the scale of the project's success both from an environmental and an economic point of

view. Also, the quantities of N and P in soils and water should be measured as well as faecal matter and herbicides/insecticides in water. This is necessary in order to reduce excess quantities of these substances, if any, so as to lessen eutrophication in rivers, lakes and seas, improve the quality of water for drinking and other purposes and assist farmers by advising them on the correct application rates for fertilizers etc.

Other aims of the project are: to put the land under its most environmentally appropriate use; to increase the productivity of the forests, farms and rangeland; and to ensure that the land and its products are used sustainably. Much of the area in the Anatolia watershed has been over-exploited and some has been inappropriately converted to arable farming. All this has led to decreasing returns and a continuous deterioration of the land. This not only affects the immediate area, but also can and has caused damage to property and farmland downstream through flash flooding, the washing away of topsoil and inundating land with coarse material. In order to ensure sustainability, supply and demand estimates for the different crops should be undertaken. While the EAWRP undertook surveys of the demand for fuelwood, poles, timber, food and feed, no estimates appear to have been made of the original growing stock and yield of trees nor the performance of the various tree planting and direct sowing initiatives. Provision was made to undertake such measurements, but these were not done. Without such indicators it is difficult to judge the sustainability levels for forest products and to propose measures and options to balance demand with supply.

The completion report of the EAWRP does indicate the economic returns from the various interventions. Those for arable agriculture are based on crop yields before and after the project's initiatives, where as those in the forestry sector are based on growth models, without any field measurements. Therefore, without actual measurements it is difficult to place much confidence in the results. It can be argued that the project trees will have only been growing for 8 years at most, but measurements could and should be taken and compared to the growth patterns of similar species in other parts of Turkey. From such measurements and comparisons, predictions can be made and then compared to the models. Even though the EAWRP has been handed over to the government, it is strongly recommended that the various interventions are measured periodically and records are kept of removals of wood and non-wood products. This would be of importance to the EAWRP not only to determine the sustainability of trees inside and outside the forest, but also to act as a pointer for the present AWRP.

Another point not covered under the EAWRP, but of relevance is carbon sequestration. In the Bank's Project Concept Document (PCD) for the AWRP, (WB. 2001a) it is stated that the proposals "are consistent with the GEF Operation Program 12 'Integrated Ecosystem Management' by reducing threats to biodiversity and promoting carbon sequestration." (Page 4, Paragraph 3). In order to measure the quantity of carbon sequestrated by the various initiatives, it is necessary to undertake a baseline survey of organic carbon in biomass and soils at the start of the project and at intervals throughout the project's lifetime and beyond. For trees, this means undertaking inventories at regular intervals and for range and arable lands the yields of grass and crops can be measured. It also means that organic soil carbon should be measured periodically. This

information will provide data on the amount of additional organic carbon sequestrated under the different land uses. If it is significant, then the country could include it as an offset measure in their carbon accounting or consider it for carbon trading.

In summary, the EAWRP did not undertake sufficient M & E, especially baseline surveys of existing land use conditions before the project commenced and monitoring the progress of the various interventions. This must not occur in this project.

The GEF funded *In-situ* Conservation of Genetic Diversity project in the East Anatolia Watershed Rehabilitation project area had five components.

1. Site surveys and inventories of ecosystems to determine suitable habitats and species for gene preservation.
2. Selecting and protecting 'gene management zones' (GMZ) to preserve targeted wild relatives of specific annual and perennial species.
3. Building a database of existing and generated information and incorporating this into a central data management plan.
4. Help formulate a 'national plan for *in-situ* conservation' of wild crop relatives and forest genetic resources in their own habitat.
5. Provide institutional strengthening to government and allied bodies.

The project successfully completed all the five components and 22 GMZ were established and maintained. A GIS centre was fully staffed and equipped, with training given to the staff. The sustainability of such a centre was questioned in the Completion Report (ICR. WB 1999) but the AWRP could and should use the services of this centre.

The key lessons that were learnt from this project are as follows.

1. Concerned government agencies must work together if *in-situ* conservation is to be successful.
2. The local population must be informed about the activities of a GMZ and participate in its management.
3. For technical projects such as this, sufficient and up-to-date training and retraining is a priority. A scientific advisory committee could provide the necessary guidance.
4. The project implementation committee and the inter-ministerial steering committee are effective mechanisms to assist project agencies with limited experiences of working together.
5. Continuity of the task team by the donor and recipient is extremely important.
6. To avoid delays etc. in donor/World Bank procedures, the implementing agency should maintain a core team equipped with the necessary skills.

From an environmental viewpoint, the first two points are the most pertinent. In some MCs of the AWRP, there are areas that should be preserved because they:

- contain endangered or rare plant species;
- are a source of seeds or cuttings from 'superior' or 'plus' plants;
- contain landraces that could provide useful genes for crop improvement programs;
- have potentially useful species, such as medicinal and herbal plants, that can be managed *in-situ* or used as a source for *ex-situ* production;

- are part of larger areas that have potential for wildlife conservation and tourism.

The local population could identify such 'hotspots' including gene management zones and be involved in their planning and management.

While this '*in-situ* conservation of genetic diversity' project was successful, there was no mention about its usefulness to the sister EAWRP. Yet one complaint of the EAWRP was the poor genetic quality of much seed supplied by the local population. The '*in-situ*' personnel should have been able to pinpoint 'plus trees' and other superior plants and advise the project to collect seeds/cutting from such sources or pay a premium to the locals that collected seeds from these sources. This should be pursued under the AWRP.

Another on-going project is the GEF II: Biodiversity Conservation and Natural Resource Management Project executed by the MoF (GDNP) and the MoE. The goal of the project is sustainable conservation of biological diversity and ecological integrity in selected forests, wetlands, steppe and alpine ecosystems that are representative of Turkey's four major bio-geographical zones. The project objectives are summarised below.

- To establish effective, inter-sector, participatory planning and sustainable management of protected areas and natural resources at four selected biodiversity conservation management sites.
- To build national and legislative capacity to facilitate replication of these activities.

The project activities include monitoring and structuring of biodiversity information systems, as well as the integration of biodiversity conservation concerns into forest management plans. The AWRP should be linked to this on-going project in relation to biodiversity inventories at project sites, the integration of biodiversity conservation concerns in the planning stage and gathering baseline information vis-à-vis endemic species and sensitive habitats.

Regarding the GEF sub-component, there is an on-going GTZ assisted capacity building project in the MoE. The project is being implemented in Bursa, (an agriculture/industry province) and Mugla (a tourist resort province), to encourage 'a systems approach' in environmental management. Activities related to establishing a structure for pollution prevention, enhancing coordination, developing and implementing environmental monitoring systems, and encouraging public and private sector participation will be supported. The project started in April 2000 and will finish by April 2003. The lessons learnt by the MoE could be of considerable use to the GEF sub-component.

Background information was prepared for the AWRP preparation mission (3-17 June 2002). This information consisted of a handbook (WB. 2002b) and statistical data on the proposed MCs by province, a menu of activities, the components of these activities and the cost of each component etc., (WB. 2002c). The handbook included the Project Concept Document (PCD) for the AWRP (WB. 2001a) and the ICR for the EAWRP (WB. 2002a). The ICR for the EAWRP has been dealt with above and will not be discussed further; thus, only the environmental concerns of the PCD will be summarized.

The main sector issues relating to the environment are:

1. *Degradation of the natural resource base.* This has occurred through over-use of the natural resources and the inappropriate use of some areas. In consequence, most land suffers from erosion, leading to loss of topsoil, flash flooding, sedimentation and deteriorating productivity from the land. Biodiversity quality and quantity has diminished as well as a loss of organic carbon from the biomass and the soils.
2. *Intensive input use for agricultural production.* On some farms, there has been an excessive use of fertilizers and pesticides/herbicides, while some manure has been discarded into water bodies. This has affected ground and river water making some drinking water unsafe and causing eutrophication in ponds, streams, rivers, lakes and ultimately in the delta area of the Black Sea. Again this has led to decreased biodiversity, and polluted drinking and other water.
3. *Nutrient flow from major watersheds to the Black Sea.* Apart from overuse of organic and inorganic fertilizers on some farms and the discarding of organic fertilizers into water bodies, a major source of dissolved nutrients in water bodies flowing into the Black Sea is from agro-industries. Most of these industries do not treat their effluents or treat them inadequately before discharge into streams, but some manure is used as fertilizers on agricultural land etc. However, the application rate is not controlled. In consequence, most of the effluents finish up in water bodies flowing into the Black Sea with the environmental consequences as mentioned above.
4. *Inadequate policy and regulatory capacity towards meeting EU standards.* Turkey is a candidate country to join the EU, but even if it were not, it should, in its own interests, comply with EU standards. These include complying with the EUs environmental *aquis,* (especially regarding water quality and waste management and their monitoring) and adopt the Environmental Impact Assessment directive, particularly the nitrates' directive.

The PCD indicates that the AWRP will fulfil a number of global environmental objectives namely 'climate change' and 'improved international waters quality through nutrient reduction.' These will occur through appropriate land use, increasing biomass cover, especially tree planting and increased vegetation on rangelands, ecologically sustainable land use, appropriate use of agricultural chemicals and fertilizers and improved livestock/agro-industry practices. Not mentioned, but as important, is biodiversity protection on all land-use classes including agriculture.

The PCD states that the monitoring of these environmental indicators should be an integral part of the project.

The descriptive and statistical information that was provided with the Preparatory Mission handbook described 38 main activities (WB. 2002c). Some of these activities have several options such as those under agricultural terracing, agronomic package, environmentally friendly agricultural techniques and irrigation. All these options have been screened for their positive, negative and neutral environmental effects. In addition, the environmental effects caused by agro-industries are also examined. These form the basis of environmental screening described in the next section (Section F).

The information about agro-industries was obtained from field visits and from a consultants document for the AWRP entitled "Design of Village-level Manure Management and Handling Systems" (J P Metcalfe June 2002). This document specifically refers to the GEF component.

Similarly four other documents provided background information for the GEF component. These are: Water and Soil Pollution (MoE - CKOK & MARA - KKGM, April 2002); Design of Water and Soil Quality Monitoring System (Kolonkaya N., 2002); Agricultural Profile, Pollution and Erosion Problems of Corum, Amasya and Tokat Provinces: C Okan & N Durutan trip report including a MARA document (WB 2001c); and Household Questionnaire for the GEF Component of the Anatolia Basin Project (Surkal Ltd, Ankara, May 2002).

One consultant's document of significance to the REA is the report on Monitoring and Evaluation for the AWRP (F. M. Anderson and D. Kanatli, June 2002). This report discusses the M&E requirements for all the activities in the project area, including environmental monitoring, both for micro-catchments and for the GEF components. The primary objective of M&E is to track the performance of project initiatives so as to provide objective evidence of the quantity and quality of implementation and the impact of the Project as a whole. The report stresses the importance of collecting baseline information and listing key performance indicators (KPIs) or objectively verifiable indicators (OVIs) that can be used to judge the impacts of various interventions compared to the baseline data. A distinction is made between outcomes (short-term) and impacts (long-term). For example an outcome could be the planting and establishing 1,000 ha of *Pinus nigra* on bare land over a period of five years in a single MC. The impacts of such a planting should be the reduction of erosion, improved stream flow, increases in biomass capital and yield, additional carbon sequestration in wood and soil and increased flora and fauna. Several of these impacts may not become fully apparent for several years and up to 50 years for the tree crop, half the nominal rotation age of *P. nigra.*

To quantify the impacts, measurements of all or some of the most important factors should be taken. A baseline survey must be performed at the outset and measurements taken at specified intervals. Because of the long-term nature of this particular intervention, provision has to be made to continue taking measurements beyond the lifetime of the project. In addition, measurements could be taken in other more mature *P. nigra* stands outside the project so that projections can be made of the likely impact of this intervention over time. This is why it is important to undertake measurements on the interventions in the EAWRP, even though the project has been handed over.

Of course, the planting of 1,000 ha of pine may be nullified if, in the same or another MC in the AWRP, a similar area of pine is cut down and converted to pasture or arable agriculture. Therefore, account must be taken of all land use changes, to determine the net changes, remembering that clearing mature stands of trees for other uses may have a greater (negative) impact on say carbon store, even if a similar area is planted.

The M&E report recommends that a full-time Evaluation Officer be appointed as well as a Special Studies Advisory Group (SSAG) that will have primary responsibility for the commissioning and conduct of studies concerned with assessment of the AWRPs impact. It also states "The overall GEF program will require staff in each of the four GEF provinces to oversee and manage their M&E activities. These Provincial staff will be backstopped at Ankara in the MoE and KKGM by staff fully familiar with the needs for M&E. These Ankara-based groups will incur support costs to oversee their Provincial teams. The costs of these defined Ankara and Provincial staffs should be identified and allowed for in the Project's budget." These recommendations are endorsed for the REA. It should be stressed that the monitoring of environmental indicators are not to be treated any differently from the monitoring of other indicators in the Project, in other words they should be viewed as an integral part of the whole monitoring process. The report recommends that at least 2% of the Project's budget be set aside for M&E purposes and lists the requirements for such a unit. This is endorsed in this report.

The M&E report states that while micro-catchment plans have been standardized for AGM, GDRS and TUGEM (and is on compact disc [CD]), the MoE and KKGM are not yet involved to this level of MC planning. It is strongly recommended that the MoE and KKGM personnel are trained in the standardized MC process and that they be fully integrated into the MC teams. Even though the involvement of MoE and KKGM is at present limited to 4 out of the 13 provinces, they should become involved in all provinces. After all, the results of the GEF initiatives on the appropriate use of organic fertilizers, soil testing and improved farming practices such as minimum tillage have direct applications on all MCs. Likewise the mapping needs for the GEF component should be similar if not identical to the mapping needs of the AWRP.

The report discusses the risks involved in the M&E system. It states: "The newness in Turkey of field-level interventions with an environmental focus has some risks for the Agencies involved. Where possible, these risks must be managed so their effects on overall Project result are minimized. Effective and timely inter-Agency collaboration will be a key way of identifying and addressing problems quickly and efficiently. The M&E system devised to support this work must be an effective tool to aid this collaboration. Aspects of the M&E system concerned with environmental activities will evolve during the Project's implementation. However, any lost opportunities for improving the system when such improvements are indicated will inevitably reduce the impact and learning from the Project. Close collaboration from the beginning of the Project between the staff of the KKGM, MoE and the M&E Unit is a key consideration."

It goes on to state "A successful M&E system GEF program will track the interventions sufficiently rigorously to allow favourable results to be taken up by follow-on projects concerned with the same issues. Adequate baselines, input tracking and output, outcome and impact assessments are all required."

While this REA lays down baseline and follow-on activities for M&E, they are not rigid and should be modified in the light of field experiences. This is where the advice of the proposed Evaluations Officer and the SSAG may be critical. There are twenty-one (21)

recommendations made in the M&E report (Appendix 6). These recommendations are fully endorsed for the REA with the proviso that OVIs for the AWRP, which should have been defined and agreed by all partner Agencies by the end of July 2002, may be modified as a result of this REA. To date (September 2002), no additional OVIs have been submitted by partner agencies to those given in the M&E report Appendix 2 as examples. Therefore, additional OVIs required for environmental M&E are suggested in the M&E plan of this report (Section I).

The monitoring of soil for the hydrogen ion concentration (pH), nitrogen (N) (organic and inorganic), phosphorous (P), pesticides, herbicides and fungicides is important, especially for farmers, to determine the amount of these substances in the soil before planting, during the growing season and after harvest. From such information, it can be determined if surplus chemical are being applied to the land and farmers can be given advice concerning the correct application rates and the frequency and time of application according to the type of crop. If there are excessive chemicals in the soil, some of them will find their way into surface and groundwater and thus could affect water used for drinking and other purposes. Too much N & P can cause eutrophication and adversely affect the flora and fauna in rivers and seas.

One of the tasks under the GEF component of the AWRP is to monitor the water and soil for chemicals, dissolved and suspended solids, turbidity and coliform matter, including faecal coliform. Professor Nazif Kolonkaya has prepared a report for the Project on the design of water and soil quality monitoring system (Kolonkaya N., 2002). The objectives of the study are:

1. To evaluate the institutional capacity for soil and water monitoring in the Kizilirmak and Yesilirmak watersheds flowing into the Black Sea.
2. To establish a model to monitor soil and water quality in a selected MC (Suluova MC) of the above watersheds.

The results from such a study could then be applied to the remainder of the MCs throughout the AWRP. The cost of such a study is estimated at US$ 1.3 million over a six-year period, with US$ 1.1 million being for laboratory analysis. The cost for laboratory analysis seems high and the time period too long. Soil and water tests have to be undertaken on many MCs during the lifetime of the project (7 years) and therefore, this monitoring initiative may have to be revised. Also, testing for soil organic carbon (C) was excluded from the chemical analysis, as was stream flow from the surface water testing procedure. Measuring soil organic C is an indicator for carbon sequestration and stream flow determination should indicate the success or otherwise of initiatives to improve soil infiltration rates and reduce flash flooding.

Simple soil analysis is required for the project to assist farmers regarding fertilizer application, and water monitoring is needed to determine the success of erosion control. The State Hydraulic Works (DSI) should be consulted about existing and proposed monitoring points and procedures in the MCs and rivers of the five watersheds. One monitoring procedure has been described for a project undertaken for DSI by the

International Office for Water (Aegean Rivers Integrated Water Resource Use Planning & Management: International Office for Water, Sophia Antipolis, France, March 1999). Again, the extension service of MARA has been consulted about soil testing procedures.

Regarding the formulation of this REA, data from the various field trips were used as were some insights obtained as a result of meeting with the beneficiaries and the concerned government agencies. The minutes of the Field Trip undertaken in July 2002, is given in Annex 6. Additional information was obtained from the WB Preparatory Mission Report, (WB. 2002d), The Forest Sector Review (WB. 2001b) and Towards FAOs Agri-environmental Indicators (Sema Alpan-Atamer, FAO. 2002).

F. Environmental Screening.

There are thirty-eight project components listed in the AWRPs Statistical Information Handbook (WB. 2002c) and several of these components have sub-components such as those under terracing, and agronomic package etc. Also, there are some components that should be included, but are not, such as the measurement of biomass over time, especially for baseline information: this is most important for measuring the environmental impact of various interventions. Again, components of the GEF sub-project are not included in the Handbook and these are important from a screening viewpoint.

Within each component/sub-component there are several activities, some of which may result in possible adverse environmental impacts (without mitigation measures), many that should yield positive environmental impacts and some that are more or less environmentally neutral, but may be of economic importance. In place of listing all the components and subcomponents and then detailing the activities for each intervention with their possible environmental impacts, all similar components have been grouped together and condensed into eight tables. These tables are given in Annex 2. For each table, interventions (activities) are listed and activities that may result in possible positive and negative environmental impacts are provided. For example, a list is provided of components that may have negative environmental impacts such as road building. It is stated if the individual activity for each component is included under this heading (yes) or excluded (no). Sometimes it may have this activity (perhaps) or it is not applicable (N/A). Annex 2 does not reflect the outcome of the environmental effect, it only states that an activity (say road building) is or is not part of the component menu. Annex 2 is a precursor to environmental screening. It lists all components by activities and the activities that have positive and negative environmental effects are then screened. These are dealt with in this Section. In addition a checklist of interventions to improve productivity is given as well as interventions to increase economic activities. For each of the 8 tables, there is a description of the possible adverse environmental impacts, with a discussion of mitigation measures. Generally, the possible positive environmental impacts are not discussed, as their benefits are self-evident. This is also the case for interventions to improve productivity and economic activities.

Therefore, in the following screening matrices only the possible major negative and positive environmental impacts (by project components/sub-components) are listed with a summary of the proposed mitigation measures or their environmental benefits. This is then discussed for each potential negative or positive environmental activity. Such a matrix, together with Annex 2, should help the HQ and field-staff pinpoint the possible major environmental impacts and the proposed mitigation measures to negate adverse impacts. It also describes the data collection needed to verify the degree of impact, be it positive or negative, that the intervention has caused. This is elaborated more fully in Section I dealing with the Monitoring and Evaluation Plan. However, M&E for individual components such as road building is undertaken by independent bodies either in ministries or by private firms. This is or should be specified in the documents covering specific activities.

SM Table 1. AWRP: Environmental Screening Matrix: Road Building.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1000, 1400, 1500, 1600, 1700, 1800? 1900? 2300?	Road building[11].	*Negative:* Surface and gully erosion, dust, road washout. *Positive:* roadsides quickly re-vegetated, improved microclimate.	Adhere to construction standards, especially drainage & alignment, grass sides of roads. Plant shrubs and trees along roadside to stabilize soil.	Continuous soil erosion if road not built / maintained properly. Grass and trees along road should quickly stabilize soil, improve environment.	Enforce standards, provide maintenance budget, re-vegetate road sides quickly.	Construction standards applied. Have clauses in contract to minimize damage. Re-vegetation of roadsides, budget for regular maintenance.

There are three types of roads to be constructed under the project:
a). Service roads by AGM of the MoF. It is proposed to build 170 km of service roads in the project micro-catchments. According to the technical specifications described in the "Unit price list for the activities to be contracted in 2002" by the Department of Study and Project of AGM these are roads at a width of 4 m. in average, without any ditch or sub-grade to be used during implementation and maintenance of the project. They are usually constructed by levelling at the ridges of the terrain. Loose sides are immediately planted (for example with *Acacia sp.* in Malatya under EAWRP). Explosives and other costly construction techniques are not used.

[11] Forest roads are not subject to the environmental assessment (EA) process according to present EIA Regulation, but the Regulation is under review by the MoE. Since the Bank's safeguard policy ask for specific EA processes in some cases, the MoE is planning to add a provision to read "If the owner of the project asks to conduct a specific EIA for the project, then the MoE will conduct such an EIA". Therefore, when a specific forest road is to be constructed and if the use of explosives are planned; then Ministry of Forestry may ask the MoE to conduct an EA for this intervention.

b). B-type secondary forest roads by GDF. It is proposed to build 127 km of forest roads in the project areas. The General Directorate of Forestry has published a document for road construction. This gives the technical and administrative specification /conditions for road construction bidding, including a format for special provisions and a sample contract (Forest Roads, Road Construction Works, Gen. Dir. of Forestry, Ankara, 1988). These are roads for production as well as reforestation activities. They are constructed with the specifications of 4 m platform width plus 1 m ditch width (5 m. in total) and 0.5 m sub-grade width, a minimum curve radius of 10-12 m and maximum slope of 10%. The specifications do not specifically consider environmental concerns. They should be updated, with the assistance and approval of MoE, with regard to the use of explosives, the prevention soil erosion and specifying earth moving standards.
c). Service roads for access to irrigation channels/pipes by GDRS. It is proposed to build 64.5 km of service roads in the project micro-catchments. The number and size of such roads are kept at minimum for least-cost considerations. They are used during the construction stage and afterwards for operation and maintenance.

While the specifications for road building and maintenance that are given in the various handbooks are acceptable, a potential negative environmental impact concerns road construction. When undertaking road construction, maximum slopes should not exceed standards set for the soil type and terrain. Culverts should be installed to prevent erosion and bridges built across streams or rivers of a specified width. Where the soil is disturbed through cut and fill, the exposed ground should be re-vegetated quickly to prevent erosion. There should be clauses in the road building contract concerning environmental protection such as no cutting of trees without approval, replacing cut trees with appropriate species, where to dump excavated soil, no use of explosives without approval from MoE, how to maintain a temporary camp etc. Maintenance of roads is important to prevent erosion, rutting and water logging etc. Planting vegetation along the roadside should stabilize the soil and improve the microclimate.

SM Table 2. AWRP: Environmental Screening Matrix:
Forest and Rangeland (Non-Arable) Ground Preparation/Terracing.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1000, 1100, 1200, 1300, 1500, 1600, 1700, 1800, 1900.	Ploughing, deep ripping, terracing – hand	*Negative.* Initial surface and gully erosion. *Positive* Decreased erosion, improved infiltration, increased ground cover, improved microclimate.	Adhere to construction standards for terracing, re-vegetate area quickly especially terrace edges.	Continuous soil erosion if area remains degraded and terrace not properly built / maintained. Revegetation will quickly stabilize soil, improve environment.	Enforce standards, provide maintenance budget, re-vegetate area quickly. Limit use of machinery, limit site preparation to dry season, mulching.	Construction standards applied, budget and/or training for regular maintenance.

Ground preparation in forest areas, both with machines and by hand will cover an estimated 33,395 hectares. Only hand terracing will be undertaken in forest activities. Mechanical terracing was abolished by the MoF after bad experiences during the early stages of the EAWRP. When undertaking ground preparation, including terracing, to reduce erosion, improves degraded forest and range areas and for reforestation, care must be taken not to exacerbate erosion and increase flash flooding. This should be done by first undertaking a classification of soil types depth, slope and rainfall and adhering to prescriptions for [mechanical] and hand terracing according to internationally acceptable specified criteria in the instructions published by the AGM. (Issues to be Taken into Account in the Erosion Control Activities, Instruction No: 14, Ankara, 1999 and Instructions No. 6, 7 and 8 regarding erosion control activities, in-forest rangeland rehabilitation activities and reforestation activities respectively). These conform to international standards. Deep ripping should only be applied where the soil will benefit from infiltration. However as found under the EAWRP, most rangelands will be improved through enclosure. When the soil is disturbed, the exposed ground should be re-vegetated quickly to prevent erosion and to improve the microclimate. If these initiatives are not carried out or poorly carried out, then there may be soil compaction or continued erosion. Water harvesting should be considered on rangelands to be rehabilitated in order to sustain the vegetative cover and the soil-water balance.

On Farm land, ploughing up and down slopes leads to increased erosion. However, many fields are narrow and contour ploughing may not be practical. Alternatives to 'slope' ploughing include minimum tillage and terracing and the planting of perennial crops. It is proposed to carry out ground preparation operations on 1,000 ha. When undertaking ground preparation including terracing to reduce erosion, to improve marginal lands for cultivation and enhance range areas, care must be taken not to exacerbate erosion and increase flash flooding. This should be done by first undertaking a classification of soil types, soil depth, slope and (maximum) rainfall statistics, then adhering to prescriptions

for mechanical and hand terracing according to the specified internationally acceptable criteria in the instructions published by the former TOPRAKSU (Guidelines for Terracing, TOPRAKSU, Ankara) and the Technical Specifications for Bidding for Terracing published by GDRS (Ankara-2000).

SM Table 3. AWRP: Environmental Screening Matrix:
Arable Ground Preparation/Terracing.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
4000, 4100, 4200, 6000, 6100, 6200, 6400, 6600, 6700? 6800? Demonstra-tion 6400.	Ploughing, drilling, minimum tillage. Terracing – hand and mechanical	*Negative*: Surface and gully erosion. Top soil loss *Positive:* Decreased erosion, improved infiltration, fertility build-up, better soil structure.	For terracing adhere to construction standards, practice contour ploughing and minimum tillage, plug gullies and re-vegetate quickly, especially terrace edges.	Ploughing up and down slope leads to continuous erosion and gullies. If terrace not built properly or maintained soil loss continues. Improves soil moisture and friability.	Enforce terracing standards, demonstrate benefit of contour ploughing, minimum tillage, reduced fallow and planting of perennial crops.	Construction standards applied for terracing, demonstra-tions of improved techniques throughout project area. Farmer training provided and farmer participation in planning and execution

Deep ripping should only be applied where the soil will benefit from infiltration and clearing should be confined to where trees are to be planted or sown, or where rangeland areas are to be re-seeded. When the soil is disturbed, the exposed ground should be re-vegetated quickly especially at the edges of the terraces to prevent erosion and to improve the microclimate. It was observed in Malatya that planting fruit trees and vegetables on the terraces, while planting either fodder or vines on the slopes increase both the agricultural benefits to the farmers and the environmental benefit of the soil and water balance. If these initiatives are not or poorly carried out, then there may be soil compaction or continued erosion. Demonstration of alternatives to slope ploughing with the appropriate agronomic package, including drip irrigation on terraces, is essential as is farmer participation in the planning and execution of alternatives. Early commitment of farmers should be sought for re-vegetation of terraces, including perennials, immediately after they have been prepared.

SM Table 4. AWRP: Environmental Screening Matrix:
Gully Rehabilitation.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature/Scope & Timeframe of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1000, 1100, 1200? 1500, 1600, 1700, 1800, 1900, 2200? 2300? 2500? 4000, 4200, 6100, 6600? Demonstra-tion 6400.	Gully rehabilita-tion.	*Negative* Initial actions may cause additional erosion until vegetation established. *Positive:* Decreased erosion, bank protection veg'n cover, fertility build-up.	Plugging gullies by mechanical / vegetative means, including terracing. Plug gullies quickly, re-vegetate soon especially with grass & perennials.	Perhaps some initial soil loss, but erosion soon contained by gully bank protection initiatives, plugging and revegetation.	Apply appropriate plugging methodology & terracing standards. Revegetate with grass / perennials. Demonstrate various plugging techniques.	Construction standards applied for plugging / terracing, demonstra-tions of improved techniques throughout project area. Training and participation essential.

Gully plugging, especially at an early stage will prevent loss of topsoil and fertility. The number and frequency of gullies should be well calculated in order to optimise environmental benefit and minimize costs. The lessons learnt from the EAWRP in gully plugging must be transferred and implemented in the AWRP. However, prevention is better than cure, and gullies can be prevented through appropriate and sufficient vegetation cover, correct land preparation practices, especially for arable farming, reduction of fallow and the use of suitable harvesting methods and equipment.

SM Table 5. AWRP: Environmental Screening Matrix:
Irrigation, Small Reservoir, Pond Construction and Channel Work.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature/Scope & Timeframe of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1400, 1500, 2300? 4000, 4200. Demonstra-tion 6400.	Irrigation installation, building small reservoirs, ponds less than or equal to 15 m high, drinking points, dips. River channel work.	*Negative*: Initial actions may cause erosion. May be some tree removals in path of work. Less water down stream. *Positive:* Better water use decreases erosion. Watering points /dips provided for animals.	Build concrete and soil canals, introduce irrigation piping where appropriate. Construct small ponds / reservoirs. Realign river channel if appropriate. Revegetate especially with grass/ perennials.	Perhaps some initial soil loss, but erosion soon contained by revegetation. Biodiversity improved by provision of watering points for domestic and wild animals. Increased soil C. Possible fish farming, recreation.	Apply appropriate methodology for irrigation and pond building etc. Replace removed vegetation with grass / perennials. Demonstrate various building techniques.	Construction standards applied for irrigation, ponds etc. Demonstra-tions of improved techniques throughout project area. Farmer training and participation essential.

There should be no major negative environmental effects when building irrigation channels, ponds, small reservoirs and realigning water courses. Reservoir construction is mainly to regulate water flow and provide water balance to the soil since rainfall is very irregular between the seasons. Flooding is expected to be reduced by roughly 40-60%. There may be some initial erosion, but this can be quickly stopped through re-vegetation. Some of the irrigation and pond work etc. will be put out to tender. There are internationally acceptable technical specifications published by GDRS (Ankara-2000) for small irrigation dams (up to 15 m high). This contains a clause to seek approval from the state authority, i.e. GDRS whenever explosives will be used. There should be clauses in the bidding document concerning environmental protection such as no tree cutting without approval, replacing cut trees, re-vegetation of bare soil, where to dump excavated soil, how to maintain a temporary camp etc. Also, there could be monitoring of the sediment load. In addition there should be training in water management for the farmers. Water consumption for irrigation can be reduced from 1 to 0.5 l/sec per ha with drip and sprinkler irrigation. Loans should be available for drip and sprinkler irrigation plus closed channel systems.

SM Table 6. AWRP: Environmental Screening Matrix:
Application of Herbicides, Insecticides and Pesticides.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1300 1600? 1700? 2100? 2600? 6100, 6200? 6600, 6700, 6800, 6900, Demonstra-tion 6400. Integrated pest management, (IPM).	Applica-tion of chemical control agents.	*Negative*: Overapplica-tion and inappropriate use can have adverse effect on ground & river water. Can affect people spraying or nearby. *Positive:* Can remove noxious weeds and control harmful insects' etc. Can kill parasites on farm animals.	Only use permitted chemicals. Train people in storage, handling, use and disposal of containers. Demonstrate alternatives to chemicals such as IPM. Use genes of wild varieties of indigenous species that have pest resistance. Appropriate dosages when treating farm animals.	May be continual build-up of potentially dangerous toxic and hazardous chemicals in water and soil if not controlled. .	Enforce use of permitted chemicals only. Provide on-going training in storage, handling and use to negate toxic buildup. Demonstrate alternative techniques to chemicals. Monitor ground and river water. Site sheep dips to avoid contamina-tion of groundwater.	Government only allows production / import of certified chemicals. Smuggling controlled. International handling /use standards applied. Farmer training and participation essential. Monitoring budget approved.

All farmers that use or will use permitted herbicides, insecticides and pesticides on their arable and horticultural crops should have the correct training in storage, handling and use of these chemicals as well as the careful disposal of the containers. Appropriate clothing should be demonstrated. Alternatives to chemicals, such as disease resistant

strains (from local wild varieties) and integrated pest management could be demonstrated. Local people may know of natural predators and plants with naturally occurring insecticide properties: such indigenous knowledge should be tapped. The control of ticks and other parasites is important in animal husbandry; therefore, the pastoralists should be trained in the handling and use of control agents.

SM Table 7. AWRP: Environmental Screening Matrix: Application of Chemical and Organic Fertilizers.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1300, 1500, 2200? 2500? 2600? 6100? 6200, 6300, 6700 6800, 6900. Demonstra-tion 6400.	Use of chemical and organic fertilizers, green manure, mulch and nitrogen fixing trees and shrubs on farm, in nurseries etc.	*Negative*: Over applica-tion and inappropriate use can have adverse effect on ground & river water. Can affect drinking water. *Positive:* Correct use can increase productivity without affecting surface and groundwater. Can also increase sequestration potential in plants and soil.	Test soil for existing fertilizer content (7000). Advise farmer on correct dosage. Encourage use of organic fertilizers, green manure, agro-forestry species and mulch. Demonstrate storage and use of organic fertilizers. Supply appropriate equipment.	May be continual buildup of N and P in waterbodies increasing eutrophica-tion in lakes and the Black Sea Correct application rate can significantly reduce N & P and faecal matter in water bodies.	Provide soil testing as a service. Advise on the correct use of fertilizers. Encourage the use of organic fertilizers, mulch etc. Provide on-going training in storage, handling and use. Encourage organic farming. Monitor soils, ground and river water.	Project provides soil testing and advice on fertilizer application rates. Finds uses for surplus manure from chicken farms and cattle feeding units. Provide storage units for manure and secures equipment for spreading. Farmer training and participation essential. Approved M&E budget.

On some farms, too many chemical and organic fertilizers are used, but for many small farmers not enough fertilizers are applied to the soil. There is a surplus of manure in some large agro-industrial units, some of which finds its way into water bodies including the Black Sea (SM Table 8). There is a pressing need to reduce the amount of fertilizers finishing up in water bodies by reducing the over application on some fields and halting the disposal of agro-industry surpluses into rivers etc., while at the same time increasing the application rate on farms where too little fertilizers are used.

The correct and timely application of fertilizers should help improve the overall yield of farm and horticultural crops. Training should be provided for the use of fertilizers on irrigated land. While chemical fertilizers are easier to handle than organic fertilizers, organic fertilizers will improve the soil texture and water retention capacity. Also

growing green manure, fodder crops or agro-forestry (nitrogen-fixing) shrubs and trees should increase the soils mineral content and friability. The latter will provide browse for animals as well. Some of these interventions are not well known and therefore, their demonstration is important, not only for farmers, but also for project staff.

In many areas, organic fertilizers are not fully or properly used and in some areas, because of a lack of wood, dung is used for cooking and heating. The price of chemical fertilizers has increased recently because subsidies have or are being removed. Therefore, it is an opportune moment to demonstrate the proper use of organic fertilizers. This will assist in increasing agricultural productivity, while at the same time reduce pollution in water bodies, especially in wetlands and the Black Sea. SM Table 8 gives the screening matrix for manure management in the project area.

SM Table 8. AWRP: Environmental Screening Matrix:
Manure Management of Agro-industries.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
AI 1, AI 2, AI 3, AI 4?	Manure manage-ment.	*Negative*: Poor management of manure from cattle and poultry has resulted in dung being dumped in water bodies and landfills. *Positive:* The proper storage and use of dung can improve agricultural productivity & save water bodies from pollution.	Demonstrate correct storage, handling and use of manure. Undertake surveys of Poultry units and Cattle feeding sheds. Draw up plans for the disposal and use of manure. Undertake survey of potential users of manure.	Continued & increasing eutrophica-tion levels in rivers, lakes, and seas etc. Groundwater pollution levels remain high in many cases. If manure management plan successful, then eutro-phication and pollution levels gradually decline.	List all manure-producing industries. Demonstrate correct and safe storage, handling and use of dung. Demonstrate biogas production? Demonstrate to farmers' correct and beneficial use of manure. Improve handling & distribution. Tree planting and better management will provide alternative energy to dung.	Willingness of agro-industries to comply with regulations. Show agro-industries that it can be profitable to use rather than dispose of manure. Handling and distribution system improved. Loans available. Increase compliance with regulations on water pollution control and solid waste control.

Without proper management of manure, water pollution and eutrophication will persist in the AWRP area. Similarly, without better monitoring of the agro-industries pollution and eutrophication will only be partially solved. Hence the importance of assisting the MoE in tackling the pollution problem from these industries (Screening Matrix 9).

SM Table 9. AWRP: Environmental Screening Matrix:
Pollution Control of Agro-industries.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
AI 4, AI 5, AI 6, AI 7, AI 8, AI 9, AI 10, AI 11, AI 12.	Pollution control.	*Negative*: Many agro-industries pollute surface water. Add to eutrophication and groundwater pollution. *Positive:* Pollution reduction will improve environment and comply with laws.	Help MoE undertake survey of agro-industries to determine quantity and quality of discharges. Study the potential treatment and/or use of effluents. Devise action to comply with laws.	Effluence pollution will continue because penalties for pollution very low. However, EU application may force government to make industries comply with pollution laws.	Propose profitable uses of effluents. Advise on effluent treatment methods & costs. When privatising state factories persuade government that new owners have to comply with laws.	Willingness of agro-industries to comply with pollution laws. Agro-industries shown that it can be profitable to use rather than dispose of untreated effluents. Increase compliance with regulations on water pollution control and solid waste control.

The final table in Annex 2 (Table 8) lists the various agro-industries found in the AWRP area. These industries add to the pollution problems, especially to eutrophication of the Black Sea. By law, these industries should treat all effluents before they are released into water bodies etc. However, some factories were built before the relevant environmental laws were passed. What is more, because of a considerable and ongoing depreciation of the Turkish Lira, the penalties for not complying with the law are meagre. Also many of the factories are state owned and are considered to be above the law.

Some of the factories are to be privatised (sugar and pulp/paper). This may be an opportunity for the government to insist on compliance with the pollution laws as a privatisation condition. This is not only in the interest of improving the environment, but bring the factories into compliance with EU directives, an objective of the government.

Many of the effluents have actual or potential productive uses. These are listed in Table 8 of Annex 2 along with the environmental effects of the effluents. The project could demonstrate the uses of some effluents, especially animal manure. Also, it could seek the help of donors or other organizations to assist the various agro-industries in the proper treatment of their effluents and/or profitable uses for these waste products. By use of the world-wide-web, contacts could be established with sister factories that could provide

advice on treatment etc. It is possible that the EU could arrange visits to member countries to examine at first hand how manure management is a profitable business.

Most activities proposed by the project will have considerable environmental and economic benefits. Screening matrixes 10 & 11 list the key benefits of these project activities. On the other hand, if the resources of the project area continue to be overused, this will lead to an increased environmental deterioration, that not only will affect the people living in the region, but also could have some negative national and international consequences. These consequences are outlined in Screening Matrix 12.

SM Table 10. AWRP: Environmental Screening Matrix:
Rehabilitation Activities (Tree Planting, Sowing, Coppicing, Rangeland Restoration).

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2200, 2500, 2600, 6100.	Multiple rehabil-itation activities throughout project area.	*Negative*: Negligible. *Positive:* Increase biomass cover with indigenous species. Improve biodiversity. Decrease erosion. Improve water infiltration & water flow. Increase C. sequestration.	Planning and undertaking various tree planting initiatives etc. inside the forest estate and on farm. Ditto for rangeland improvement as described in the project planning documents.	Steady increase in ground cover. Slow but accelerating growth of biomass. Steady accumulation of C in wood, grass & soil. Increase in water quality and flow. Steady reduction in erosion rate.	Provision of native seeds, seedling and cuttings for the various regeneration initiatives. Buffer zones to protect forests. Fencing and enclose rangelands. Full support activities. Training of local people HQ and support staff. Good M&E.	Full consultation with and participation of local people. Timely provision of resources. Cooperation between and within government agencies, NGOs and donors. Flexibility with plan.

All these forest, farm and rangeland activities should result in considerable environmental benefits to all the MCs within the project area. Most, if not all will provide substantial economic benefits and result in a reversal of degradation and non-sustainable use of resources. The principal emphasis is restoring degraded forest and range areas, but there are tree-planting initiatives etc. on farm to complement the arable and horticultural interventions. Buffer zones of species with potential non-timber value could be planted round forests to protect them. There will be other initiatives to ensure sustainability such as inventories of wood and non-wood products, surveys to locate rare, endangered or popular species and the location of potential areas to promote tourism including eco-tourism.

SM Table 11. AWRP: Environmental Screening Matrix:
Environmentally-friendly Farming and Horticultural Practices.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
4000, 6100, 6200. Improved Practices· 6000, 6600, 6900, 7000. Perennial crops Demon-strations .6400.	Rainfed & irrigation areas: environ-mentally-friendly arable and horticulture practices.	*Negative* Negligible. *Positive:* Decrease erosion, and loss of N & P. Increase soil water capacity, improves soil structure and fertility. Improve micro-fauna. Increase C sequestration.	Planning and undertaking various environment-ally-friendly farming and horticultural practices as described in the project planning documents.	Steady decrease soil loss and gully formation. Steady increase in improved soil structure. Moderate accumulation of C in soil. Decrease of excess N & P.	Demonstra-tion of improved practices. Initial provision of seeds if necessary. Full support activities. Training of local people HQ and support staff. Good M&E. Organic farming promoted.	Consultation with and participation of local people. Timely provision of resources Cooperation between and within government agencies, NGOs and donors. Flexibility with plan. Organic certification pursued.

These activities aim to improve sustainable farm production, while decreasing erosion on farm and increasing the beneficial soil properties. There will be complementary activities such as soil testing, advice on the correct dosage of fertilizer especially organic fertilizers and the promotion of integrated pest management and apiculture.

The principal environmental (and economic) rationale of the project is to reverse the persistent deterioration of the natural habitat of the watersheds in the Anatolia region. This has been caused by over-exploitation of the resource base and inappropriate land-use practices (SM 12). Areas have been cleared for fuelwood, poles and timber and not allowed to regenerate. Farm animals, especially goats in forests and on rangelands have been grazed on areas without letting these areas recover with a resulting deterioration of the vegetation and a dominance of non-palatable species. Farmers have cleared forests and rangelands for arable farming some of it on slopes that are too steep. All these actions have resulted in environmental degradation. Many interventions are proposed to reverse this degradation and make the different land-use options environmentally appropriate and sustainable. In order to measure the effects of the different interventions, baseline surveys both of supply and demand must be undertaken and a tracking of the impacts of the different components monitored at least over the lifetime of the project if not beyond. Only through appropriate M&E could the degree of success be determined and the options available to ensure the sustainability of the resource base. Such surveys will quantify changes in erosion rates, biodiversity, eutrophication, drinking water quality and organic carbon sequestration.

SM Table 12. AWRP: Environmental Screening Matrix:
Over-use of Natural Resources.

Project Component (number)	Project Activity	Relevant Environ-mental (Env) Indicators	Potential Field Actions	Nature, Scope & Time-frame of Potential Env Impacts	Mitigation Proposed	Key Assumptions
1000, 1100, 1200, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2200, 2300, 4000, 4200, 6100,	Over-use of natural resources such as wood and non-timber forest products, grazing areas, and farming on unsuitable land. Fertilizer, pesticides, herbicides, insecticides over-use discussed in SM Tables 6/7.	*Negative:* Over exploitation of the natural resources has resulted in degradation, deforestation, erosion, flash flooding, siltation and inappropriate land use etc. *Positive:* Through discussion with farmers can get them to reduce over-exploit-ation and degradation.	Apart from pursuing project activities to reverse degradation and improve productivity, surveys of existing and potential supply and demand of the various natural resources must be undertaken to determine sustainability levels.	May be a continual deterioration of the resource base if insufficient action taken to reverse degradation. M&E of interventions essential to quantify scale of various initiatives.	Undertake supply and demand resource surveys. Determine present & future land carrying capacity. Propose options for sustainable resource use. Initiate agreed options. Monitor and evaluate various interventions.	Appropriate baseline surveys and M&E undertaken. M&E budget sufficient to measure impacts of Project during and beyond the Project's lifetime. Training in land use planning and environment-ally friendly agricultural production

As a result of this environmental screening it can be seen that there are no large-scale operations such as highway construction, dam building greater than 15 m in height and large irrigation canals for projects in the MCs. Therefore, no EIAs are required according to the recent environmental impact assessment (EIA) regulations dated 6 June 2002, before the different components are undertaken. It is only necessary to ensure that the various environmental mitigation proposals are stipulated in the operations manual or the contracts and that these stipulations are adhered to, with monitoring being performed by designated people within the government agencies. It is or should be part of the stipulations in the specifications for individual activities such as road building that monitoring and evaluation will be undertaken by an independent body within the various ministries or by outside agencies. The MoE should vet all new initiatives to make sure that they are in compliance with the Country's and Bank's environmental regulations.

The EIA regulations state that an Initial Environmental Evaluation (IEE) is required amongst other things on:

- Restructuring of agricultural land.
- Projects with the objective of intense agriculture on arable and non-arable land.
- Water management projects for agricultural purposes.
- Transformation of forest land for other land uses.

Terracing could be considered as restructuring of agricultural land, rainfed horticulture and application of organic and inorganic chemicals may be regarded as intense

agriculture and the proposed micro-irrigation initiatives for arable agriculture and horticulture could be viewed as water management projects. Therefore, subject to clarification by the MoE, such interventions are subject to IEE studies, which the project will have to undertake and submit to the provincial government for approval. Seeing that there are 13 provinces in the project area and three ministries dealing with projects, up to 39 IEE studies may have to be submitted, but probably the MoF will not have to do so as all its projects are on forest land which appears to be exempt from the regulations except perhaps for improving rangeland within the forest and of course clearing forests for other uses such as (legal or illegal) farming. It is recommended that the MoE should review the proposed menu of components and this screening exercise undertaken above in Section F to determine if indeed any of the activities are subject to IEE studies as laid out in the regulations (Official Gazette No: 24812/11.07.2002). If so, this REA report might be of help to prepare the IEE studies.

Again, according to EIA regulations dated 6 June 2002 there are many agro-industries that are subject to the EIA and IEE process. These would apply to several industries in Amasya, Corum, Samsun and Tokat if they were being built today.

Industries subject to the EIA process include:

- Poultry plants (>60,000 chicken and > 85,000 chicks).
- Pulp and paper plants.
- Sugar factories.

Industries subject to the IEE process include:

- Cattle (> 500) and sheep (>1,000) fattening units.
- Milk and dairy produce plants of 5,000 l/day.
- Slaughterhouses subject to 1st and 2nd class permits.

As previously stated these industries are also subject to internationally acceptable effluent discharge standards, according to the Water Pollution Control regulation of 1986, but for one reason or another few, if any, comply with it. A full list of factories subject to EIA regulations and other laws is given in Annex 3.

G. Project Environmental Impacts.

If the results from the EAWRP are duplicated in this project, then the project should have a substantial positive environmental impact. The reason for the success of the EAWRP, despite few objectively verifiable indicators, was the participatory nature of the project, initiatives that were of direct benefit to villagers and the coordination and cooperation of government agencies. Initially, some villages in the EAWRP did not want to be part of the project, but after seeing its benefits they requested to join. Indeed the initial success of the project resulted in an expansion to other provinces in East Anatolia.[12]

[12] It should be noted that disappointment of some villagers in the EAWRP MCs still prevails because the project was terminated before some of the planned activities were completed. The villagers think that these activities are Government commitments and should be fulfilled before implementing new activities.

During the AWRPs Preparatory Mission's field trip (6 to 12 July 2002) to selected micro-catchments in five provinces, the villagers welcomed the project. Already, the menu of interventions has been discussed with participating villages and they have chosen specific initiatives from the menu. At one meeting in Amasya province, a village that was excluded from one MC area requested inclusion; such is the enthusiasm for the project. One general comment was that for too long the government had neglected the remoter rural areas and that the EAWRP and this project went some way towards redressing this neglect, by recognizing the environmental importance of such areas.

The protection of watersheds is of national if not global importance. Neglect and misuse of such areas has led to severe erosion, flash flooding, sedimentation build-up in dams, inundation of lowland farms and villages with coarse materials, loss of ground cover and biodiversity, and reduced carbon sequestration. This is exacerbated through poor agricultural and agro-industrial practices that increase erosion, pollute ground water and caused eutrophication in streams, rivers, lakes, wetlands and the delta regions of the seas.

The present project is confined to 60 MCs covering an area of about 535,000 ha out of which 154,000 ha will be the physical implementation area. Therefore, in itself, it will only tackle a small part of the problem of watershed protection in Turkey and indeed in the Anatoilian watersheds. Never the less, the fact that the government has requested this follow-on project to the EAWRP, even in times of considerable economic restraint, indicates its commitment to protecting watersheds and reversing the vast environmental deterioration caused by past polices and practices. This project will refine the initiatives of the EAWRP and provide verifiable evidence on the scale of its success. It should also act as a catalyst for future public, private and self-help watershed initiatives.

The anticipated environmental impacts of the project have been discussed in previous sections, especially in Section F (Environmental Screening) and Annex 2. Therefore, these impacts will not be repeated, except to reiterate that the project should result in substantial environmental benefits. How substantial these environmental benefits are, was not really quantified in the EAWRP and this is a significant task of this present project; hence the importance of monitoring and evaluation. But before this is detailed, an assessment of alternatives is appropriate.

H. Assessment of Alternatives

The main alternative to the present project is the 'business as usual approach.' This means there would be no follow-on to the (successful) EAWRP. This alternative was rejected because it does little or nothing to address increasing rural poverty, especially in remote areas largely caused by natural resource degradation. It would exacerbate the high economic and social costs caused by the present pervasive environmental degradation and destruction. Without GEF support, the project would lack the holistic approach to controlling nutrient loads, undertake a public outreach program and boost the monitoring and evaluation effort. As already discussed, the EAWRP demonstrated the success of 'participatory watershed management.' However, there is still room for

improvement, especially in quantifying results of the interventions. This, together with other new initiatives, described in the PCD (WB 2001a) will be pursued in this project.

Two other alternatives that were suggested and rejected were confining the project extension to the East Anatolian region and having a single sector approach as opposed to a multi-sector approach. There are better chances of replication if different areas and new challenges are included in follow-on projects. Also, a single sector approach, while it may be administrative simpler, will not solve the problem of watershed management.

I. Monitoring and Evaluation Plan[13]

M&E of individual activities. Monitoring and evaluation has to be considered at the micro and macro levels. There are enabling activities that assist the project in executing its plans and there are the sum of specific activities, which together comprise a component. A specific activity, such as road building, terracing and irrigation works can be monitored closely with a set of rules to ensure that mitigation measures are in place to negate any adverse environmental effects (see pages 42, 43, 75 and 76).

It would beneficial, if the planners of the individual operations such as road building, terracing, and irrigation canal construction are given some training or advice on the environmental aspects of such operations. For example, before fixing the alignment of a road or an irrigation channel, consultations should be held to ensure that the structure does not go through an environmental 'hotspot,' or that excavated soil is not dumped in a wetland or on an area prone to erosion.

The screening section detailed the potential negative environmental impacts for the different operations together with the proposed mitigation monitoring and evaluation actions. Therefore, these proposals will not be repeated here. It is up to the supervisors of the different operations to ensure that the construction standards are observed and the necessary environmental concerns are addressed. For example, there should be clauses in all road building contract concerning environmental protection such as no cutting of trees without approval, replacing cut trees with appropriate species, where to dump excavated soil, no use of explosives without approval from MoE, how to maintain a temporary camp etc. It would be advantageous if people within the MoE check such contracts before being issued. Similarly, if for example the forest authority itself undertakes road building, it should have its standards reviewed by the MoE. The cost of M&E of these individual operations is already covered by the operation; therefore no additional cost or extra personnel are required for this monitoring.

M&E of Components. Most of the components such as forest rehabilitation and other tree planting efforts, rangeland rehabilitation, improved farming practices and manure management, will have positive environmental benefits, provided the individual activities have been performed properly with correct inputs and land preparation methods. Thus, the M&E *COMPONENTS* consist of quantifying the scale of benefit, rather than

[13] This plan assumes that the M&E activities are part of and coordinated by the M&E Unit of the AWRP.

examining individual operations. This quantification can then be used to judge the success or otherwise of the intervention or to compare different interventions or different treatments of the same intervention.

There are four broad groups of components in micro-catchments covering forestry, rangelands, agriculture and miscellaneous. Some of these components are on government land, some on village land, and some on private land. Monitoring and evaluation of each group is similar and therefore four groups of criteria will be given. The broad groups of components are given in M&E. Table 1 below. Another group of components covering agro-industries will be dealt with separately as the M&E criteria are somewhat different. There is or will be maps for each of the 60 MC showing the topography current land use, villages and physical infrastructure etc. There will be another set of maps showing some or all of the proposed interventions by area as specified above. This is the starting point for monitoring.

M&E Table 1. Proposed Components by Broad Groups.

Component	Code	Component	Code
Forestry for soil conservation, forest & habitat rehabilitation, with participation etc.			
Afforestation	1000	Non-timber forest products survey	2000
Degraded and bare soil	1100		
Gallery areas	1200	Integrated pest management	2100
Nursery	1300	Habitat rehab. in forest	2200
Oak coppice	1600	Participatory planting: forest	2500
Cedar areas	1700	Participatory plant: outside	7100
High forest	1800	Wild-tree grafting: forest	2600
Maquis	1900	Wild-tree grafting: outside	7000
Rainfed agriculture/horticulture		**Irrigated agriculture/horticulture**	
Agricultural terracing	4100	Small irrigation	4000
Fallow reduction	6000	Fodder crops	6800
Environmentally friendly	6200	Environmentally friendly	6200
Horticulture	6600	Horticulture	6700
High value crops	6900	High value crops	6900
Demonstrations	6400	Demonstrations	6400
Rangeland		**Miscellaneous activities**	
Management inside forest	1400	Game areas	2300
Management outside forest	6300	River bed rehabilitation	4200
Rehabilitation inside forest	1500	Habitat rehab. outside forest	6100
Rehabilitation outside	6300	Protecting hotspots	2200/6100
		Apiculture	7200
		Agric. processing techniques	7400

Note. Rehab = rehabilitation. Outside = outside the forest. Plant. = planting.

Not included in the current menu of project activities are:

1. Undertaking periodic inventories of (woody) biomass on all land use types.
2. Estimating the demand for wood and non-wood products.
3. Estimating the removals of wood and non-timber forest products.

4. Periodically testing the soils for their organic carbon content.
5. Locating and protecting environmental 'hotspots.'
6. Including environmental training in the overall training program.
7. Compiling a plan to tackle the overall pollution caused by agro-industries.
8. Introducing new options for animal husbandry.
9. Demonstrating biogas (energy) generation and use from agricultural wastes.

Inventories of non-wood forest products are recommended in the menu of initiatives. However, no inventories of woody biomass are proposed. These inventories are required for a number of reasons. An inventory at the start of the project acts as a benchmark to judge the success of the project. Periodic inventories could measure changes to the:

- Area under trees.
- Growing stock and yield.
- Supply of wood products.
- Ground cover.
- Species mix.

An increase in tree density and crown/root cover would help reduce erosion. An increased biomass stock should result in an improved flora and fauna and greater carbon sequestration. To complement these inventories, (village) demand surveys should be undertaken and a record kept of the annual removal, by location, of forest products. For example the use of fuelwood, poles, fencing materials, timber, fodder, nuts, fruit, herbal plants etc. from the forest, private trees and rangelands.

This can then be compared to the resource base to determine the sustainability of present supply or if there are actual or potential surpluses/deficits of say forest products. Such information has to be obtained from a baseline survey. Inventories are also necessary to compare the actual growth performance with models and to determine the financial yield and economic rate of return of the interventions.

For trees, this means undertaking a survey of all the areas with trees, including government forest areas, private plantations, trees on farm and on rangelands. A stratified random sample could be undertaken, placing emphasis on areas where forestry/tree-planting initiatives are to be undertaken. Knowing the area of each land-use type and the species mix, then an estimate of the growing stock and yield can be made and compared to the estimated consumption of wood products. This will give an estimate of the present degree of sustainability and indicate if the proposed 'forest' initiatives will be sufficient to meet the sustainable supply gap, if any, and may be produce a surplus for sale. It is not anticipated that supply/demand surveys be undertaken in all villages of every micro-catchment, but at least 10% of the villages should be included in such a survey at the start and at or towards the end of the project.

Organic carbon is not only stored in trees, but also is sequestered in soils. Soil carbon accumulates mainly through root attrition, but also because of the decay of leafy biomass and other flora and fauna. Thus, the greater store of woody biomass and the greater production of grasses and annual crops, the more organic carbon is stored in the soil.

Only by undertaking soil analyses over time can these changes be quantified. Hence the reason for testing soil. From measurements taken in other countries, the increase in carbon storage in forest soils is equivalent to the carbon stored in trees. Thus, a forest with an average store of 50 tonnes of carbon per ha in above and below ground wood, should have an additional 50 t. C in the soil compared to an equivalent hectare of arable land. Neglecting measuring soil carbon can significantly understate the sequestration potential of tree planting (and rangeland) initiatives of this and other projects.

Regarding potential important bio-diversity areas in MCs, the local people should be asked about wild land races of cereals, areas where they collect medicinal/herbal plants and wetlands. In addition, experts could undertake a quick inventory of flora and fauna, preferably with the help of local people. The forest service could also look for 'plus' trees as potential sources of seeds, cloning material and cuttings. One observation from the EAWRP was that the tree planting material (seeds and cuttings) was generally of poor quality and the completion report recommended that in the AWRP, better planting material should be obtained. The location of plus trees is one option, another is only using certified seeds, clonal material or cutting from seed orchards or approved sources.

The EAWRP had a GEF component to identify and protect *in-situ* plant material of actual or potential importance, (WB. 1999). This may be important in the Project area because there may be landraces and wild crop relatives of cereals and trees etc. that could help improve agricultural and silvicultural productivity or disease resistance worldwide. This is one reason for seeking out such plants.

Another reason is that there may be endangered or economically important species that should be protected and used as a source for propagation and *ex-situ* production. Such species could include medicinal and herbal plants. Again the local population may be able to identify potential game areas or 'wildlife' protection areas. These latter two initiatives are already part of the proposed menu of options. But protecting and using all such 'hotspots' is both environmentally and economically important. Some of these activities may be included under components 2200 'Habitat Rehabilitation' (within forests) and 6100, 'Appropriate Use of Marginal Land.'

In order to heighten environmental awareness, environmental training should be included in the training programs and in information distributed by the Project. Local people including school children could be involved in recording plants and animals in their areas and the project should consider placing bird nesting boxes in forests and establishing school nurseries for vegetables, bush and tree seedlings. These could be for project use or to give to the children to take home and plant in their gardens. Planting trees round and within the school compound should also be part of the project's initiatives as should be providing schools with posters and other environmental materials. All these efforts will enhance the peoples' interest in their environment and the work of the project.

The GEF component of the project is concerned with controlling agricultural pollution. Originally a separate project was considered to address the discharge of agricultural nutrients into the Black Sea and approximating the EU *aquis* in the Turkish legal system.

However, it was agreed to link it to the AWRP so that the watershed project incorporates environmentally friendly farming practices such as minimum tillage and the appropriate use of organic fertilizers. As part of this package soil testing is important. The MoE and the KKGM of MARA will be in charge of the GEF component. As yet they have had little or no experience in the MC participatory process, for they were not involved in the EAWRP. This should be rectified quickly, as the proper use of organic (and inorganic) fertilizers based on soil testing should be an important and integral part of farming in all MCs. There are publications about fertilizer use. One useful one is Turkey: Fertilizer and Fertilizer Use Guidelines (Ulgen N and Yurtsever N 1995). Such a guideline could form the basis of offering advice to the farmers.

But manure from farm animals is not the only source of agricultural pollution. There are agro-industries (including forest industries) that pollute water bodies. These include sugar beat factories, slaughterhouses, milk-processing plants, pulp and paper mills etc. These are listed in Table 8 of Annex 2 and mitigation measures are proposed in SM Table 9 of Section F above (Environmental Screening). These industries should not be excluded from the project. At least help should be afforded to the MoE in drawing up a plan on pollution reduction for these industries and suggesting how they can comply with the existing environmental laws.

The EAWRP showed that the menu of interventions, which are being promoted in this project, increased the ground cover in forests and rangelands and by inference decreased erosion and increased biodiversity and carbon sequestration. Farming practices were improved through soil conservation and more appropriate crop rotations and land use. However, there were no measurements on stream flow, turbidity, erosion rates, carbon sequestration and bio-diversity and therefore, figures could not be placed on the scale of success of these outcomes. This is an important task of this project.

Without undertaking measurements, it is difficult to put figures on the cumulative success of the AWRP in the short and long term, especially as the menu of interventions is large and only a few villagers have as yet chosen the mix of operations for their micro-catchment. Also, while the project may be successful in itself, its cumulative effect has to be judged by the effect it has on people within the area and the rest of the country undertaking some of the project's activities through their own initiatives.

Long-term measurements have to be undertaken on stream flow, erosion rates and biodiversity changes. But one example can be given on the short and long-term effect of tree planting in relation to carbon sequestration. With an average rainfall of about 750 mm and a 60% crown cover, the per-hectare accumulation of woody biomass above and below ground of *Pinus nigra* should be about 12 dry tonnes of wood after 5 years and about 40 t after 15 years. This translates into a sequestration of 6 t /ha of organic carbon in the wood after 5 years and 20 t C after 15 years. In addition, there will be extra organic carbon stored in the soil beneath the trees. This could amount to about 6 t C/ha after 5 years and 20 t C after 15 years. This gives an indication of the cumulative effect of the project in relation to carbon sequestration for one particular tree species in one rainfall zone with a 60% crown cover, assuming that initially the area was bare. This is

why it is important to measure the effect of the different interventions so that each intervention can be judged and the sum of the initiatives totalled to provide verifiable results on erosion rates, stream flow, biodiversity and carbon sequestration.

Baseline and M&E information for 'Forestry Components.'

Obtaining baseline information in areas where there are going to be interventions is important. For forestry intervention on all land areas (public and private), entails making an estimate of existing growing stock and yield etc. M&E Table 2 gives the key performance indicators (KPI/OVI) that should be measured in order to judge the effectiveness of the different interventions.

There are 13 possible components for forestry in M&E Table 1 above. Not every component will be undertaken in every MC, but all those that are, should be measured separately. It is also possible that a component will be undertaken on more than one site. Each site should be sampled separately. A sample survey should be undertaken, the sampling percentage depending on the total area of the component. A statistician should be consulted about the percentage. Also, there may be individual tree planting efforts inspired by the project and additional components suggested by the beneficiaries.

While the forest service should undertake the baseline survey on its land, surveys have to be undertaken on non-forest land-private/public as well. The project has to engage some competent body to undertake such work. This should be done through the M&E unit.

Information from this baseline survey will be used to quantify the effectiveness of the individual components (and by specific sites). What can be recorded easily is the *net* area planted with trees by species etc.,[14] and its success in terms of ground cover, taking account of the area planted as a result of the project, plus individual tree planting efforts because of the project or other initiatives *minus* the area deforested or degraded for wood products or cleared for other uses. These were the data recorded in the EAWRP. What the EAWRP did not attempt was to measure increase in woody biomass stock and yield, increase in organic carbon sequestration in wood and forest soils, or biodiversity improvements. This will be attempted in this project.

[14] This includes interplanting and underplanting, coppice areas, areas established or improved by direct sowing, rehabilitating areas by natural regeneration and farm tree planting.

M&E Table 2. Baseline Survey Data: Forests. [5]

Component.	MC. Village	Date. Survey Team Photograph numbers.	
Component sites (1)	1	2	3 (etc.)
Area (ha.)			
Map reference/GPS			
Ownership			
Slope (% or % class)			
Aspect (compass reading)			
Soil type			
Cover type (dominant species)			
Cover class (% or % class)			
Principal species of trees and shrubs			
Total above ground woody biomass (alive and dead)- stem, branches and twigs. The measure should be given in m^3 and or dry tonnes (2). Per ha figures should be given in brackets			
Live trees			
Dead trees			
Live shrubs, bushes			
Dead shrubs, bushes			
Estimated yield in m^3 and or dry tonnes (2). Per ha figures should be given in brackets			
Live trees			
Live shrubs and bushes			
Soil C to 0.5m (t C) (3)			
Other data (4)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. To convert from m^3 to dry tonnes, the wood density by species has to be known. It is difficult to measure the volume of shrubs. Therefore weight and moisture content of shrubs from a sample area should be taken and converted to dry weight.
3. Soil analysis has to be undertaken by certified laboratories. At the same time organic C is being assessed, measurements of N, P could be undertaken as well. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
4. Other data may include the presence of medicinal & herbal plants etc., products removed including tree/grass fodder, fruit and nuts from trees and bushes, fauna and management practices, if any.
5. The forest service may have its own tables and format to measure above ground biomass.

Two publications may be of use to the AWRP regarding inventory work. They are 'Biomass Assessment Methodologies' (Ryan P & Openshaw K, 1991) World Bank Energy Series No. 48, and 'Baseline Survey of Organic Carbon in Woody Biomass and Soils on Different Land-use Types in Benin' (Openshaw K 2000).

To determine organic carbon in wood, the quantity of below ground woody biomass has to be determined. If there are no estimates available in Turkey, then the above publication from Benin can be used to obtain estimates. Irrespective of woody biomass species, dry wood (0% moisture content) contains about 50% organic carbon. Resurveys of the different components should be undertaken every 3 years. In addition, surveys of sites outside the project area especially on the EAWRP area should also take place and

information from routine forest service inventories could also be used. M&E Table 3 specifies the type of information required during the component resurvey.

M&E Table 3. Resurvey Data: Forests. [5]

Component.	MC. Village	Date. Survey Team Photograph numbers	
Component sites (1)	1	2	3 (etc.)
Area (ha)			
Map reference/GPS			
Ownership.			
Slope (% or % class)			
Aspect (compass reading)			
Soil type			
Cover type (dominant species)			
Cover class (% or % class)			
Principal sp. of trees & shrubs			
Total above ground woody biomass (alive and dead)- stem, branches and twigs. The measure should be given in m^3 and or dry tonnes (2). Per ha figures should be given in brackets			
Live trees			
Dead trees			
Live shrubs, bushes			
Dead shrubs bushes			
Estimated yield in m^3 and or dry tonnes (2). Per ha figures should be given in brackets			
Live trees			
Live shrubs and bushes			
Soil C to 0.5m (t C) (3)			
Average tree height (m)			
Average shrub ht. (m)			
Yield of fruit etc. (kg & kg /ha)			
Other data (4)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. To convert from m^3 to dry tonnes, the wood density by species has to be known. It is difficult to measure the volume of shrubs. Therefore weight and moisture content of shrubs from a sample area should be taken and converted to dry weight.
3. Soil analysis has to be undertaken by certified laboratories. At the same time organic C is being assessed measurements of N, P could be undertaken as well. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
4. Other data may include the presence of medicinal & herbal plants etc., products removed including tree/grass fodder, fauna and the existing management practices.
5. The forest service may have its own tables and format to measure above ground biomass.

The project's implementation period is seven (7) years, thus, at most, the forest initiatives will be 7-years old and the growth of newly planted trees, even in the oldest areas will be modest. Therefore, while re-measuring project components in year 3 and 6 to record the growth of the trees and changes in cover, it would be beneficial to measure older areas of similar species in the Anatolian catchment area and also in the 'forest' components in the EAWRP areas. Some of the tree plantations in the EAWRP will be 15 years old by the end of this project and thus, they should yield some very useful information. Some coppice areas may have been harvested once and likewise for some poplar areas. Therefore, it is recommended that measurements be undertaken on similar 'forest'

components outside the project area in order to obtain information on the likely growth patterns of the different components.

Some of the forest components consist of grafting and/or planting fruit and nut trees and bushes. By the end of the project some will be yielding produce. Therefore, removals of produce should be recorded annually. This not only applies to fruit and nuts, but also to medicinal and herbal plants in forests, tree fodder, fuelwood and poles etc. While the above form tries to measure some flora and fauna, a more detailed inventory of flora and fauna should be undertaken throughout the 'forest' areas to indicate if there has been a noticeable change. This should be done with knowledgeable local people. What is more difficult to measure is the decrease in soil erosion and the improvement to stream flow and water quality because the 'forestry' components. The measurement of soil erosion and water quality is discussed later. Measurements of turbidity, stream flow, water quality etc. will be undertaken, but the changes will be as a result of the aggregate interventions, not just because of a single 'sector' intervention, unless it can be shown that changes in a stream's water quality are directly because of a sector action.

Baseline and M&E information for 'Rangeland Components.'

There are both rangeland areas inside and outside 'forest' land. There are four components within this 'sector,' namely management of rangelands within and outside forests and rehabilitation of rangelands within and outside the forests. As is to be expected, these areas have mainly grasses and herb species, but there are also shrubs and bushes, with the occasional tree. Many rangelands have been over-grazed and in some areas there is a preponderance of non-palatable species. The plant cover is usually poor, ranging from 10% to 40%. In consequence these areas are prone to severe erosion. As with the baseline surveys for forests, the existing conditions of the different component areas have to be recorded, so that these baseline conditions can be compared to survey information in subsequent time periods. The basic Baseline survey form is similar to that of the 'forestry' survey form, but of course, much more emphasis is placed on the grass and herb species etc. Also, there should be information recorded as to past and present grazing patterns, with indications of what the carrying capacity was 10 years ago and today. M&E Table 4 gives the Baseline Survey Data required for the rangeland components and M&E Table 5 gives the Resurvey requirements. These surveys will be the responsibility of two organizations, AGM (of MoF) and TUGEM (of MARA).

M&E Table 4. Baseline Survey Data: Rangelands. [7]

Component.	MC. Village	Date. Survey Team Photograph numbers	
Component sites (1)	1	2	3 (etc.)
Area (ha.)			
Map reference/GPS			
Ownership.			
Slope (% or % class)			
Aspect (compass measure)			
Soil type			
Cover type (dominant species)			
Cover class (% or % class)			
Principal species of grass, herbs and shrubs			
Biomass excluding shrubs & trees. t & t/ha			
Estimated annual yield. t & t/ha			
Carrying capacity and grazing period. Type and No. animals/ha.			
Total above ground woody biomass (alive and dead) if any - stem, branches and twigs. (2) The measure should be given in m^3 and or dry tonnes (3). Per ha figures should be given in brackets			
Live trees/shrubs/bushes			
Dead trees etc.			
Estimated yield in m^3 and or dry tonnes (4). Per ha figures should be given in brackets			
Live trees			
Live shrubs and bushes			
Soil C to 0.5m (t C) (5)			
Other data (6)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. A 5% stratified sample undertaken for woody biomass.
3. The vegetation cover (above and below ground) is estimated from stratified m^2 plots. The vegetation is separated into above and below ground matter and into vegetation classes. It is then weighed and the weights recorded. Specimens are taken from each sample to determine the moisture content. The dry weight can then be determined and from this information the weight per ha and total area weight can be calculated knowing the sampling percentage. A statistician can advise about the sampling %. From this information estimates of annual yield can be made in consultation with rangeland specialists. This information can be used to estimate the organic carbon in biomass. On a dry basis there is about 45% carbon in grassy vegetation.
4. To convert from m^3 to dry tonnes, the wood density by species has to be known. It is difficult to measure the volume of shrubs. Therefore weight and moisture content of shrubs from a sample area should be taken and converted to dry weight.
5. Soil analysis has to be undertaken by certified laboratories. At the same time organic C is being assessed, measurements of N, P could be undertaken as well. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
6. Other data may include the presence of medicinal & herbal plants etc., products removed including grass fodder, fauna and management practices, if any.
7. The forest service and TUGEM may have its own tables and format to measure above ground biomass.

M&E Table 5. Resurvey Survey Data: Rangelands. [7]

Component.	MC. Village	Date. Survey Team Photograph numbers	
Component sites (1)	1	2	3 (etc.)
Area (ha)			
Map reference/GPS			
Ownership			
Slope			
Aspect			
Soil type			
Cover type			
Cover class			
Principal species of grass herbs and shrubs			
Biomass excluding shrubs & trees. t & t/ha			
Estimated annual yield. t & t/ha			
Carrying capacity and grazing period. Type and No. animals/ha.			
Total above ground woody biomass (alive and dead) if any - stem, branches and twigs. (2) The measure should be given in m^3 and or dry tonnes (3) Per ha figures should be given in brackets			
Live trees/shrubs/bushes			
Dead trees etc.			
Estimated yield in m^3 and or dry tonnes (4). Per ha. figures should be given in brackets			
Live trees			
Live shrubs and bushes			
Soil C to 0.5m (t C) (5)			
Other data (6)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. A 5% stratified sample undertaken for woody biomass.
3. The vegetation cover (above and below ground) is estimated from stratified m^2 plots. The vegetation is separated into above and below ground matter and into vegetation classes. It is then weighed and the weights recorded. Specimens are taken from each sample to determine the moisture content. The dry weight can then be determined and from this information the weight per ha and total area weight can be calculated knowing the sampling percentage. A statistician can advise about the sampling %. From this information estimates of annual yield can be made in consultation with rangeland specialists. This information can be used to estimate the organic carbon in biomass. On a dry basis there is about 45% carbon in grassy vegetation.
4. To convert from m^3 to dry tonnes, the wood density by species has to be known. It is difficult to measure the volume of shrubs. Therefore weight and moisture content of shrubs from a sample area should be taken and converted to dry weight.
5. Soil analysis has to be undertaken by certified laboratories. At the same time organic C is being assessed, measurements of N, P could be undertaken as well. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
6. Other data may include the presence of medicinal & herbal plants etc., products removed including grass fodder, fauna and management practices, if any.
7. The forest service and TUGEM may have its own tables and format to measure above ground biomass.

As will be observed the two tables are the same, but the recorded data will be different. Some of the rangeland areas will be fenced and the vegetation allowed to recover naturally. In other areas, ruminants will be excluded and the area left to recover. Re-seeding will occur in yet other areas and planting of fodder species both annuals and perennials are other options. Physical interventions such as gully plugging and terracing may be undertaken and it is possible that application of organic fertilizers, both liquid and solid, may be done on an experimental basis as part of the manure management program. All these activities should lead to an increased flora (and fauna), resulting in a greater vegetation cover and in consequence a decrease in the erosion potential. Because the results of re-vegetation should be quicker than the 'forestry' initiatives, resurveys should be undertaken every two years. Of course, if perennials are introduced, their growth will be slow at first then accelerate. Therefore, the measurement of older sites in the EAWRP is recommended to obtain information on the likely outcome of this kind of intervention.

Baseline and M&E data for 'Rainfed Agricultural/Horticultural Components.'

Undertaking baseline and monitoring surveys on arable areas are somewhat different from forest and rangeland surveys for the soil is constantly being disturbed and the inputs (and outputs) into the area are much greater and more frequent. The aim of the interventions in the agricultural sector is to reduce environmental degradation while at the same time increasing unit output, either physically or economically. Poor and inappropriate practices have led to wind and water erosion, loss of soil structure, ground and surface water pollution and the use of marginal land for arable agriculture.

A package of environmentally friendly farming practices will be demonstrated and the farmers will be at liberty to chose from a menu of options. They will be given advice on land preparation methods, fertilizer application rates, crop rotations and the appropriate crops and varieties for particular species. The soil will be tested for minerals, especially N and P, but organic C should also be tested. The advice will be geared to the slope and aspect of the land as well as its area. Most farmers have several plots of land in different locations, with different slopes and may be on different soil types; therefore, this will determine the variety of recommendations.

The environmental indicators that can be measured are the mineral content of the soil, the pesticide/herbicide/insecticide residues in the soil, its water absorption capacity and the organic content of the soil. It is difficult to measure reduction in erosion, but some of the measures taken such as gully plugging, terracing and minimum tillage should be reflected when stream and river water is tested. However, This may also be reflected in the number of landslides, washouts and the formation/expansion of new and existing gullies.

When undertaking a baseline survey, a stratified sample of fields should be chosen being representative of slope aspect and proposed treatments. The present practices and crops should be noted with information about current yields. Soil testing should be undertaken for mineral content, structure, organic matter content and water absorption capacity. The yield of the crops should be given by its components, for example straw and grain for cereal crops. This should be converted into dry weight. Even for green manure yield

estimated should be given. M&E Table 6 gives the baseline information to be collected from the sample sites and M&E Table 7 gives the Resurvey Data Table.

M&E Table 6. Baseline Survey Data: Rainfed Agriculture. [8]

Component	MC. Village	Date. Survey Team Photograph numbers	
Component sites (1)	1	2	3 (etc)
Area (ha.)			
Map reference/GPS			
Ownership			
Slope			
Aspect			
Soil type			
Present farming practice			
Present cropping pattern			
Erosion description (2)			
Existing yield(s)			
Fertilizer application & rates (inorganic)			
Fertilizer application & rates (organic)			
Pesticides etc. used & application rates			
Use of IPM, if any			
Quantity of woody biomass in field (3)			
Soil testing			
Minerals N &P (4)			
Soil C to 0.5m (t C) (5)			
Physical structure			
Organic content			
Water capacity			
Pesticide presence (6)			
Other data (7)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. The erosion description should describe the number and type of gullies, landslides etc.
3. There may be shrubs and trees scattered in the field or along boundaries. If so they should be measured. On marginal lands or steep lands it is possible that the proposed intervention may bee fruit trees and bushes or changing to a meadow. This will be measured as in forestry or rangeland M&E.
4. Soil analysis has to be undertaken by certified laboratories. Trace elements may also be measured.
5. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
6. The presence of pesticides etc. will have to be tested in a certified laboratory.
7. Other data may include the incidence of soil fauna.
8. MARA may have its own baseline and monitoring tables.

The measurement of N & P in soils should be done before sowing, during the growing season and after harvest. Likewise, pesticide presence can be tested before sowing and after harvest. This baseline information can then be compared to the resurvey information. For arable crops, resurveys should be conducted annually.

M&E Table 7. Resurvey Data: Rainfed Agriculture. [9]

Component.	MC. Village	Date. Survey Team Photograph numbers.	
Component sites (1)	1	2	3 (etc.)
Area (ha)			
Map reference/GPS			
Ownership.			
Slope			
Aspect			
Soil type			
New farming practice			
Change of land use with description of crops (2)			
New cropping pattern			
Erosion description (3)			
New yield(s)			
Fertilizer application & rates (inorganic)			
Fertilizer application & rates (organic)			
Pesticides etc. used & application rates			
Use of IPM, if any			
Quantity of woody biomass in field (4)			
Soil testing			
Minerals N &P (5)			
Soil C to 0.5m (t C) (6)			
Physical structure			
Organic content			
Water capacity			
Pesticide presence (7)			
Other data (8)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. On marginal lands or steep lands it is possible that the proposed intervention may bee fruit trees and bushes or changing to a meadow. This will be measured as in forestry or rangeland M&E. With the introduction of irrigation some rainfed agricultural will be converted to irrigation. This should be noted and included under irrigated land.
3. The erosion description should describe the number and type of gullies, landslides etc.
4. There may be shrubs & trees scattered in the field or along boundaries. They should be re-measured.
5. Soil analysis has to be undertaken by certified laboratories. Trace elements may also be measured.
6. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
7. The presence of pesticides etc. will have to be tested in a certified laboratory.
8. Other data may include the incidence of soil fauna.
9. MARA may have its own baseline and monitoring tables.

Baseline and M&E data for 'Irrigated Agricultural/Horticultural Components.'

The baseline and resurvey information for irrigated agriculture/horticulture is very similar to that for rainfed agriculture/horticulture. The only difference being that information is recorded about the type of irrigation system, the number and types of crops per year and

the rate and frequency of water and fertilizer application etc. M&E Tables 8 and 9 give the Baseline and Resurvey Data required for monitoring irrigated agriculture.

M&E Table 8. Baseline Survey Data: Irrigated Agriculture. [10]

Component.	MC. Village	Date Survey Team Photograph numbers.	
Component sites (1)	1	2	3 (etc.)
Area (ha)			
Map reference/GPS			
Ownership			
Slope			
Aspect			
Soil type			
Irrigation system (2)			
Irrigation practice (3)			
Present farming practice			
Present cropping pattern			
Erosion description (4)			
Existing yield(s)			
Fertilizer application & rates (inorganic)			
Fertilizer application & rates (organic)			
Pesticides etc. used & application rates			
Use of IPM, if any			
Quantity of woody biomass in field (5)			
Soil testing			
Minerals N &P (6)			
Soil C to 0.5m (t C) (7)			
Physical structure			
Organic content			
Water capacity			
Pesticide presence (8)			
Other data (9)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. Some land may already be irrigated but the practice is sub-optimal. If so, describe present system. Other land will be converted to irrigation one the system is installed.
3. If irrigation is undertaken, describe irrigation practice.
4. The erosion description should describe the number and type of gullies, landslides etc.
5. There may be shrubs and trees scattered in the field or along boundaries. If so they should be measured. On marginal lands or steep lands it is possible that the proposed intervention may bee fruit trees and bushes or changing to a meadow. This will be measured as in forestry or rangeland M&E.
6. Soil analysis has to be undertaken by certified laboratories. Trace elements may also be measured.
7. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
8. The presence of pesticides etc. will have to be tested in a certified laboratory.
9. Other data may include the incidence of soil fauna.
10. MARA may have its own baseline and monitoring tables.

If there is an existing irrigation system this should be described. Otherwise, the areas that will be converted to irrigated agriculture should be recorded under 'rainfed' agriculture. The measurement of N & P and pesticides is the same as for rainfed agriculture. This baseline information can then be compared to the annual resurvey information.

M&E Table 9. Resurvey Data: Irrigated Agriculture. [10]

Component	MC. Village	Date. Survey Team Photograph numbers.	
Component sites (1)	1	2	3 (etc.)
Area (ha.)			
Map reference/GPS.			
Ownership.			
Slope			
Aspect			
Soil type			
Irrigation system (2)			
Irrigation practice (3)			
New farming practice			
New cropping pattern			
Erosion description (4)			
New yield(s)			
Fertilizer application & rates (inorganic)			
Fertilizer application & rates (organic)			
Pesticides etc. used & application rates			
Use of IPM, if any			
Quantity of woody biomass in field (5)			
Soil testing			
Minerals N &P (6)			
Soil C to 0.5m (t C) (7)			
Physical structure			
Organic content			
Water capacity			
Pesticide presence (8)			
Other data (9)			

1. An individual component may be undertaken on more than one site in an MC. All sites should be surveyed. Some non-component sites may also be measured as a control.
2. The new irrigation system should be described.
3. Describe the new irrigation practice.
4. The erosion description should describe the number and type of gullies, landslides etc.
5. There may be shrubs and trees scattered in the field or along boundaries. If so they should be measured. On marginal lands or steep lands it is possible that the proposed intervention may bee fruit trees and bushes or changing to a meadow. This will be measured as in forestry or rangeland M&E.
6. Soil analysis has to be undertaken by certified laboratories. Trace elements may also be measured.
7. Organic soil carbon is also found at lower horizons, but about 80% are found in the first 0.5 meters.
8. The presence of pesticides etc. will have to be tested in a certified laboratory.
9. Other data may include the incidence of soil fauna.
10. MARA may have its own baseline and monitoring tables.

Baseline and M&E information for 'Miscellaneous Components.'

The Miscellaneous components cover four activities. These are the Planning of Hunting Areas (2300), Appropriate Use of Marginal Land (6100) and Protecting Hotspots (2200/6100). The appropriate use of marginal land can fall under Forestry, Rangelands or even Agriculture. Therefore, undertaking baseline and resurvey work on such areas will depend on the choice of use. Once this is decided then the pertinent surveys can be applied. Again, potential hunting areas may be in forests or rangelands. What is important is to undertake an inventory of the animals and decide on the number of hunting permits that can be issued each year. Alternatively, it is possible to introduce partridges or other game birds into an area or restock rivers with indigenous fish and then issue fishing or hunting permits.

Some of a micro-catchment may form part of a larger area that has wildlife potential. Such areas are not considered under the present project and will have to be considered separately and identified by the General Directorate of National Parks, Game and Wildlife (GDNP) in the MoF. If any areas are found suitable, then the GDNP should propose initiatives for reservation and eco-tourism.

Hotspots in this report cover areas that contain rare or endangered plants, species that could be of commercial use if propagated *ex-situ* such as medicinal and herbal plants, superior plants, such as plus trees and bulbs of flowers that can be used for breeding (and cloning) and land races or wild varieties of cereals and fruit/nut trees etc. of use to agriculture and horticulture. Such hotspots have to be identified by project staff, specific experts and local knowledgeable people. Baseline surveys then can be undertaken and a decision taken on their protection and management. These hotspots can be the source of genetic diversity for the project and worldwide.

Baseline and M&E information for 'Soil Erosion & Water Quality.'

Using GIS, it is possible to monitor erosion. This is done by observing changes in the digital imagery from satellite data. However, the methodological parameters have to be tested on the ground to see if the interpretation is correct. The MoF has received a proposal to test the methodology in the Kahraman-Maras Orcan stream micro-catchment area. The Project should examine this proposal to determine if it should be supported.

Another way to measure soil erosion is by inserting measuring sticks on all land use types throughout the Project area and monitoring the rate of soil loss both in areas with project components and similar areas where no activities will take place. Because the annual erosion rate may be small, meaningful results may not be obtained until after 10 years or more. A quicker method is the use of silt traps down stream from MCs to measure soil carried away be erosion, but this will only give the erosion rate without indicating the principal sources of erosion. Therefore both methods are recommended. The General Directorate of Rural Services (GDRS) has soil research institutes monitoring soil loss. These institutes should be consulted about the methodology and measurement frequency to determine soil loss and erosion by land-use types, slope and cover classes.

The rate of soil erosion in a micro-catchment can also be measured by the amount and size of particulates carried in surface water bodies. There should be measuring stations at the start and the end of streams or rivers in each micro catchment. These stations can measure the amount and sizes of particulates in the water, its flow rate and other important parameters. Limnographs and pluviometers can be used for water quality monitoring in combination with rainfall measurements. In the paper on "Water and Soil Monitoring System" prepared for the project (Kolonkaya N 2002), the following parameters were recommended to be measured (M&E Table 10).

M&E Table 10. Water Quality Analysis Parameters.

Analytical Parameters	Surface Water	Ground Water
Flow	+	
pH	+	+
Salinity	+	+
Dissolved Solids	+	+
Conductivity	+	+
Suspended solids	+	+
Turbidity	+	+
NO_2-N	+	+
NH_3-N	+	+
NO_3-N	+	+
Total P	+	+
Organic –N	+	+
Pesticides		+
Herbicides		+
Insecticides		+
Total coliform	+	+
Faecal coliform	+	+

Note. In addition the water flow parameter has been added. Source Kolonkaya N, 2002, amended.

The river measuring stations should measure the above parameters at least monthly and for soils the parameters should be measured before planting, during growing and after harvest or on the advice of the soil research station of GDRS. There should be sampling units on all land-use types, but on arable land the sampling percentage should be the greatest. Sampling should occur throughout the project's lifetime. A full discussion of M&E for soil and water monitoring is given in Annex 5. Briefly, this annex lists the additional equipment required to monitor soil and water throughout the project area.

Baseline and M&E information for 'Agro-Industry Components.'

The GEF component of the project is confined to four provinces whose rivers flow into the Black Sea. One of the main thrusts of the project is manure management from agro-industries and at the farm level. Much of the manure from agro-industries and some of it from cowsheds finish up in surface and underground bodies that ultimately flow into the Black Sea. This is causing excessive eutrophication and thus adversely affecting the flora and fauna. The GEF component will demonstrate methods of manure storage, management and use for agro-industries (cattle and poultry) and farms.

A monitoring document for this component has been produced (Kolonkaya N. 2000) and part of the parameters to be tested are given in M&E Table 10 above. There are also parameters given for soils. This monitoring procedure should be followed. However, it only covers one river: the improved storage, handling and use of manure are not included in that document. But these facets are covered in another consultants report (Metcalfe J.P. 2002). There will be monitoring of the building and use of solid and liquid storage facilities, liquid and solid transportation and its application on the field. There will be testing of soils before the (organic) fertilizers are added in order to determine the correct dosage depending on the proposed crop. There will also be testing of the former effluent discharge point to ensure that the new storage facilities are functioning properly and that no effluents are leaking into water bodies. The testing of surface and ground water should continue after the project's termination and the DSI should be involved. Similarly, soil testing should be an ongoing procedure, which in the medium term will be provided by GDRS. Eventually the farmers should pay for this testing service.

As a result of this GEF 'manure management' component, which also includes the demonstration of environmentally friendly farming practices such as minimum tillage, the beneficial outcomes will be promoted in the remainder of the MCs, so that monitoring the results is important, not only to test the eutrophication rate, but also to demonstrate the beneficial effect of the correct application of fertilizers, especially organic fertilizers.

There are other agro-industries in the project area releasing untreated effluent into water bodies besides poultry units and cattle feeding facilities. These include sugar factories and paper mills etc. A list of these industries is given in Annex 2 Tables A2-8 (Agro-Industrial Waste) and environmental screening is discussed in the Environmental Screening Section (F). While the monitoring of this effluent is not included in the GEF component, it is recommended that the project assists the MoE in monitoring this effluent and draw up plans for effluent reduction, that can be presented to other donors etc. There are laws about effluent disposal, but for various reasons factories are not in compliance with the laws. This is why it is important to devise a plan to ensure compliance.

Precipitation Measurements etc.

There is a lack of meteorological information in the project area. Data from the nearest town is usually taken as pertaining to the micro-catchments. But most MCs are remote from these stations and many are at much higher elevations where precipitation, wind and insolation are different from towns. Therefore, it is recommended that the project install at lease five new stations, one in each major catchment area, to monitor the various meteorological conditions over the project's lifetime and beyond. Also simple devices could be placed in many MCs to measure precipitation, humidity and temperature.

J. Environmental Management Plan

The project covers five large watersheds in 13 provinces and it is planned to have interventions in 60 micro-catchments in 12 of these provinces, plus stand-alone GEF activities in Samsun. In addition three of the 13 provinces will have both GEF and MC activities. Of course, there may be additional private, government and donor activities.

In the EAWRP, approximately 60% of the activities related to forests, excluding rangelands within forests, 25% related to agriculture and the remaining 15% were rangeland initiatives. Most forest activities concerned conifers, including cedar rehabilitation (96%), 3% were oak coppice rehabilitation and the remaining 1% dealt with trees outside the forest, participatory planting and riverbank protection. Irrigation initiatives accounted for 60% of the agricultural components and rainfed the remaining 40%. Regarding rangeland rehabilitation, 90% took place on areas within the forest.

The delineation and ownership of rangelands outside the forest hampered work on rangelands in the EAWRP. The same constraints will not be as severe in the AWRP area and therefore, more rangeland rehabilitation components are expected, compared to the EAWRP. Again because of the GEF component on manure management and improved farming practices, there may be a relative increase in farming initiatives. But it is still anticipated that forestry components will account for the bulk of the interventions. Therefore, when devising an environmental management plan (EMP) this has to be kept in mind. The EMP Table 1 gives the areas of proposed activities by broad categories for the project. As mentioned above, many villagers in MCs have to finalize activities and as the project progresses the composition of these will be subject to change.

EMP Table 1. Proposed Activities for the AWRP.

Component	Area (000 ha)	%	Comments (units: 000 ha.)
Forestry	48.9	32	Inside forest 48.5, outside 0.4
Range rehabilitation	12.0	8	Inside forest 7.0, outside 5.0
Habitat rehabilitation	31.2	20	Inside forest 30.0, outside 1.2
Hunting areas in forest	30.0	20	
Non-timber forest products	1.7	1	Inventory
Biotic protection in forests	12.8	8	Integrated pest management
Agriculture	17.5	11	Rainfed 6.6, irrigated 10.9
Miscellaneous	0.0	0	Apiculture & nurseries
Total	154.1	100	

The monitoring and evaluation of environmental indicators is one amongst many that the M&E Unit will be supervising. Therefore, it is part of the activities of this unit and should not be viewed as something distinct. There are two kinds of M&E to be undertaken, one at the micro-level and the other at the macro-level. At the micro-level individual or groups of operations are observed at all stages from planning through execution to post completion to see if they are in compliance with environmental

standards and to record the effects of the initiative. If necessary, if there are still negative environmental impacts, the plans will be adjusted to negate such impacts.

The following action plan has been drawn up to monitor and evaluate these initiatives.

1. The local and HQ government officers, the beneficiaries and representatives from MoE should be involved in planning and approving the different initiatives. They should conform to nationally approved practices and have MoE clearance.
2. Before any MC plans are enacted, especially where there is a possibility of negative environmental impacts, the plans should be reviewed and inspected by MoE.
3. During execution of each operation, the supervisory officer or the person in charge of the contracting team is responsible for ensuring adherence to the plans. Independent inspectors from the MoE and/or the responsible Government Agency plus the M&E unit of the project will monitor the operation and report on its degree of compliance.
4. If the activity is not in compliance, then the agency or firm undertaking the task will be subject to penalties and/or fines and compliance has to be enacted.
5. On completion of the specific task or tasks, an independent inspection will take place by the MoE, the M&E unit and the 'Inspection' body within the concerned ministry to verify that the job conforms to the criteria specified and that there is adherence to the environmental plan.
6. The field supervisory team and the beneficiaries will check the tasks at frequent intervals and report on any positive or negative environmental effects to the concerned bodies such as MoF, MARA, MoE, GDRS, DSI etc. and the local government offices.
7. Any negative environmental effects will be reported and action plans will be drawn up by the concerned agencies, with the approval of the MoE, to negate the effect and the damage will be repaired or rectified.
8. At yearly intervals or other agreed time intervals, post inspections of the tasks will be undertaken by MoE, the M&E unit and the concerned ministries to ensure that the initiatives are not causing environmental damage or if they are, steps have been or are being taken to correct this negative effect.
9. If during the lifetime of the project, actions are taken that would trigger an EIA, such as proposals to increase the height of a dam above 15 m, then the concerned ministry should commission an EIA, which has to be approved by the MoE. Also, the WB should be informed at the preparatory stage to ensure that the amendments are in compliance with the WB "Safeguards Policies."
10. If the MoE does not have sufficient field staff to inspect the various MCs then the project should train the proposed four MoE officers that will be put in the field in the four provinces where GEF operations are to be undertaken. These officers will then be in a position to inspect and approve or reject the 60 MC plans and the operations.

In Section F an environmental screening of the project's components was undertaken using the matrix as detailed in the TOR (Annex 1). Section I covered the monitoring and evaluation plan and gives examples of data collection requirements for broad components covering forests rangelands, farms and miscellaneous activities. These two sections form the basis for the Environmental Management Plan. This is given in Standard World Bank Matrix form and is presented in Annex 7. Table 1 of Annex 7 gives the environmental

impacts and proposed mitigation measures for 17 environmental concerns or issues, from road building at the micro-level to erosion measurement at the macro-level. Table 2 of Annex 7, then details a monitoring program for all these 17 initiatives. Table 3 gives a list of additional equipment required for monitoring and the training requirements are given in Table 4. All this information is summarized in this section. EMP Table 2 gives an excerpt from Annex 7 Table 1 highlighting the main environmental concerns.

EMP Table 2: Environmental Impacts and Mitigation Measures.

Issues	Anticipated/Potential Environmental Impacts	Effects on Environment	Actions or Mitigation Measures
Road building activities.	Roads could negatively affect erosion, soils, biodiversity, stream flow, drainage and wetlands. Roads will give access to areas that have been degraded and enable mitigation measures to be undertaken thus having positive environmental effects. Roads will also open up remote rangelands and remove over-grazing pressures on homestead pastures. **Probability of occurrence: High.**	Restoration and re-vegetation of watershed areas. More sustainable use of land, greater biodiversity and increased C storage. Overall reduction of erosion. Reduced dissolved minerals in surface and ground water. Poor alignment/steep slopes result in accelerated erosion.	Enforce road-building standards and provide maintenance budget. Issue directives on re-vegetation of exposed areas, replacing cut trees, explosives use, disposal of excavated soils, etc. Include MoE in road alignment surveys to ensure that biodiversity and wetlands etc. are protected. MoE requested to conduct an IEE if explosives to be used.
Forest and rangeland (non-arable) terracing, ground preparation etc.	Initially, this could lead to surface and gully erosion, poor drainage etc. The initial surface and gully erosion, if any, will be substantially offset by improved infiltration, soil stabilization, increased ground cover (bio-diversity), improved micro-climate, greater C sequestration. **Probability of negative effects low, positive effects high.**	Restoration and re-vegetation of watershed areas. Overall reduction of erosion. More sustainable use of land, greater biodiversity and increased C storage. Reduced dissolved minerals in surface and ground water. Inaction and improper terracing etc. will result in continued degradation.	Enforce standards for terracing and provide maintenance budget. Re-vegetate area quickly, especially terrace edges and chiefly with indigenous species. Provide training if necessary.
Arable ground preparation incl. Terracing.	Initially, could lead to surface and gully erosion, poor drainage etc. Improved farming practices such as minimum tillage, contour ploughing, hand/mechanical terrace reduce top soil loss, decrease erosion, improve soil structure increase infiltration encourage fertility build up. **Probability of negative effects low, positive effects high.**	Less soil loss through water (and wind) erosion. Reduced dissolved minerals in surface and ground water. Continued ploughing up and down the slopes will accelerate erosion.	Enforce standards for terracing and provide maintenance budget. Demonstrate improved farming practices. Provide farmer training. Involve farmer participation in planning/execution of initiatives.
Gully rehabilit-ation.	Initial actions may cause additional erosion until vegetation established but overall will lead to decreased erosion, improved bank protection, restoration of vegetation cover, and fertility build-up in soil. **Probability of negative effects low, positive effects very high.**	Soil stabilization and increased vegetation will reduce erosion, mineral loss, improve biodiversity and C sequestration.	Apply appropriate gully plugging methods and terracing standards. Vegetate with grass, shrubs & trees. Demonstrate improved techniques throughout project area. Provide farmer training. Involve farmer participation in planning/execution of initiatives.

Issues	Anticipated/Potential Environmental Impacts	Effects on Environment	Actions or Mitigation Measures
Channel work, irrigation, pond and reservoir construction.	Building of irrigation channels and realigning watercourses may cause initial erosion. Poor irrigation practices may lead to surface soil loss, mineral leaching and/or salination. Pond and reservoir construction could deprive downstream areas of water. Better water use should decrease erosion by controlling flash flooding. The provision of more watering points will enable fuller and better use of rangelands. Increased ground cover by increased cropping. **Probability of negative effects low to moderate, positive effects high.**	Properly constructed earth and concrete canals will minimize erosion potential. Ponds and reservoirs will better control water flow and diminish incidence of flash flooding and soil erosion. Greater all-year round use of arable and pastoral lands. Reduce pressure of over-grazing near homesteads and clearing more forest and rangelands for arable farming. This should decrease organic C emissions and improve biodiversity	Apply construction standards Re-vegetate canal banks with grasses and shrubs etc Involve MoE for IEE and beneficiaries in site choice, design, planning and execution phases. Ensure that villages that draw water from same sources agree on plan for water sharing. Plan for pond construction to take into account down-stream requirements. Ensure that reservoir plans and construction are approved by MoE and comply with World bank safeguard requirements. Provide farmer training in drip and sprinkler irrigation and propose proper water pricing.
Application of chemical control agents (CCA) in project nurseries:	Over use or inappropriate use of herbicides, insecticides and pesticides could affect negatively plant population, lead to leaching in ground and surface water and affect the persons applying chemicals. **Probability of negative effects low to moderate, positive effects moderate.**	Inappropriate and/or over use of chemical agents could negatively affect the environment through leaching of the chemicals in ground and surface water and a build up of toxins in the soil. It could also adversely affect the user. (and his/her family).	Only use internationally approved chemicals in correct dosages at appropriate times.[15] Provide training for project workers in storage, handling and use of CCAs and disposal of containers. Practice IPM (integrated pest management) where appropriate.
Application of chemical control agents by farmers in their own fields.	Over use or inappropriate use could affect negatively plant population, lead to leaching in ground and surface water and affect the persons applying chemicals. **Probability of negative effects low to moderate, positive effects moderate.**	Inappropriate and/or over use of chemical agents could negatively affect the environment through leaching of the chemicals in ground and surface water and a build up of toxins in the soil. It could also adversely affect the user (and his/her family).	Ensure farmers only use approved CCAs. Get MoE to examine chemical list to ensure that only internationally approved chemicals are allowed.[15] Provide information to farmers and distributors of chemicals on the purchase and use of CCA. Provide training for farmers in storage, handling and use of CCA and disposal of containers. Demonstrate IPM and encourage appropriate use.

[15] The following pesticides fall into WHO IA and IB lists. Ensure that they are not purchased and used under this project. Azinphos-Methyl, Chlorfenvinphos, Dichlorvos, Dichrotophos, Methidation, 14-EPN, Methamidophos, Monocrotophos, Omethoate, Oxydemeton-Methyl, Parathion-Methyl, Phosphamidon Phorate, Thiometon, Triazophos, Aldicarb, Benfuracarb, Carbofuran, Furathiocarb, Mewthomyl, Oxamyl, Tefluthrin, Zetacypermethrin, Dnoc Ammonium, Cadusafos, Ethoprophos, Fenamiphos, Brodifacoum, Choumachlopr, Zinc Phosphide, Difenacoum, Floucomafen. Also see Annex 3.

As outlined above, this routine monitoring of all activities will be undertaken by the project. Of particular importance from an environmental perspective are the project activities specified in Section F, Environmental Screening, SM Tables 1 to 6, namely:

- Road building.
- Ground preparation including terracing in forests.
- Ground preparation including terracing outside forests.
- Gully rehabilitation.
- Irrigation and ponds etc.
- Application of chemical control agents.

Project and MoE staff who are supervising these activities should ensure that the environmental mitigation actions, as specified in above Table EMP 2 and in Annex 7 (Table 1) and the Environmental Screening Tables, are enacted. These should be specified in contracts or work programmes and the supervisors should report back to the project's Monitoring and Evaluation Unit.

Other regular activities undertaken by the project include reporting on the progress of the various activities. These will be judged against annual targets, such as the area of oak coppice regenerated, the amount of bare land planted, the area of rangeland rehabilitated, the survival rate of planted trees, the area of farms adopting the agronomic package etc. These can be used as indicators to the success of various interventions and of the project. But they do not give measurable indicators as to the effect on the environment. This is why additional monitoring is required. The M&E report (Anderson & Kanalti 2002), recommended that the proposed Special Studies Advisory Group should have primary responsibility for commissioning and managing 'impact studies' such as those detailed above in the M&E section. These impact studies could be awarded through the competitive grants system process (CGS), although for such studies as the inventory of woody biomass inside and outside forests, there may be few groups, except perhaps university departments, capable of doing this outside the government services.

The above M&E consultant's report recommend that geographical information system maps (GIS) be used to provide basic data for all project areas. Again it says that global positioning system (GPS) handsets should be used when undertaking baseline and re-survey studies. The report says that every Province will have a portable GPS and the M&E Unit should acquire two more: the use of GPS devices when undertaking the surveys is essential. The report lists the equipment requirements of the M&E Unit, but for the 'environmental' monitoring additional equipment will be required (Annex 7 T.3).

At the macro level, the overall environmental impacts of the project will be assessed. It will be too time consuming and costly to monitor all 60 MCs as well as the GEF components. Therefore, regarding erosion measurements, water quality, carbon sequestration and biodiversity, it is proposed to monitor 12 MCs, one for each province as well as the GEF components in Amasya, Corum, Samsun and Tokat. It is proposed that the monitoring will be phased in over three years from 2003, undertaking four baseline surveys (of forestry, rangeland and agriculture) in each of the first 3 years with

follow-up resurveys at set intervals, depending on the activities. The proposed time intervals were given in Section I on M&E, namely every 3 years for forestry, every two years for rangelands and every year for agriculture. In addition, the monitoring of the GEF component will start in 2003 and continue over the 7-year lifetime of that component. As stated in the M&E section, measurements of forest areas outside the MCs should also occur, especially in the EAWRP area to obtain information about older age classes of trees in similar climatic zones And 'forest' monitoring should be undertaken every 3 years until the trees are at least 15 year's old, rangeland monitoring until the interventions are 10 years old and those for agriculture until eight years after the initiative. The proposed Baseline survey and monitoring plan is shown in EMP Table 3. Monitoring beyond the year 2009 is subject to money being available and the agreement of the various government agencies.

In addition to monitoring Forestry, Rangeland and Agricultural interventions, there will be general monitoring of Erosion and Water as described in the M&E section above. This will be monitored at set intervals each year. It is proposed that the monitoring of soil and water continue for fifteen years.

EMP Table 3. Proposed Baseline & Resurvey Schedule of Sectors in the Project.

Year	2003	2004	2005	2006	2007	2008	2009	Comments
Baseline survey	2/4	2/4	2/4					All sectors (6/12 provinces)
Measurements outside AWRP				yes	yes	yes	yes	Measurements of trees, soil and rangelands
Re-survey (Re-S) Forest Marginal lands				 4 2	 4 2	 4 2	 4 2	Every 3 years to year 15. Measurements in other non-project areas.
Re-S Rangeland			2	2	4	2	2	Every 2 years to year 10
Re-S Agriculture		2	4	6	6	6	6	Every year to year 8
Monitor (M) rivers	4	8	12	12	12	12	12	Every year to year 15
M soil erosion	8	12	12	12	12	12	12	Every year to year 15
GEF component	4	4	4	4	4	4	4	The project is for 7 years, but monitoring should continue to yr. 15

Note: In the Baseline survey, where 2 provinces are surveyed each year for 3 years, only half of the provinces are surveyed. This applies to agriculture, where half of the provinces have rainfed agriculture surveyed and the other half have irrigated agriculture surveyed. Similarly it is proposed to only survey half of the provinces that have marginal land improvement interventions.

The M&E Section I above detailed the work required in each sector for special environmental studies and EMP Table 4 summarizes the activities for these special studies with an estimate of their indicative costs etc. More details are given in Annex 7, Tables 1 to 3.

EMP Table 4. Special Environmental Studies.

Component	Activity	Perform	Comments
Forestry sector			
Tree planting etc. for production and erosion control	1.Inventory of biomass 2. Monitoring of soil (Repeat every 3 years)	1. MoF; University 2. Government /University soil units.	1. $5 to $7,500 each 2. $5 to $7,500 each (in all provinces)
Habitat rehabilitation of flora and fauna	1.Inventory of biomass 2. Monitoring of soil (Repeat every 3 years)	1. MoF; University 2. Government /University soil units.	1. $5 to $7,500 each 2. $5 to $7,500 each. Hotspots identified. Survey in 6 provinces
Hunting areas	Survey of flora and fauna (every 3 years)	Project with perhaps some help.	Down as a project activity
Biodiversity study in all areas of project (forest and non-forest)	Survey of flora and fauna (Repeat every 3 years)	Award through the CGS, with perhaps project assistance.	$7 to $10,000 each. (in all provinces)
Tree & soil measured outside forest areas	1.Inventory of biomass 2. Monitoring of soil	As for biomass inventory above	As for biomass & soil above. 10 areas
Rangeland Sector (within and outside forests).			
Rangeland Management & rehabilitation	1. Inventory of biomass 2. Monitoring of soil (Repeat every 2 years)	1. MoF; University 2. Government /University soil units.	1. $5 to $7,500 each 2. $5 to $7,500 each (in 6 provinces only)
Hunting areas on rangelands	Survey of flora and fauna (every 3 years)	Project with perhaps some help.	Down as a project activity
Biodiversity study in all areas of project	Survey of flora and fauna	Award through the CGS/project assistance.	Included in the forestry sector
Agricultural Sector			
Rainfed agriculture & horticulture	1. Inventory of biomass 2. Farming practices 3. Monitoring of soil (Repeat every year)	1. Project, MoA; MoF 2. Project 3. Government /University soil units.	1. $2 to $3,000 each 2. Project cost 3. $5 to $7,500 each (in 6 provinces only)
Irrigated agriculture & horticulture	1. Inventory of biomass 2. Farming practices 3. Monitoring of soil (Repeat every year)	1. Project, MoA; MoF 2. Project 3. Government /University soil units.	1. $2 to $3,000 each 2. Project cost 3. $5 to $7,500 each (in 6 provinces only)
Marginal land rehabilitation	1. Inventory of biomass 2. Farming practices 3. Monitoring of soil (Repeat every 3 years)	1. Project, MoA; MoF 2. Project 3. Government /University soil units.	1. $2 to $3, 000 each 2. Project cost 3. $5 to $7,500 each (in 6 provinces only)
Biodiversity study in all areas of project	Survey of flora and fauna	Award through the CGS/project assistance.	Included in the forestry sector
Other studies			
Erosion Monitoring (Frequent monitoring)	1. Silt traps and sticks to measure soil loss. 2. GIS study.	1. Project. Monitor at set intervals 2. CGS.	$10,000 for the devices. $25 to $35,000 one area
River water study (one per province). Frequent monitoring	Measure flow rate, turbidity, sedimentation, mineral content etc.	1. CGS with project assistance	$10 to $15 000 each per year. (all provinces)
Hotspot studies (Repeat every 3 years)	Determine areas of rare, endangered, useful species etc. to protect. Undertake inventory.	Project, MoA; MoF Local people, national experts.	$5,000 each if experts used.
Meteorological	Data collection for temp. & rainfall.	Project	Collect daily records

Component	Activity	Perform	Comments
GEF studies			
Manure management	Improve handling and storage etc.	GEF component	Covered by project. Funding for Biogas demonstration (EU?)
Field trials	Manure application	GEF component	Covered by project
EMP Table 4). Soil & water monitoring	Soil and water testing	GEF component	Should cover both main rivers to Black Sea
Agro-industry discharge	1. Compile plan 2. Monitor discharge; assist with compliance	MoE, CGS	Funding required (EU?)

The costing for all the above activities is tentative and should be reviewed. However, taking the above estimates, the total indicative cost of the baseline and resurveys for the different sectors and special studies amounts to between US $ 2.4 and $ 3.5 million; that is between 3.5% and 5% of the total budget. The breakdown of the indicative costs for the special environmental studies is as follows, (EMP Table 5).

EMP Table 5. Estimated Cost of Special Environmental Studies.

Monitoring Activity	Estimated cost for 7 years (US$ 000)
Forestry trees	280 – 420
Forestry habitat rehabilitation	140 – 210
Biodiversity (all areas)	196 – 280
Measurements outside project areas	100 – 150
Sub-total	716 – 1060
Rangeland management & rehabilitation	200 – 300
Sub-total	200 – 300
Rainfed agriculture	252 – 378
Irrigated agriculture	252 – 378
Marginal land	98 – 147
Sub-total	602 – 903
Erosion measurement (GIS)	25 - 35
River measurements	720 – 1080
Hotspots	140 – 140
Total	**2,403 – 3,518**

To put these costs in perspective, an example of monitoring benefits is appropriate. Carbon trading is now being undertaken. The value of sequestered carbon on the world market averages between US$ 5 & 10 per t C. The forestry component of the project may sequester about an additional 0.5 million t. C after 5 years and 2.4 million t. C after 15 years on 48,900 hectares. Similarly, the rangeland and habitat rehabilitation areas may sequester an extra 320,000 t. C after 5 years and 960,000 t. C after 15 years on 43,200 ha. Increased sequestration on farm land will be modest, but could amount to 24,000 t. C in both time periods on 17,500 ha. At a price of US$ 5 per t. C, the value of the sequestered carbon on all the areas is worth US$ 4.2 million after 5 years and US$ 12.9 million after 15 years. Unless the carbon accumulation is monitored and certified, this value cannot be claimed.

As stated above, these costs are indicative only and have to be verified. It is possible to reduce monitoring costs by decreasing the sampling areas and/or increasing the time intervals between sampling. Again, the number of rivers for monitoring erosion etc. could be reduced, as could the monitoring parameters. Measurements of stream flow and silt load are important and should be undertaken frequently, but the measuring frequency of the mineral content etc. could be reduced to say twice or thrice per year. The number of parameters and the frequency of measurements should be verified by experts.

One additional environmental concern is the pollution of groundwater, including drinking water with unacceptable levels of N, P, pesticides and faecal matter. Some of this is because of poor farm and agro-industrial manure management, others because of effluents from agro-industries, some because of raw sewage from households is seeping into wells and yet others because of excess application of organic and inorganic fertilizers and pesticides etc. on fields. The project, including the GEF component will try and tackle this problem, although some pollutants such as human sewage and non-manure agro-industrial effluents are not in the project's remit. Ways to reduce groundwater contamination are through demonstration and training in all aspects of storage and application. This will be part of the training component. Testing of groundwater will be undertaken as part of the GEF component.

Equipment Requirements.

The additional equipment needs for environmental monitoring are modest. For measuring trees, bushes, grass and herbaceous cover, standard mensuration equipment is required. The forest service should already have such equipment including consumables such as paper and string, but if not, then four sets will be required. In addition, scales to weigh wood and grass are needed, as are moisture content meters. A full list of equipment requirements is given in Annex 7 Table 3. The cost of each set, including consumables should not be more than US$ 5,000, or for four sets, US$ 20,000.

Soil testing will be undertaken in laboratories after samples are taken from the field. The cost of additional equipment such as soil augers is estimated to be US$ 4,000 (Annex 7, Table 3). This will be provided by the project. Measurement of organic soil carbon is of prime importance, but on all land, especially agricultural land the measurement of N and P should be done. If this testing is to be undertaken by government soil laboratories, they may require additional testing equipment, chemicals and other consumables. Also extra equipment may be required in the field. The cost of such equipment etc. is estimated to be US$ 150,000 (Annex 7 Table 3). However, this cost should be covered in the overall cost of undertaking such work. The estimated cost of soil testing using information in EMP Table 3 is US$ 790,000 to 1.185 million. Cost estimates should be obtained from such institutions and compared to the indicative budget. If the government undertake the work on using their staff and the estimate is below US$ 500,000 without equipment, then the project could buy the equipment. However, as part of the GEF component, soil testing for farmers will be done, so in addition, organic C could be requested. This should reduce the monitoring budget for this component. Bio-diversity surveys require

standard equipment, which the people undertaking the survey should already have. This also applies to monitoring of IPM areas.

As described in the M&E section above, soil erosion can be measured by placing measuring sticks throughout the project area and measuring the level of decrease (and sometimes increase) in the surface level. The cost of measuring sticks has been estimated to be 10,000 (Annex 7 Table 3). Erosion rates may also be measured by using satellite imagery. A proposal has been submitted to the MoF to test the methodology (Cost US$ 25, to 35,000). This should be considered by the project. The cost is included in EMP 5.

The largest equipment requirements will be for monitoring 12 rivers in the project area, excluding the GEF proposal. Equipment will be required for two monitoring points on each river, one where the micro-catchment starts and the other where it ends. Flow meters or piezometers will be required, as will sand/siltation traps. The cost of such field and laboratory equipment is estimated to be US$ 268,000 (Annex 7, Table 3). Most of this equipment will be covered in the river measurement budget of US$ 720,000 to 1.08 million (EMP Table 5). The project will provide simple silt traps and sieves of different meshes to estimate the degree of erosion on 60 selected MC over the project's lifetime (and beyond). The equipment cost for 60 micro-catchment rivers is estimated to be US$ 48,000 (Annex 7, Table 3). This is in addition to the costs given in EMP Table 5 above.

While gathering meteorological information is not really part of environmental monitoring, more accurate information will be useful for the project as a whole as well as for this part of M&E. Therefore, simple equipment at all 60 MCs (cost US$ 18,000) and it is recommended to establish an additional five meteorological stations in the project area. The equipment is listed in Annex 7 Table 3 and estimated to cost US$ 37,000. The combined cost for these stations is US$ 55,000.

The GEF component will cover equipment costs for soil and water measurements, so no additional costs will be required for this component. However, effluent monitoring from agro-industries may require additional equipment. This is not included and funding for this will have to come from other sources, possibly the EU or an EU country.

The total equipment budget (excluding Table 4 costs - US$ 25,to 35,000) is US$ 137,000.

Environmental Training Requirements.

An environmental training matrix is given in Annex 7 Table 4. Some of the training will be covered by the project budget when it is holding general training sessions, during village participatory meetings or when it taking farmers to demonstrations. Other training will have a specific 'environmental' budget. Project staff will be given training on the environmental aspects of various project initiatives. In turn, these staff members will pass on this knowledge to the beneficiaries or use it when they are involved in project activities such as road building or pond construction.

The environmental training requirements consist of providing environmental awareness training to project staff for specific project components that may need special attention such as road construction, terracing, irrigation etc. as described in the Environmental Screening Sector (F). These courses should be given annually to staff who will be designing and supervising these activities. Courses could be part of general training courses with the environmental component lasting about a day. The courses could be given by local consultants and/or staff from the MoE. The cost of such a course is estimated to be US$ 5,000 per year or in total US$ 35,000.

Farmers use pesticides, herbicides and insecticides (chemical control agents [CCA]). Many are unfamiliar with storage, the correct application rate or the clothing that should be worn during application. They also have superficial knowledge about the storage and use of fertilizers, especially organic fertilizers, and its application on rainfed and irrigated land. The project should train staff on these important elements as well as the need to test soil. There should also be general environmental training and field visits. The training of trainers (extension workers etc.) in the above topics should be undertaken twice a year for the first four years with refresher courses once per year for the last three years. This may be combined with other training. Each course should last about one week, including visits to demonstration units. The cost of such training courses including CCA handling consultants, fertilizer experts, and trained staff from MoE, MoF and MARA should be between US$ 20,000 to 25,000 per course. Therefore, the total cost for eleven training courses will be US$ 220,000 to 275,000. These trainers will then train the farmers. In addition, as part of the project's activities, farmers will be taken to field demonstrations.

If meteorological measurements are going to be carried out then some training in the recording and maintenance of the meteorological equipment is required. Likewise for the reading and maintenance of piezometers and measuring sticks for erosion determinations. Project staff will have to be trained (and retrained) for these routine measurement tasks, the cost of training is estimated to be about US$ 22,000 over seven years.

While there is a drift to towns, especially of young people, many children will be the next generation of farmers and forest workers. It would be prudent for the project to provide some environmental education for school children. This could take the form of project staff visiting schools and giving talks about the project, providing inputs for the establishment and maintenance of school nurseries, planting shrubs and trees round the school premises, providing posters and environmental materials and organizing competitions or projects with environmental themes. In addition, children could act as environmental monitors, reporting on plants and animals they have seen, good and bad practices they have come across and ways to improve the environment. There should and could be a small budget for school nurseries etc. of the order of US$ 52,000 (US$ 4,000 per province). Supplementary money could be obtained from other donors. In addition to providing some guidance for children, community instruction should be provided including environmental training and incorporating practical work such as tree planting along roads and streams, around houses and in kitchen gardens. People, especially women, could be trained in seedling production and the growing of medicinal and herbal plants. Again a budget of US$ 52,000 could be provided for this activity.

In order to undertake the special studies, training should be given on supply and demand methodologies. Staff will be trained to undertake baseline surveys and re-surveys. It is planned to have a two-week course each year of which one week would be in the field. The cost of each course, excluding consultants and staff time is estimated to be US$ 6,000 or US$ 42,000 for seven years.

Environmental training like any other training is a two-way process. Many people have local knowledge about the environment and the use of local medicinal and herbal plants etc. This knowledge should be tapped. Project personnel should try and obtain this information by raising the topic at community meetings and during training courses.

The two government partners in the GEF sub-component namely MoE and KKGM, have little, if any, experience in project activities of the type undertaken in the EAWRP, whereas the other partners in the project do. Training courses should be provided to these government agencies to familiarize the staff about the project activities and protocol. The M&E Consultancy Report (Anderson and Kanatli 2002) recommended that there should be four MoE personnel posted to the project, one in each of the four provinces where the GEF sub-component is active. This recommendation is endorsed. It is these people that should be trained quickly about the main activities in the MC areas and ways of incorporating the GEF initiatives into the main project.

The estimated cost of all the components of this training is US$ 423,000 to US$ 478,000.

Consultancy Services.

Many environmental consultancy services have already been specified in the text under the various headings, especially for monitoring and evaluation (EMP Table 4). Again on Page 84 it is mentioned that consultants will be required for training courses in CCA management and fertilizer use etc. The cost for these consultancy services has already been included under the different components or initiatives. Therefore, this section only deals with additional consultancy requirements.

An environmental consultant may be required to give advice on environmental monitoring requirements to the proposed Special Studies Advisory Group and to independently review the M & E results of these activities. For this, a budget of US$ 35,000, spread over 7 years is proposed. In addition, project personnel or people chosen to undertake the inventory work may need training on whole tree measurement and the measurement of shrubs and bushes and other miscellaneous consultancy services. An international consultant is recommended for the 'Supply and Demand' survey training in years 1 & 2 (Annex 7 Table 4). The cost of the consultant is estimated to be US$ 50,000 to US$ 57,000, including preparatory work and equipment. In addition, local consultants are required for environmental training, integrated pest management and other environmental training activities. For this US$ 50,000 should be put aside.

It is assumed that the M&E centre will undertake data entry and data analysis. The M&E unit may not have enough personnel for this task. It may be that additional (part-time) staff will have to be hired to undertake data entry and analysis or consultants hired who specialize in data entry and analysis. It is suggested that a budget of US$ 15,000 per year be allocated for such tasks or US$ 105,000 for the 7-year period.

The additional cost for these consultancy services is US$ 240,000 to 247,000 and the total cost of assessing the environmental benefits of the project is estimated to be US$ 3.14 to US$ 4.38 million.

The Bank's Safeguard Policies.

The principal Bank's Safeguard Policy that applies to the project is Environmental Assessment (OP 4.01, BP 4.01, GP 4.01). In part, this REA is in response to this safeguard policy and the provisions in the REA ensure compliance with this policy.

The above Bank Procedure (BP 4.01) includes Dam and Reservoir Components (BP 4.01 Annex B and OP/BP 4.37). The dams to be constructed by GDRS in the AWRP will have body heights of 7-15 m, and will accommodate up to 80% of the annual water flow of the micro-catchment. The GDRS has a long experience with the design, construction and maintenance of over 600 small dams. The investigations and design are normally carried out by provincial engineers, assisted by headquarter engineers, surveyors, and hydrologists, as needed. Most provincial offices and HQ have computer based design programs. The designs made in the provinces are reviewed and approved by senior HQ staff. Dam construction is either done by GDRS construction units or by private contractors. In either case, supervision is undertaken by provincial and HQ staff. Annual inspections are carried out by GDRS provincial staff, after which the users are instructed to carry out the necessary maintenance.

The Bank's Operational Policy on *International waterways* (OP. 7.50), which applies to the Black Sea and its tributaries may be triggered due to the proposed construction of three small dams in the Kizilirmak and Yesilirmak Basins. The technical specifications of the planned dams in these two basins are summarised in Table SP 1.

SP Table 1. Dam Specifications for the Kizilirmak & Yesilirmak Basins.

Specifications. Province	Height. (m)	Reservoir volume (m^3)	Irrigated land (ha)	Water surface area (ha)
Tokat (Kepez)	15	200,000	40	4.0
Tokat (Sarac)	10	120,000	24	3.5
Amasya (Hamamozu)	15	250,000	50	3.5

The amount of water retained in the reservoir and used for irrigation will only marginally decrease the quantity of water flowing into the Black Sea, because the bulk of irrigation water will be conveyed back to the Black Sea by surface and ground water routes.

Two of the proposed dams are at the limit to trigger a review by independent qualified persons or companies and the possibility of an EIA. The World Bank distinguishes between small and large dams. Small dams are normally 15 meters or less in height. Large dams are more than 15 meters in height. However, dams between 10 and 15 meters in height are treated as large dams if they present special design complexities, for example a large flood-handling requirement, location in a zone of high seismicity, foundations that are complex and difficult to prepare, or retention of toxic materials

For small dams, generic dam safety measures designed by qualified engineers are usually adequate. From the above specifications, the proposed dams should be treated as "small." However, should the height of the two dams at 15 meters be increased, then the Bank would require the following:

i. A review by an independent panel of experts (the Panel) of the investigation, design and construction of the dam and the start of operations.
ii. The preparation and implementation of detailed plans: a plan for construction supervision and quality assurance, an instrumentation plan, an operation and maintenance plan and an emergency preparedness plan.
iii. The pre-qualification of bidders during procurement and bid tendering.
iv. Periodic safety inspections of the dam after completion.

These provisions are specified in the Bank's 'Safety of Dams' operation policy OP 4.37 (October 2001). The GDRS already fulfils most if not all of the above criteria.

The Project is only directly involved in Pest Management in its tree nurseries when pesticides and herbicides may be used. The Bank's safeguard policy guidelines on Pest Management (OP 4.09) have been addressed by ensuring that there will be proper storage, handling, use and container disposal of authorized chemicals.

The project is undertaking integrated pest management (IPM) on areas where it is directly involved. To reduce the insect population that are harmful to the forest trees, biological, semi-biological, bio-technical and mechanical pest control methods will be employed such as chitin inhibition materials, repelling pheromones or mechanical methods. This will be done with the help of natural predators such as insects, birds, and mammals etc. There is a guide for the principles of forest pest control published by the GDF entitled 'Control Principles for Forest Pests,' (GDF, Instruction No. 286, Classification No. IV-1519, Ankara, 1995).

In addition, because farmers are using pesticides and herbicides on their own land within the project area, training will be given in storage, handling, use and container disposal. The project will ensure that through the MoE, only allowable chemicals are used. There is differentiation in agricultural subsidies for pesticides in direct correlation with their toxic ingredients. There is legislation regulating pest control in the Law for Pest Control and Agricultural Quarantine (1957). This law regulates imports, exports, production, sale and control of pesticides. A Regulation on Labelling of Pesticides (1983), the Code of Conduct for Pesticide Prescription (1984) and the Code of Conduct for Toxicological Classification of Pesticides (1984) are other legislations applied to pest control activities.

The project will support the construction of small-scale dams that will be on public lands and therefore, the building of these dams will not trigger the Bank's Operational Policy on *Involuntary Settlement* (OP. 4.12).

Finally, through the GEF sub-component, the project is tackling excess eutrophication of surface water, including the delta region of an international water, namely the Black Sea. Through manure management, effluent disposal and environmentally friendly farming practices, the project should address relevant concerns expressed in the Bank's safeguard policy 'Projects in International Waters' (OP 7.50, BP 7.50, GP 7.50).

Table SP 2 details the safeguard policies as it applies to critical components in the AWRP that are of concern from an environmental viewpoint. The project is taking the necessary internationally acceptable measure to address all these concerns.

SP Table 2. World Bank Safeguard Policies for Specific Watershed Activities.

Activity	Safeguard policy triggered	Possible adverse impact	Proposed mitigation measure	Proposed monitoring & evaluation	Responsible institution
Road building (service roads).	Environ-mental assessment (EA) [Possible erosion etc.]	Construction activities may cause erosion or increase erosion rates. Some rare habitats and/or flora species could be disturbed.	Follow standard procedures for road alignments and construction methods. Restrict road size (< 4m) Plant sides quickly with fast growing deep rooted plants.	Endurance and performance after construction. Erosion after construction	MoF-AGM, GDRS, GDNP.
Road building (forest roads)	EA [Possible erosion when building.]	Construction activities may cause erosion or increase erosion rates. Landslides, slips & other movements in road cuts. Some rare habitats and/or flora species could be disturbed/ destroyed. Roads could function as ecological barriers and may interrupt migratory routes Create easy access for illegal wood cutting and land clearing. Roads may obstruct stream flow & fish migration.	Follow standard procedures for road alignments and construction methods. Restrict road size (< 5m) and slope (max 15%) Ensure minimum cut, fill and spoil heaps. limit earth moving to dry periods. Install sediment basins, vegetate erosive surface as soon as possible. Restrict explosives use. To prevent ecological barrier, plan corridors. Effective control of wood cutting.	Endurance and performance after construction. Soil carried by surface run off (silt at downstream) Waste disposals after construction. Distribution and movement of some key fauna species.	MoF – General Directorate of Forestry, GDNP.
Clearing, ploughing, deep ripping (in non-arable) forest and rangeland - hand and machinery.	Forestry; EA [Possible erosion in preparation. Aim is to help establish ground cover to stop erosion.]	Disrupt ecological process or change the character of the rangeland and forest & affect species distribution. Increase erosion due to clearing vegetation and disturbing soil. Increase runoff due to vegetation clearing and soil loosening. Biodiversity destruction.	Soil erosion control measures. Water conservation measures. Wildlife conservation measures. In-situ biodiversity conservation activities. Consultations with interest groups.	Rangeland condition. Rangeland use and carrying capacity. (number and types of flora and fauna). Seasonal distribution of animals. Change in social conditions. Changes in wildlife population and species diversity (flora & fauna).	MoF – AGM, GDNP.
Arable ground preparation.	EA [possible erosion when building.]	Removal of nat. vegetation. Biodiversity destruction. Increase erosion due to cultivation. Some rare habitats and/or flora could disappear.	Soil erosion control measures. Taking care to protect natural flora and vegetation structure by not permitting cultivation in sensitive areas	Monitoring of vegetation structure in sensitive areas (species distribution and dominance). Erosion rate after ground preparation.	GDRS, MARA.

Activity	Safeguard policy triggered	Possible adverse impact	Proposed mitigation measure	Proposed monitoring & evaluation	Responsible institution
Terracing by hand in (non-arable) forest and rangeland areas	EA [Possible erosion in preparation aim to stop erosion]	In the case of replanting, exotic species may be introduced Aggravate erosion following terracing	Take necessary measures to establish indigenous species. Re-vegetate terraces. Water harvesting for rangeland rehabilitation Consultations with villagers	Monitor establishment of plant cover in the disturbed areas. Monitor downstream changes in sediment carried by surface run-off	GDRS, MARA.
Arable ground terracing.	EA [Possible erosion in preparation; aim is to prevent erosion]	Increase erosion while preparing terrace Destruction of natural vegetation.	Immediate re-vegetation of terrace edges/slopes Planting perennials/grass wherever possible Obtain farmer's pledge Minimize mechanical work and design slope in accordance with soil structure & weather. Promote drip irrigation. Study/research value of natural vegetation for terrace stabilization	Monitoring of vegetation structure (species distribution/dominance) Erosion rate after ground preparation. Agricultural/horticultural yields.	GDRS, MoE – GDNP
Building irrigation ponds	EA. For watersheds draining to Black Sea.	Attract water born diseases. Puddling round edges Poor disposal of excavated materials Decrease water flowing to lower catchments and may be international waterways.	Observe building codes. Vectors for disease control. Proper design and correct vegetation to limit puddling. Proper disposal of earth etc. Minor amount of water storage. Control storage capacity.	Monitor water for water born diseases Monitor water quality and quantity (sedimentation) Water quantity and availability downstream. Monitor edges of ponds Monitoring of disposal.	GDRS
Building small reservoirs	EA. For watersheds draining to Black sea. Inter-national waterways. Dam safety	Reduced downstream water flow Changing water quality in the pond Sedimentation. Change in groundwater conditions Water borne diseases including mosquitoes. Changes in hydrologic regime of the streams Decrease water flowing to lower catchments and may be international waterways.	Limit dam height to 15 0m Observe building coders. Minor amount of water storage Control storage capacity and ensure water release to satisfy downstream requirements Control land use in surround area to minimize erosion. Limit water retention time in the pond Disease vector control. Hydrological plan for water basin	Climate (wind, temperature, rainfall). Stored water quality and quantity in the reservoir Reservoir silt deposits Disease vectors Downstream water quantity and availability. Aquatic products harvested	GDRS, MARA, MoE, DSI
Installing irrigation pipes and small-scale irrigation.	EA.	Increased water use. Introduction/ increase in use of fertilizers Introduction/increase in use of pesticides. Soil erosion. Soil erosion with sprinkler irrigation on slopes. Changes in vegetation. Scouring of canals, clogging canals by sediments/weeds.	Controlled use of water. Hydrological plan for water basin. Introduce sprinkler or drip irrigation for efficient use. Economic cost for water Design of sprinkler system to ensure that sprinkler application rate does not exceed infiltration rate. Design irrigation canals for easy weed and sediment removal. Proper handling and use of certified pesticides IPM.	Physical and chemical properties of soils. Water quality at upstream and downstream (nutrients and pesticides). Erosion rate.	GDRS, MARA, MoE

K. Public Consultations

The project has been drawing up plans through public consultation from the beginning of project preparation. Since the Bank's Project Concept Document (PCD) meeting in November 2001, eight training courses on various topics were conducted in the provinces for about 300 field staff. The topics of these courses included: the participatory process; participatory micro-catchment (MC) planning; natural resource degradation and rehabilitation; project monitoring & evaluation; and project administration. This training better enabled the field staff to explain the project to the beneficiaries, local authorities and NGOs and help with problem solving during meetings. Indeed the training included the participatory planning process based on the 'Beneficiary Centred Problem Census, Problem Solving Process' (BCPCPSP). This process stresses the importance of listening to the beneficiaries and helps them propose activities, rather than being told what to do. In February 2002, a total of 16 MCs were chosen as the first areas for project activities. One MC was identified in ten of the project provinces concentrating on erosion control. In the other 3 provinces where there is GEF involvement, namely Tokat, Amasya and Corum, two MCs were chosen per province, one focusing on agricultural pollution and the other mainly on erosion control. The BCPCPSP was started in March 2002 in the villages of each micro-catchment, particularly in those that are prone to erosion. Most if not all the problems were identified in the consultation meetings with the villagers together with their relevant solutions. Annex 8 gives a list of villages that took part in these participatory planning meeting in the five micro-catchment areas visited by the national consultant.

Several public consultations were made with all the actors in the project including MARA, MoE, MoF and the involved departments, field staff of these Ministries of five of the thirteen provinces. Villagers in several water catchments, private farmers, owners of cattle feeding sheds, local mayors of towns with agro-industries and village heads were consulted about the project and their views were noted. Two field trips were made to the project area, one by the international consultant in early June 2002 and one by the local consultant in July 2002. The international consultant was accompanied by other international and national consultants, government agency personnel from Ankara and the project area and World Bank Staff (Annex 8).

The local consultant accompanied by one of her colleagues visited six water catchments in five provinces, discussed the project with local people and government officials and collected information on these areas, especially in relation to the environment and the possible mitigation activities. The beneficiaries took an active part in these discussions. The minutes of the meetings held with the people in the six watersheds are given in Annex 6 and a list of participants is given in Annex 8. As a result of a series of meetings with the project staff, it was observed that the MC communities are well aware of the problems associated with over-exploitation of natural resources and the project's concept for their sustainable use. It was also observed that there is a significant commitment to the project both by the project staff and by the community.

Consultations are ongoing with all the players and this draft 'Regional Environmental Assessment' report was presented at a workshop in the MoF in Ankara on Friday 6th September 2002. A participant's list is given in Annex 8, together with a brief outline of the presentation. In addition in October 2002, the national consultant visited Malatya Province in order to see the practices and outcomes resulting from the EAWRP and to consult with the local staff that worked in the previous project on lessons learnt (Annex 8). It is anticipated, that this REA will be the starting point of an extended dialogue on mainstreaming environmental concerns in everyday activities of villagers and official in the project area.

Comments were received from World Bank Staff and GoT officials. As a result, the first draft REA was edited. A second consultation workshop was held on the 26th December 2002 to discuss this new draft REA. Annex 8 gives a list of participants at this meeting. But since then it has been further refined to include a summary of the REA in World Bank format (Annex 7) and a list of participants at various meetings with the beneficiaries, local authority people and GoT officials etc., together with details about making the report available to the general public. This is given in Annex 8.

One or two points emerge from a review of the consultation and participation process that took place during the EAWRP. The early consultations were biased to a top-down approach. This may be understandable because the villagers requested more economic initiatives as opposed to environmental interventions. Also, it was easier for government agencies, especially the MoF to undertake project components on their land rather than on land where ownership was in dispute or on private land. Lessons were leant from this and now in the AWRP (male) villagers are fully involved from the start.

Some of the villages were disappointed with the EAWRP project because it was terminated before components were finished. They contend that Government should fulfil its obligations and complete the initiatives that were started, before proceeding with other projects such as this AWRP. This project should ensure that there is enough money and time to fulfil all the commitments it has made.

There was a GEF sub-component in the EAWRP, but there does not seem to have been much cooperation between the main project and the GEF intervention. In part, this was because the GEF initiative was concerned with gene conservation of indigenous plants. But one complaint of the project was that planting material, particularly tree seeds, were generally of poor quality. The GEF sub-component could have assisted the main project in identifying superior seed sources in the area or within Turkey.

The GEF sub-component of this AWRP has a critical part to play, even though it is confined to four provinces. The promotion of friendly agricultural practices using organic fertilizers; undertaking soil testing and demonstrating minimum tillage applies to all the project areas not just the four provinces. Therefore, there must be a full and integrated partnership between the government agencies that were working in the EAWRP and the new agencies that are joining them on this project. Also barriers must be overcome and there has to be flexibility concerning delineation lines. There are trees

outside the forest and samples of these have to be measured during baseline and re-surveys. The forest service has the expertise, but from preliminary indications it says that it is not its responsibility to measure such trees, whereas MARA may not be capable of doing this task. Such disputes must be faced and a compromise reached. This project will benefit the people and the country, not only individual sectors.

This REA report has been translated into Turkish and will be made available to the public especially in the project areas. The REA document will be discussed in length by the relevant stakeholders from government organizations, professional bodies and NGOs at a workshop to be held in Ankara on the 20th February 2003.

Finally, when making the field trip in early June, not enough time was spent in each village, because the programme was too crowded. When undertaking future field trips, enough time must be set aside so that the views of all the villagers, both male and female, be heard. The same should apply to future participatory meeting. The project will succeed best if the ownership is vested in the people and they feel it is their plan.

Baglicadere Micro catchments plan (to be inserted by GDRS).

Orcan Micro-catchment Plan (to be inserted by GDRS).

Kabaktepe Micro-catchment Plan (to be inserted by GDRS).

Gogden Micro-catchment Plan (to be inserted by GDRS).

Annexes

Annex 1. Terms of Reference for the Regional Environmental Management Plan.

Annex 2. Environmental Screening of Proposed Interventions for AWRP, including the GEF Component, and their likely Environmental Impacts.

Annex 3. Legal Framework.

Annex 4. Selected Micro-catchments in the AWRP.

Annex 5. *AWRP: Project Performance Monitoring Component.*

Annex 6. Minutes of Meetings during Field Trip of Sema Alpan July 2002.

Annex 7. Environmental Management Plan AWRP.

Annex 1. Terms of Reference for the Regional Environmental Management Plan.

The National and International Consultants will carry out the following main tasks. Additional tasks may be requested by the Project Preparation Unit during the assessment.

Task 1 - Policy, Legal and Administrative Framework. Analyse the policy, legal and administrative framework (government, NGOs, communities) that are influencing or involved in environmental management in the project areas. Include the assessment of national and, where applicable, regional priorities as to how they may constrain or facilitate implementation of proposed project activities. Assess inter-agency coordination issues and propose appropriate institutional arrangements for adequate consideration of environmental issues during and after project implementation. Propose requirements for capacity building during project implementation, including need for consultants and training, and provide estimates of costs and TOR.

Task 2 - Baseline Data. Collect relevant baseline data for the natural environment, including climate, soil, geology, water resources, land use, agriculture, livestock, agro-industry, biodiversity, rural infrastructure, as well as the social environment, including demography and economics[16]. Based on the information collected, key environmental issues will be determined, that will have to be considered by the project or that may impact project implementation. Trends with regards to these environmental issues will have to be assessed. Benchmarks for project impact assessment and monitoring will be determined. The REA shall provide a detailed description of the baseline environmental status in the different provinces.

Task 3 - Lessons from previous and ongoing projects and studies. Review experiences with environmental issues and mitigation under the EAWRP, and determine lessons to be taken into account during design and implementation of the AWRP. Identify other projects and studies with similar components as the proposed project that are carried out in the project provinces. Determine whether activities under these projects serve or contradict the proposed project activities. Lessons shall again be integrated in project design and implementation.

Task 4 - Environmental Screening. Review the proposed project components and activities from the point of view of environmental risks and benefits. Propose screening criteria to address and prioritise environmental concerns and impacts. Propose environmental indicators to be considered in the evaluation of project benefits, both in the short (up to 5 years) and long-term (15 years) timeframe.

Task 5 - Project Environmental Impacts. Outline potential negative and positive environmental impacts of each of the project activities, and provide qualitative and quantitative assessment. Develop mitigating measures for each of these impacts during design, implementation and management of the activities.

[16] Some of this baseline information will be available in working papers prepared under other project preparation activities. This data will be made available by the PPU and can be used by the consultants, after review and analysis.

Suggested format for the Project Screening Matrix:

Project Component	Project Activity	Relevant Environmental Indicators	Potential Field Actions	Nature, Scope and Time-frame of Potential Environmental Impacts	Mitigation Proposed	Key Assumptions

Task 6 - Analysis of alternatives. Compare the project's activities and the results of the impact assessment against the without-project situation in the short and long-term scenarios. Estimate the cumulative incremental impact of the project on the project areas' environment, natural resource base and socio-economic conditions. For the non-Black Sea catchment areas the extent of interventions under the EAWRP shall serve as the starting point for estimating this cumulative impact assessment. For the GEF funded activities in the Black Sea provinces, the results of manure management and agro-industry studies will be used to provide a possible scenario of interventions.

Task 7 - Monitoring and Evaluation Plan. Determine the expected environmental outputs expected from the proposed project. Propose appropriate practical and useful indicators to monitor and evaluate negative and positive project environmental impacts. Propose monitoring and evaluation tools and strategies that could be integrated into the project.

Task 8 - Environmental Management Plan. Prepare an environmental management and monitoring plan for project implementation, which addresses all key environmental impacts, as well as the mitigating measures during construction and thereafter, and institutional responsibilities for implementation, monitoring and supervision. This plan shall be fully costed and requirements for equipment shall be determined. Develop an environmental management training program, including training modules, consultants' needs, TOR, and costing possible funding sources.

Task 9 - Consultation with Stakeholders. Take the lead in conducting public consultation workshops (with affected/beneficiary groups, relevant government agencies, local administrations, academics, NGOs, and others). Solicit opinions on positive and negative environmental issues associated with the proposed project to aid the development of the REA framework. The public consultation will be facilitated by the PPU and Group 2 staff. There will be a close cooperation with the social assessment Consultant and other project preparation teams. The workshops will be conducted early on during the consultancy in two central cities within the project area, as well as towards the end of the consultancy to present the draft REA. Review the consultation and participation process that took place during EAWRP and provide recommendations for necessary awareness raising, consultations and feedback during project implementation.

Task 10 - Review of Bank Safeguard Policies. Review the Bank's safeguard policies and determine which of these policies applies to the proposed project. For those that apply, determine the implications for project design.

The Consultants will produce a Draft REA covering the tasks outlined above. The REA report should be developed in a clear, logical and readable manner. A suggested outline of the REA is given below. The executive summary shall be brief and succinct. The draft report will be submitted to the PPU. Comments will be provided by the PPU and implementing agencies and the World Bank within two weeks from the submission date. Within three weeks of receipt of the comments the draft final REA report will be submitted to the PPU. Comments will be provided within one week from the submission date. This is also the time when the final consultation workshops will take place (see Task 9). The final EA report shall address final comments and will include the minutes of the public consultations. The consultants will also prepare a non-technical summary of the EA report. The Consultant will submit any additional material that was collected as part of the project that may be of use to the proposed project. An electronic version of the REA report and non-technical summary will also be submitted in MS Word 2000 format and any electronic version of maps and figures included in the EA report.

Suggested Outline of the REA Report.

This outline is based on the REA framework outlined in the World Bank Environmental Assessment Sourcebook Update #15, and has been modified to a more appropriate format given the scope of the proposed REA. The REA will include a clear and concise executive summary, and sections outlined below that describe the consultant's tasks. The main report should be succinct. Other data that is relevant should be attached as annexes.

Executive Summary
Acronyms

A. Introduction
B. Project Description
C. Institutional & Policy Issues
D. Baseline Information
E. Lessons from Previous Ongoing Projects & Studies
F. Environmental Screening
G. Project Environmental Impacts
H. Assessment of Alternatives
I. Monitoring and Evaluation Plan
J. Environmental Management Plan
K. Public Consultation
Maps, Tables, Figures, Graphs, Photographs
Appendices/Annexes
Information Sources/Bibliography

Annex 2. Environmental Screening of Proposed Interventions for AWRP, including the GEF Component, and their likely Environmental Impacts.

Table A2 1. Proposed interventions by the MoF for Soil Conservation and Seedling Production.

Intervention	Soil conservation through tree planting and seedling production			
	Afforestation	Poor, degraded and bare soil	Gallery areas	Nursery rehabilitation
Intervention code	1000	1100	1200	1300
A. Interventions with possible adverse environmental impact				
Forest roads	Yes	No	No	No
Service roads	Yes	No	No	No
Ground preparation/terracing	Yes	Yes	Yes	Yes
Gully rehabilitation	Yes	Yes	No?	No
Application of pesticides/insecticides	No	No	No	Yes?
Overuse of resources	Perhaps	Yes	Perhaps	No
B. Interventions with possible positive environmental impacts				
Seed sowing	Yes	Yes	No	Yes
Natural regeneration	No	Yes	No	No
Planting	Yes	Yes	Yes	No
Weeding	Yes	Yes	Yes	Yes
Gully rehabilitation	Yes	Yes	No	No
Fertilizer application (with GEF)	?	?	?	Yes
Forest road maintenance	Yes	No	No	Yes
Fencing	Yes	Yes	Yes	Yes? (natural)
Maintenance	Yes	Yes	Yes	Yes
C. Interventions to improve productivity				
Re-vegetation (seed sowing)	Yes	Yes	Yes	Yes
Natural regeneration	No	Yes	No	No
Planting	No	Yes	Yes	Yes
Pruning	Yes	Yes	Yes	? (roots)
Thinning	Yes	Yes	Yes	Yes?
Fertilizer application (with GEF)	?	?	?	Yes
Weeding	Yes	Yes	Yes	Yes
Natural conservation	Perhaps	Yes	No	No
D. Interventions to improve economic activities				
Inventory of woody biomass	Yes	Yes	Yes	No
Estimation of use of woody biomass	Yes	Yes	Yes	No
Improved management/use of woody biomass etc. (2200)	Yes	Yes	Yes	No
Inventory of NWFP (2000)	Yes	Yes	Yes	No
Promotion of NWFP (2000)	Perhaps	Perhaps	Perhaps	No
Establish/manage bee hives (6800)	Perhaps	Perhaps	Perhaps	Perhaps
Possible hunting areas (2300)	Perhaps	Perhaps	No	No
Possible protection area (2400)	Perhaps	Perhaps	No	No
Integrated pest management (2100)	Perhaps	Perhaps	Perhaps	Yes
Establishing private nurseries	No	No	No	Yes
Training incl. Environmental training	Yes	Yes	Yes	Yes
Guard shed/Store	Yes	No	No	Yes

Note. Yes, No, Perhaps etc. refers to whether or not a specific activity such as road building is listed under the component such as afforestation. If the particular intervention could have a negative or positive environmental impact etc., then this is recorded in the appropriate column and discussed in the main text.

For tree planting initiatives for soil conservation in forest areas including galleries and to protect and improve poor degraded and bare soils as well as to raise seedlings, there are little potential adverse environmental impacts caused by the proposed interventions and many positive impacts. One potential negative impact concerns road construction. When undertaking road construction, maximum slopes should not exceed standards set for the soil type and terrain. Culverts should be installed to prevent erosion and bridges built across streams or rivers of a specified width. Where the soil is disturbed through cut and fill, the exposed ground should be re-vegetated quickly to prevent erosion. Maintenance of roads is important to prevent erosion, rutting and water logging etc. At present some of the areas, especially the degraded areas, are being overused for goods and services (grazing, wood and non-wood products etc.). This is a principal reason for the interventions. It is important to undertake an inventory of the growing stock and yield of the different flora and fauna so as to determine the imbalance, if any, between supply and demand and to formulate a sustainable supply strategy.

Where ground preparation by hand and machine is proposed including terracing, care must be taken to prevent erosion. If fertilizers, both organic and inorganic, are to be added, first, soil testing must be undertaken to ensure that the correct dosages are applied. Otherwise, too much application could lead to leaching of excess minerals into surrounding water bodies; these could eventually finish up in the Black Sea. This could be undertaken in collaboration with the GEF component. Generally speaking, fertilizer application will have a positive influence on the environment by promoting plant growth and encouraging an increase in flora and fauna. The nursery may use pesticides and/or herbicides. It is important to ensure that only certified chemicals are allowed and that they are handled, used and stored according to FAO or other agreed directives. Also, the containers must be disposed of according to agreed procedures.

The local population should be consulted about rare or endangered flora and fauna and possible sites for protection or hunting. If such areas exist, then a complete inventory should be undertaken and if potential biodiversity areas (hotspots) are found, then they should be protected, provided agreement is reached with the beneficiaries. As mentioned above, a forest inventory of total aboveground woody biomass should be carried out before the proposed interventions occur. This will act as a baseline by which the rehabilitation measures can be judged. In addition, an estimate of the annual increment should be made and compared to an estimate of annual removals of wood products. This will indicate the condition of the growing stock. Similarly, an inventory of flora and fauna should be undertaken before interventions are made with estimations of the current off-take of plant and animal products (fruit, mushrooms, honey, game, fish etc.). Such an inventory can then be used as a baseline to compare changes, both positive and negative. These inventories can be used to devise an improved management plan in order to remove not more than the sustainable supply of any one product and if necessary, protect biodiversity hotspots.

Various interventions are given to improve the productivity of the land. Some have already been suggested, but others are new. Likewise interventions are given to improve the economic viability of the rangeland areas. Again some have been suggested and others are new. Besides rehabilitating nurseries, it is important to provide training in nursery establishment and management to the local population, so that they are encouraged to raise seedling of perennials for the project, for their own use and for sale. Training should also be given in environmental protection.

All the above interventions, except for nursery rehabilitation should lead to an increase store of woody biomass and additional sequestration of carbon in wood and the soil beneath the wood. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiative and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 2. Proposed interventions by the MoF for Forest Rehabilitation.

Intervention	Forest Rehabilitation			
	Oak coppice	Cedar	High forest	Maquis
Intervention code	1600	1700	1800	1900
A. Interventions with possible adverse environmental impact				
Forest roads	Yes	Yes	?	?
Ground preparation/terracing	Yes	Yes	Yes	Yes
Gully rehabilitation	Yes	Yes	Yes	Yes
Overuse of resources	Perhaps	Perhaps	Perhaps	Perhaps
B. Interventions with possible positive environmental impacts				
Natural conservation	Yes	No	Yes	Yes
Re-vegetation (seed sowing)	No	Yes	Yes	Yes
Planting	No	Yes	Yes	Yes
Coppicing	Yes	No	Yes	Yes
Pruning	No	Yes	Yes	?
Thinning	No	?	Yes	?
Gully rehabilitation	Yes	Yes	Yes	Yes
Fertilizer application (with GEF)	?	?	?	?
Forest road maintenance	Yes	Yes	No	No
Weeding	?	?	?	?
Fencing	Yes	Yes	Yes	Yes
Maintenance	Yes	Yes	Yes	Yes
C. Interventions to improve forest productivity				
Natural conservation	Yes	No	Yes	Yes
Re-vegetation (seed sowing)	No	Yes	Yes	Yes
Planting	No	Yes	Yes	Yes
Coppicing	Yes	No	Yes	Yes
Pruning	No	Yes	Yes	?
Thinning	No	?	Yes	?
Fertilizer application (with GEF)	?	?	?	?
Weeding	?	?	?	?
D. Interventions to improve economic activities				
Inventory of woody biomass	Yes	Yes	Yes	Yes
Estimation of current use of woody biomass	Yes	Yes	Yes	Yes
Improved management/use of woody biomass etc. (2200)	Yes	Yes	Yes	Yes
Inventory of NWFP (2000)	Yes	Yes	Yes	Yes
Promotion of NWFP (2000)	Perhaps	Perhaps	Perhaps	Perhaps
Wild tree grafting (2600)	Perhaps	No	Perhaps	Perhaps
Establish/manage bee hives (6800)	Perhaps	Perhaps	Perhaps	Perhaps
Possible hunting areas (2300)	Perhaps	Perhaps	Perhaps	Perhaps
Possible protection area (2400)	Perhaps	Perhaps	Perhaps	Perhaps
Integrated pest management (IPM) (2100)	Perhaps	Perhaps	Perhaps	Perhaps
Training including environmental training	Yes	Yes	Yes	Yes

For forest rehabilitation and management, there are few potential adverse environmental impacts caused by the proposed interventions and many positive impacts. One potential negative impact concerns road construction. When undertaking road construction, maximum slopes should not exceed standards set for the soil type and terrain. Culverts should be installed to prevent erosion and bridges built across streams or rivers of a specified width. Where the soil is disturbed through cut and fill, the exposed ground should be re-vegetated quickly to prevent erosion. Maintenance of roads is important to prevent erosion, rutting and water logging etc Where ground preparation is undertaken, particularly terracing with machines, care must be taken to minimize erosion while undertaking the operation and vegetation cover of the terrace wall should be promoted This also applies to gully rehabilitation. At present some of the areas are being overused for goods and services (wood and non-wood products, grazing etc.). This is a principal reason for the interventions. It is important to undertake an inventory of the growing stock and yield of the different flora and fauna so as to determine the imbalance, if any, between supply and demand and to formulate a sustainable supply strategy.

The local population should be consulted about rare or endangered flora and fauna and possible sites for protection or hunting. If such areas exist, then a complete inventory should be undertaken and if potential biodiversity areas (hotspots) are found, then they should be protected, provided agreement is reached with the beneficiaries. As mentioned above, a forest inventory of total aboveground woody biomass should be carried out before the proposed interventions occur. This will act as a baseline by which the rehabilitation measures can be judged. In addition, an estimate of the annual increment should be made and compared to an estimate of annual removals of wood products. This will indicate the condition of the growing stock. Similarly, an inventory of flora and fauna should be undertaken before interventions are made with estimations of the current off-take of plant and animal products (fruit, mushrooms, honey, game, fish etc.). Such an inventory can then be used as a baseline to compare changes, both positive and negative. These inventories can also be used to devise an improved management plan in order to not remove more than sustainable supply of any one product and if necessary to protect biodiversity hotspots.

Various interventions are given to improve forest productivity. Some have already been suggested, but others are new. Likewise interventions are given to improve the economic viability of the forest areas. Again some have been suggested and others are new. If fertilizers are added, this could be done in collaboration with the GEF component. Training should be given to the local population in all aspects of tree planting, coppicing, establishment, management and environmental protection.

All the above interventions should lead to an increase store of woody biomass and additional sequestration of carbon in wood and the soil beneath the wood. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 3. Proposed Interventions by MoF & MARA for Range Management and Rehabilitation.

Intervention	Range management		Range rehabilitation	
	In forests	Outside forest	In forests	Outside forests
Intervention code	1400	7500	1500	7600
A. Interventions with possible adverse environmental impact				
Service roads	Yes	No	Yes	No
Forest /range roads	Yes	Perhaps	Yes	Perhaps
Deep ripping	No	No	Yes	No
Gully rehabilitation	No	No	Yes	Yes
Fertilizer application (with GEF)	No	No	Yes	Yes
Field/stone clearance	No	No	Yes (field)	Yes (stone)
Reservoir construction	Yes	No	Yes	No
Overuse of resources	Yes	Yes	Yes	Yes
B. Interventions with possible positive environmental impacts				
Re-vegetation	No	No	Yes	Yes
Gully rehabilitation	No	No	Yes	Yes
Fertilizer application (with GEF)	No	No	Yes	Yes
Deep ripping	No	No	Yes	No
Field/stone clearing	No	No	Yes (field)	Yes (stone)
Forest road maintenance	Yes	No	Yes	No
Weeding	No	No	Yes	Yes
Fencing	Yes	Yes	Yes	Yes
Small reservoirs	Yes	No	Yes	No
Maintenance	Yes	Yes	Yes	Yes
Demonstrations	Yes (1400)	No	Yes (1500)	Yes (7400)
Efficiency estimation cages	Yes	Yes	Yes	Yes
C. Interventions to improve animal husbandry				
Weeding	No	No	Yes	Yes
Field clearance	No	No	Yes	No
Shade frames	Yes	Yes	Yes	Yes
Small reservoirs	Yes	No	Yes	No
Well construction	Yes	Yes	Yes	Yes
Drinking troughs	Yes	Yes	Yes	Yes
Sheep dips	Yes	Yes	Yes	Yes
Salt licks	Yes	Yes	Yes	Yes
Itching posts	Yes	Yes	Yes	Yes
D. Interventions to improve economic activities				
Inventory of NWFP (2000)	Yes	Yes	Yes	Yes
Promotion of NWFP (2000)	Perhaps	Perhaps	Perhaps	Perhaps
Inventory of mountain fruit	Yes	Yes	Yes	Yes
Promotion of mountain fruit	Perhaps	Perhaps	Perhaps	Perhaps
Inventory of woody biomass	Yes	Yes	Yes	Yes
Estimation of use of woody biomass	Yes	Yes	Yes	Yes
Improved management/use of woody biomass etc. (2200)	Perhaps	Perhaps	Perhaps	Perhaps
Wild tree grafting (2600)	Perhaps	No	Perhaps	No
Establish/manage bee hives (6800)	Perhaps	Perhaps	Perhaps	Perhaps
Fish Farming (4000)	Perhaps	No	Perhaps	No
Possible hunting areas (2300)	Perhaps	Perhaps	Perhaps	Perhaps
Possible protection area (2400)	Perhaps	Perhaps	Perhaps	Perhaps
Training incl. Environmental training	Yes	Yes	Yes	Yes

For rangeland management and rangeland rehabilitation inside or outside forests, there are few potential adverse environmental impacts caused by the proposed interventions and many positive impacts. One potential negative impact concerns road construction. When undertaking road construction, maximum slopes should not exceed standards set for the soil type and terrain. Culverts should be installed to prevent erosion and bridges built across streams or rivers of a specified width. Where the soil is disturbed through cut and fill, the exposed ground should be re-vegetated quickly to prevent erosion. Maintenance of roads is important to prevent erosion, rutting and water logging etc. At present many of the areas are being overused for goods and services (grazing, wood and non-wood products etc.) This is a principal reason for the interventions. It is important to undertake an inventory of the growing stock and yield of the different flora and fauna so as to determine the imbalance, if any, between supply and demand and to formulate a sustainable supply strategy.

Where deep ripping is proposed, care must be taken to prevent erosion. However, deep ripping should ensure a greater percolation of water and minimize run-off and possible erosion. Similarly, when field clearance is undertaken, care must be taken to preserve biodiversity especially of rare plants such as orchids. However, this operation should clear intrusive weed species, some of which are exotics. If fertilizers, both organic and inorganic, are to be added to rangelands, soil testing must first be undertaken to ensure that the correct dosages are applied. Otherwise, too much application could lead to leaching of excess minerals into surrounding water bodies; these could eventually finish up in the Black Sea. This could be done in collaboration with the GEF component. Generally speaking, fertilizer application will have a positive influence on the environment by promoting plant growth and encouraging an increase in flora and fauna.

The local population should be consulted about rare or endangered flora and fauna and possible sites for protection or hunting. If such areas exist, then a complete inventory of these areas should be undertaken and if potential biodiversity areas (hotspots) are found, then they should be protected, provided agreement is reached with the beneficiaries. As indicated above, a general inventory of flora and fauna should be undertaken before interventions are made with estimations of the current off-take of plant and animal products (wood, fruit, honey, milk, meat, wool, fish etc.). Such an inventory can then be used as a baseline to compare changes, both positive and negative. The inventory can also be used to devise an improved management plan in order to remove not more than sustainable supply of any one product.

Various interventions are given to improve the productivity of the land. Some have already been suggested, but others are new. Likewise interventions are given to improve the economic viability of the rangeland areas. Again some have been suggested and others are new. Training should be given to the local population in all aspects of the above interventions and general training in environmental protection and environmental friendly pastoral practices should be part of such training.

All the above interventions should lead to an increase store of woody biomass and additional sequestration of carbon in wood and the soil beneath the wood. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 4. Miscellaneous Interventions by MoF to assist Forest Management and Rehabilitation

Intervention	Inventory work		Planning and Establishing		
	Trees	Non-wood Forest Products	Integrated Pest Management	Game areas	Protection areas
Intervention code	Code required	2000	2100	2300	2400
A. Interventions with possible adverse environmental impact					
Building access roads	No	No	N/A	Perhaps	Perhaps
Building infrastructure	No	No	N/A	Perhaps	Perhaps
Overuse of resources	N/A	N/A	N/A	Perhaps	Perhaps
B. Interventions with possible positive environmental impacts					
Sustainable management and management plans	Yes	Yes	N/A	Yes	Yes
Natural control of pests	N/A	N/A	Yes	N/A	N/A
Increased flora and fauna	Yes	Yes	Yes	Yes	Yes
Demonstrations	Yes	Yes	Yes	Yes	Yes
Monitoring & evaluation	Yes	Yes	Yes	Yes	Yes
C. Interventions to improve productivity					
Seeding and planting, especially of fodder/browse plants.	No	Yes	N/A	Yes	Yes
Game management	No	No	N/A	Yes	?
Breeding insects to control pests and their release	N/A	N/A	Yes	N/A	N/A
Fencing of hotspots	N/A	Yes	No	Perhaps	Yes
D. Interventions to improve economic activities					
Estimation of current use of woody biomass	Yes	No	N/A	No	No
Promotion of wood products	Yes	No	N/A	No	No
Promotion of NWFP (2000)	No	Yes	N/A	Perhaps	Perhaps
Improved management/use of woody biomass etc. (2200)	Perhaps	No	N/A	No	No
Inventory of flora and fauna	Yes	Yes	Yes	Yes	Yes
Promotion of hunting	N/A	N/A	N/A	Yes	No
Use of gene pool from hotspots	Perhaps	Perhaps	N/A	Perhaps	Perhaps
Eco-tourism	N/A	N/A	N/A	Perhaps	Yes
Marketing and market information	Yes	Yes	N/A	Yes	Yes
Training including. Environmental training	Yes	Yes	Yes	Yes	Yes

N/A = Not applicable.

For the above miscellaneous forest activities, there may be a few adverse environmental impacts caused by the proposed interventions, relating to possible hunting and protection areas. If such areas are developed, then access roads and game trails may have to be built and accommodation and centres for visitors and staff may have to be constructed. When undertaking road and trail construction, maximum slopes should not exceed standards set for the soil type and terrain. Culverts should be installed to prevent erosion and bridges built across streams or rivers of a specified width. Building should comply with the building codes and care should be taken that their size is in line with the carrying capacity of the area. At present the potential game and protection areas may be overused for goods and services (grazing, wildlife, wood and non-wood products etc.). This is a principal reason for the interventions. It is important to undertake an inventory of the growing stock and yield of the different flora and fauna so as to determine the imbalance, if any, between supply and demand and to formulate a sustainable supply strategy.

The local population should be consulted about rare or endangered flora and fauna and possible sites for protection or hunting. As indicated above, a complete inventory of flora and fauna should be undertaken and if potential biodiversity areas (hotspots) are found, then they should be protected, provided agreement is reached with the beneficiaries. This inventory should include estimations of the current off-take of plant and animal products (wood, fruit, honey, meat, fish etc.). It can then be used as a baseline to compare changes, both positive and negative. The inventory can also be used to devise an improved management plan in order to remove not more than sustainable supply of any one product.

Various interventions are given to improve the productivity of the land. Some have already been suggested, but others are new. Likewise interventions are given to improve the economic viability of the rangeland areas. Again some have been suggested and others are new. Training should be given to the local population in all aspects of the above interventions including environmental protection.

There should be an increase store of woody biomass and additional sequestration of carbon in wood and the soil for protected areas and possibly game areas. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become known. This carbon could be used to offset emissions from fossil fuels and/or to trade.

Table A2 5. Interventions by MoF and MARA for Habitat Rehabilitation, Participatory Planting and Wild Tree Grafting

Intervention	Habitat rehabilitation		Participatory planting		Wild tree grafting	
	In forest	Outside: incl. use of marginal lands	In forest	Outside including agro-forestry	In forest	Outside forest
Intervention code	2200	6100	2500	6600	2600	6200
A. Interventions with possible adverse environmental impact						
Ground prep'n/terracing	Yes	Yes	Yes	Yes	No	No
Gully rehabilitation	Perhaps	Perhaps	Perhaps	Perhaps	No	No
Fertilizer application (with GEF)	Perhaps	Perhaps	Perhaps	Perhaps	No	No
Overuse of resources	Yes	Yes	Perhaps	Perhaps	No	No
B. Interventions with possible positive environmental impacts						
Nat. regeneration: trees	Yes	Yes	No	No	No	No
Nat regeneration: herbs etc.	Yes	Yes	No	Perhaps	No	No
Seed sowing: trees & herbs	Yes	Yes	Yes	Yes	No	No
Planting: trees & herbs	Yes	Yes	Yes	Yes	Perhaps	Perhaps
Grafting	Perhaps	Perhaps	Perhaps	Perhaps	Yes	Yes
Gully rehabilitation	Perhaps	Perhaps	Perhaps	Perhaps	No	No
Fertilizer application (with GEF)	Perhaps	Perhaps	Perhaps	Perhaps	No	No
C. Interventions to improve productivity						
Nat. regeneration: trees	Yes	Yes	No	No	No	No
Nat regeneration: herbs etc.	Yes	Yes	No	Perhaps	No	No
Seed sowing: trees & herbs	Yes	Yes	Yes	Yes	No	No
Planting: trees & herbs	Yes	Yes	Yes	Yes	Perhaps	Perhaps
Grafting	Perhaps	Perhaps	Perhaps	Perhaps	Yes	Yes
Weeding	Yes	Yes	Yes	Yes	Yes	Yes
Tending	Yes	Yes	Yes	Yes	Yes	Yes
Sustainable management	Yes	Yes	Yes	Yes	Yes	Yes
D. Interventions to improve economic activities						
Production of valuable wood and non-wood species	Yes	Yes	Yes	Yes	Yes	Yes
Promotion of farm trees of economic value	No	No	No	Yes	No	Yes
Sustainable management	Yes	Yes	Yes	Yes	Yes	Yes
Promotion of shelterbelts and agro-forest species	No	Perhaps	No	Yes	No	No
Promotion of beekeeping and fish farming etc.	Perhaps	Yes	Perhaps	Yes	No	No
Integrated pest management	Perhaps	Yes	Perhaps	Yes	Yes	Yes
Training inc. environmental	Yes	Yes	Yes	Yes	Yes	Yes

For the above activities, there are few potential adverse environmental impacts namely ground preparation and gully rehabilitation caused by the proposed interventions. At present many of the areas are being overused for goods and services (wood and non-wood products, grazing etc.). This is a principal reason for the interventions. It is important to undertake an inventory of the growing stock and yield of the different flora and fauna so as to determine the imbalance, if any, between supply and demand and to formulate a sustainable supply strategy. There should be many positive impacts including increasing the ground cover with trees and herbs etc., improving the microclimate and establishing favourable habitats for indigenous flora and fauna. If fertilizers are to be applied, this could be done in collaboration with the GEF component. As mentioned above, an inventory of each area should be undertaken before the proposed intervention starts. This should include the current off-take of plant and animal products, if any, (wood, fruit, honey etc.). Such an inventory can then be used as a baseline to compare changes, both positive and negative. The inventory can also be used to devise an improved management plan in order to remove not more than sustainable supply of any one product.

Various interventions are given to improve the productivity of the land and to ensure sustainability. Some have already been suggested, but others are new, especially planting trees on farms in agro-forestry formations. Likewise interventions are given to improve the economic viability of the rangeland areas. Again some have been suggested and others are new. Training should be given to the local population in all aspects of the above interventions including environmental awareness and protection of hotspots, if any.

All the above interventions should lead to an increase store of woody biomass and additional sequestration of carbon in wood and the soil beneath the wood. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 6. Interventions by MARA related to Rainfed Environmentally-friendly Agricultural/Horticultural Practices.

Intervention/Land type	Marginal land	Sloping land	Plains	River bed
Intervention code	6100			4200
A. Erosion control interventions				
Terracing (4100)	Yes	Yes	No	Yes
Gully rehabilitation	Yes	Yes	Perhaps	Yes
Channel work	Perhaps	No	No	Yes
Soil protection: mechanical	Perhaps	Yes	No	Yes
Soil protection: plants	Yes	Yes	Yes	Yes
Contour ploughing	Yes	Yes	Yes	No
Minimum tillage	Yes	Yes	Yes	Yes
Perennial crops	Yes	Yes	Perhaps	Yes
Rotational crops	No	Yes	Yes	No
Annual crops	No	Yes	Yes	No
Permanent crops	Yes	Yes	Perhaps	Yes
B. Soil improvements				
Soil testing pH, N, P, K & C; humus content etc. (7000)	Yes	Yes	Yes	Perhaps
Appropriate fertilizer use (organic & inorganic) (7000) (with GEF)	Perhaps	Yes	Yes	Perhaps
Legume crops	Yes	Yes	Yes	Yes
Agronomic package (6900)	No	Perhaps	Yes	No
Horticultural crops (6200)	No	Perhaps	Yes	No
Crop rotations (fallow reduction 6000)	No	Yes	Yes	No
Minimum tillage (6900)	Yes	Yes	Yes	Yes
Perennial crops.	Yes	Yes	Perhaps	Yes
Agro-forestry/farm trees (6600)	Yes	Yes	Yes	Yes
C. Economic enhancement				
High value crops (6700)	No	Perhaps	Yes	No
Apiculture (6800)	Yes	Yes	Yes	Perhaps
Plastic tunnels (7100)	No	Perhaps	Yes	No
Fish ponds (4000)	Perhaps	Perhaps	Perhaps	Possible
Appropriate fertilizer use (organic & inorganic) (7000) (with GEF)	Perhaps	Yes	Yes	Perhaps
Demonstrations (7300)	Yes	Yes	Yes	Yes
Training (including environmental training)	Yes	Yes	Yes	Yes
Market information	Yes	Yes	Yes	Yes
Application of pesticides and/or insecticides	Perhaps	Yes	Yes	No

For the above activities, there are few potential adverse environmental impacts namely ground preparation, terracing, gully rehabilitation and riverbank work caused by the proposed interventions. On some farms, the application of organic and/or inorganic fertilizers has been excessive with a consequential leaching of N, P and K into groundwater, streams and rivers. This is why soil testing is important. However, the majority of farms do not apply sufficient fertilizers and the appropriate application rates can increase productivity substantially. This intervention can be undertaken in collaboration with the GEF component. Likewise there may have been an overuse or inappropriate use of pesticides/herbicides yielding similar adverse environmental consequences If farmers are using pesticides and/or herbicides on their crops, it is important to ensure that only certified chemicals are allowed and that they are handled, used and stored according to FAO or other agreed directives. Also, the containers must be disposed of according to agreed procedures.

There will be many positive environmental impacts. These include soil stabilization with terracing, gully plugging, contour ploughing and minimum tillage, increasing the ground cover with rotational crops, grass, perennial crops and herbs etc., improving the microclimate with trees and bushes and applying the appropriate quantities of organic/inorganic fertilizers at the correct time.

An inventory of each area should be undertaken before the proposed intervention starts, especially of the mineral and humus contents of the soils. This should include the current off-take of farm crops and the incidence of woody biomass on farm and other non-forest land. This will indicate if some resources are being overused. Such an inventory can also be used as a baseline to compare changes, both positive and negative. The inventory can also be used to devise an improved management plan for the farming areas.

Various interventions are given to improve the productivity of the land. Most have already been suggested, but a few are new such as minimum tillage and planting trees on farms in agro-forestry formations. Likewise interventions are given to improve the economic viability of the farming areas. Again some have been suggested and others are new such as fishponds. Training should be given to the local population in all aspects of the above interventions including environmental training.

All the above interventions should lead to a decrease in erosion, a decrease in the mineral content in water bodies and an increase in crop productivity. It should also lead to an increase in carbon sequestration in woody biomass and the soil. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 7. Interventions by the GDRS related to Irrigated Environmentally-friendly Agricultural/Horticultural Practices.

Intervention/Land type	Marginal land	Sloping land	Plains
Intervention code	4000?	4000	4000
A. Erosion control interventions			
Terracing (4100)	Yes	Yes	No
Gully rehabilitation	Yes	Yes	Perhaps
Irrigation canal	Perhaps	Perhaps	Yes
Diversion weirs	Perhaps	Perhaps	Yes
Irrigation pond/farm pond	No	Perhaps	Yes
Soil protection: mechanical	Perhaps	Yes	No
Soil protection: plants	Yes	Yes	Yes
Contour ploughing	Yes	Yes	Yes
Minimum tillage	Yes	Yes	Yes
Perennial crops	Yes	Yes	Perhaps
Rotational crops	No	Yes	Yes
Annual crops	No	Yes	Yes
Permanent crops	Yes	Yes	Perhaps
B. Soil improvements			
Soil testing: pH, N, P, K & C; humus content etc. (7000)	Yes	Yes	Yes
Appropriate fertilizer application (organic & inorganic) (7000) (with GEF)	Perhaps	Yes	Yes
Legume crops	Yes	Yes	Yes
Agronomic package (6900)	Perhaps	Yes	Yes
Horticultural crops (6200)	No	Yes	Yes
Crop rotations (fallow reduction – 6000)	No	Yes	Yes
Minimum tillage (6900)	Yes	Yes	Yes
Perennial crops.	Yes	Yes	Yes
Shelterbelts (6600)	Yes	Yes	Yes
C. Economic enhancement			
High value crops (6700)	Perhaps	Yes	Yes
Appropriate fertilizer application (organic & inorganic) (7000) (with GEF)	Perhaps	Yes	Yes
Apiculture (6800)	Yes	Yes	Yes
Plastic tunnels (7100)	No	Yes	Yes
Fish ponds (4000)	Perhaps	Perhaps	Perhaps
Demonstrations (7300)	Yes	Yes	Yes
Training (including environmental training)	Yes	Yes	Yes
Market information	Yes	Yes	Yes
Application of pesticides and/or insecticides	Perhaps	Yes	Yes

For the above activities, there are few potential adverse environmental impacts namely weir construction (riverbank work), irrigation canal and pond construction including farm ponds, ground preparation, terracing and gully rehabilitation caused by the proposed interventions. On some farms, the application of organic and/or inorganic fertilizers has been excessive with a consequential leaching of N, P and K into groundwater, streams and rivers. This is why soil testing is important. However, the majority of farms do not apply sufficient fertilizers and the appropriate application rates can increase productivity substantially. This intervention can be undertaken in collaboration with the GEF component. Some farmers may use or overuse pesticides and/or herbicides on their crops. It is important to ensure that only certified chemicals are allowed and that they are handled, used and stored according to FAO or other agreed directives. Also, the containers must be disposed of according to agreed procedures.

However, most of the impacts are positive. These include soil stabilization with terracing, gully plugging, reduced water erosion because of more controlled use of the water, contour ploughing and minimum tillage, increasing the ground cover with rotational crops, grass, perennial crops and herbs etc., improving the microclimate with trees and bushes and applying the appropriate quantities of organic and inorganic fertilizers at the correct time. It is essential that training be given on the appropriate use of irrigation water. If this is not done, excessive water use may cause the soil to be un-useable because of salt being brought to the surface, or alternatively, water logging may occur, which again makes the land sterile and un-useable.

An inventory of each area should be undertaken before the proposed intervention starts, especially of the mineral and humus contents of the soils. This should include the current off-take of farm crops and the incidence of woody biomass on farm and other non-forest land. Such an inventory can then be used as a baseline to compare changes, both positive and negative. The inventory can also be used to devise an improved management plan for the farming areas.

Various interventions are given to improve the productivity of the land. Most have already been suggested, but a few are new such as minimum tillage and planting shelterbelts. Likewise interventions are given to improve the economic viability of the farming areas. Again some have been suggested and others are new such as fishponds. Training should be given to the local population in all aspects of the above interventions including environmental training.

All the above interventions should lead to a decrease in erosion, a decrease in the mineral content in water bodies and an increase in crop productivity. It should also lead to an increase in carbon sequestration in woody biomass and the soil. This is why it is important to undertake a biomass inventory and soil sampling for carbon content prior to the start of the initiatives and at intervals throughout the project's lifetime and beyond. Only by doing this will the scale of carbon sequestration become apparent. This carbon could be used to offset emissions from fossil fuels and/or to trade. Action to reduce atmospheric carbon dioxide is an environmental concern just as important as biodiversity preservation or reduction of the nutrient load in water and hence decreasing eutrophication in national and international waters and reducing excessive mineral content in groundwater.

Table A2 8. Environmental impacts of Agro-Industrial Waste.

Agro-industry (Component #)	Type of waste	Polluting places	Potential use	Environmental effect
Medium to large cattle feeding shed (AI 1)	Liquid and solid	Rivers, Black Sea, groundwater, sometimes excessive use on fields Dumps at roadside etc.	Fertilizer, energy (methane)	Excessive nitrate concentration in water bodies, pathogens in water, unpleasant smell, flies. High biochemical oxygen demand (BOD)
Medium to large poultry units (egg production) (AI 2)	Liquid and solid	Rivers, Black Sea, groundwater, sometimes excessive use on fields. Dumps at roadside etc.	Fertilizer, energy (methane)	Excessive N concentration in water bodies, pathogens in water, unpleasant smell, flies. High BOD
Medium to large poultry units (broiler production) (AI 3)	Liquid and solid, guts intestines	Rivers, Black Sea, groundwater, sometimes excessive use on fields. Dumps at roadside etc.	Fertilizer, energy (methane)	Excessive N concentration in water bodies, pathogens in water, unpleasant smell, flies. High BOD
Slaughter house (AI 4)	Liquid and solid, blood guts, intestines	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Fertilizer, energy (methane)	Excessive N concentration in water bodies, pathogens in water, unpleasant smell, flies. High BOD
Dairy products manufacture (AI 5)	Whey and liquids	Rivers, Black Sea, groundwater	Fertilizer? Food.	High BOD
Sugar beet factory (AI 6)	Liquid, residues	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Fertilizer? Energy.	High BOD, smell, flies. Smoke
Winery (AI 7)	Liquid, residues	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Fertilizer? Energy?	High BOD, smell, flies
Fruit juice manufacture (AI 8)	Liquid, residues	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Fertilizer? Energy?	High BOD, smell, flies
Fruit and vegetables (AI 9)	Liquid, residues	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Fertilizer? Energy?	High BOD, smell, flies
Confectionery (AI 10)	Residues	Rivers etc.? Dumps at roadside	Energy?	Smell, flies. Smoke
Wood processing (AI 11)	Residues	Rivers etc.? Dumps at roadside	Energy, Board making	Smoke
Pulp/paper (AI 12)	Liquid, chemicals, solid	Rivers, Black Sea, groundwater. Dumps at roadside etc.	Energy, reuse of chemicals	High BOD, some toxins. Smoke.

There are environmental laws governing most if not all the effluents produced by the agro-processing factories. However, some of the factories were built before the environmental laws were introduced (sugar factories) and other factories, while having some treatment units do not utilize them fully or they are in a state of disrepair. The poultry and cattle units dispose of some of the manure to farmers, but they cannot get rid of it all. Many units are near towns and so the smell from such factories is obnoxious as well as being a potential health hazard by polluting the drinking water and being a breeding ground for flies and other potentially dangerous insects. Also, there may be traces of medicines and growth hormones in some of the waste, which could enter the food chain: this has to be controlled if it is detected. While there are environmental rules, the best way to have the factories comply with them is to find (profitable) uses for the waste and/or help them dispose of them in a safe way. It is in the Governments interest to do so, for it has signalled its intention to comply with the European Unions "Nitrogen Directive" and it is a signatory to pollution reduction in international waters.

The GEF component of this Anatolia Watershed Rehabilitation Project has the express aim of demonstrating practical uses for agro-industrial wastes, especially manure from cattle and poultry, while at the same time reducing nitrates in rivers and ground water, by applying appropriate amounts of organic fertilizers to agricultural and horticultural crop as well as to rangelands and some tree crops. This will be achieved by testing the various soils for their mineral and humus contents and specifying the quantity and type of fertilizers to be added for specific crops. Fertilizer application in collaboration with the GEF Component has been specified in the tables. To complement this, environmentally friendly practices will be demonstrated such as minimum tillage, contour ploughing, agro-forestry, green manure and crop rotations.

Specific poultry units and cattle feeding sheds will be chosen to demonstrate appropriate storage and use of liquid and solid manure. The water entering and leaving such factories will be tested, as will farmer's fields that are testing grounds for the application of organic fertilizers. Some of the stored manure will vent methane, a more dangerous greenhouse gas than carbon dioxide. This methane could be captured in a digester. It is possible that the Project will demonstrate appropriate digesters at poultry units or cattle feeding sheds. If successful, such units could supply enough energy for the unit or be used to generate electricity. The slurry from the digester is a better fertilizer than the raw dung.

Annex 3. Legal Framework.

Some relevant legislation on agriculture and agricultural sector activities are as follows:

- Law No. 3285 on Animal Health and Surveillance.
- Law No. 904 on the Breeding of Animals.
- Law on Breeding of Olives and Grafting of Wild Olive Trees.
- Law on Agricultural Combat and Agricultural Quarantine.
- Law on Fishery Products.
- Law on Animal Feed.
- Law on Agricultural Reform on the Landscaping in Irrigated Areas
- Decree Law on the Production, Consumption and Control of the Foodstuffs and Regulation on the Production of Plant and Animal Products through Ecological Methods.

In addition to the Turkish legislation listed above, the following legislation applies to forestry:

- Law No. 3800 on the Establishment of the Ministry of Forestry.
- Law No. 6831 on Forestry.
- Law No. 2873 on National Parks.
- Law No. 2924 on Support for the Improvement of Forestry Farmers
- Law No. 4122 on National Mobilization on Afforestation and Erosion Control.
- Law No. 3234 on the Establishment of Directorate General for Forestry.
- Law No. 3167 on Land Hunting.
- Communiqué No. 285 on Implementation Principles on the Prevention & Combat of Forest Fires.

The framework Environment Act issued in 1982 is the basis for environmental legislation. The following legislation can be listed relating to nutrients and nutrient pollution.

Water Pollution Control Regulation (4 September, 1988). The purpose of the Regulation is to maintain the quality of surface and ground water resources according to their allocated uses, to ensure the best use of water resources, to set the technical and legislative rules to control the water quality. This is in order to prevent pollution in compliance with the economic and social development goals

Water quality criteria. The Water Pollution Control Regulation sets out principles for classifying surface and ground water quality in four and three classes respectively. Seawater is also classified in three classes. The classification by water quality of inland surface waters in rivers, lakes and dam reservoirs is as follows.
Class I: High Quality Water (for drinking supply, swimming, trout farming, husbandry and farming).
Class II: Slightly Polluted Water (appropriate for drinking supply with tertiary treatment, recreational purposes, fish harvesting other than trout, irrigation, other uses not included in Class I).
Class III: Polluted water (industrial supply after treatment except industries - like food and textile industries - which require high quality water).
Class IV: Highly polluted water (other low quality water uses).

Table A 3. 1- Quality Criteria of Inland Water Resources by Class.

Quality Parameters	Water Quality Classes			
	I	II	III	IV
Ammonia N (mg NH_4+-N/l)	0.2[1]	1[1]	2[1]	>2[1]
Nitrite N (mg NO_2—N/l)	0.002	0.01	0.05	>0.05
Nitrate N (mg NO_3—N/l)	5	10	20	>20
Total Kjeldahl N (mg/l)	0.5	1.5	5	>5
Total P (mg PO_4^{-3}-P/l)	0.02	0.16	0.65	>0.65

[1] *The concentration of free ammonia may not exceed 0.02 mg NH_3-N/l depending on pH.*

The classes of groundwater as defined by their quality are given below:

Groundwater Class I: High quality groundwater (may be used for drinking and in the food industry). Under the condition of supplying necessary oxygen with aeration, ground water which satisfy the quality criteria for Class I surface waters is considered as Groundwater Class I.
Groundwater Class II: Medium quality groundwater (may be used for drinking following a purification process; and may be used for irrigation, for animals and as cooling water without any purification). Water with the quality parameters, which satisfy the criteria for Class II surface waters is considered to be Groundwater Class II
Groundwater Class III. Lower quality groundwater compared to the previous classes (use of such water shall be determined by the degree of purification attainable economically and technologically and with respect to health).

Table A 3. 2 - Eutrophication Control Limits in Lakes, Ponds, Marshes and Reservoirs.

Desired Properties	Area of Use	
	Nature Conservation Areas and Recreation	Various Uses (including natural salt bitter and soda rich lakes)
PH	6.5 - 8 5	6 - 10.5
COD (mg/l)	3.0	8.0
Dissolved Oxygen (mg/l)	7.5	5.0
Suspended Solids (mg/l)	5.0	15.0
Total Coliform (MPN/100 ml)	1000	1000
Total Nitrogen (mg/l)	0.1	1.0
Total Phosphorus (mg/l)	0.005	0.1

Emission Discharge Principles. Industrial enterprises are allowed to discharge wastewater to the local sewerage system and to the deep sea, although firms may be required to pre-treat effluent prior to discharge into wastewater treatment plants. Discharge of hazardous substance to water is prohibited. The permitting procedure has been regulated since 1989 after the issuance of the Water Pollution Control Regulation. Principles for discharging effluent to ground and surface waters, and for treating wastewater, are also contained in the regulation. Effluent standards have been set for different types of industries and for the substances that may be discharged, along with basic principles to be followed. Discharge limits of pollutants listed for agro-industries do not include the nutrients. Discharge permits are subject to three-year renewable authorization. They may be refused or withdrawn in order to prevent any adverse environmental impact (e.g. direct discharge in areas, which have been highly polluted). Although the discharge standards are specified for each industrial sub-sector, they are fixed regardless of the receiving body. This means that, the limits for pollutant parameters for a specific industrial discharge are the same whether it is discharged into a lake or into the Black Sea.

Water Quality Planning. For water resource protection used for drinking and other purposes, the general principles and protection areas indicated below shall be valid until special provisions have been introduced for each resource.
Absolute protection zone. This is a 300-m wide strip extending from the maximum water level of a drinking and bathing water reservoir.
Proximate protection zone. This is a 700-m wide strip extending from the absolute protection zone surrounding a drinking and bathing water reservoir.
Mediate protection zone. This is a 1-km wide strip extending from the boundary of the proximate protection zone surrounding a drinking and bathing water reservoir.
Remote protective zone. This is the whole of the water collection basin that falls outside the other protective zones surrounding drinking and bathing water reservoirs as defined above.

All kinds of activities, which are banned or allowed with limitations, are addressed for each buffer zone. However, these rules are subject to change whenever special provisions are introduced for any resource.

Monitoring. Effluent discharges must be monitored by the enterprises themselves according to the Water Pollution Control regulation. The recordings of the monitoring are subject to inspection by The Ministry of Environment, the municipalities, or provincial governments depending on their authorization. The frequency of monitoring is stated in the "discharge permission " which is granted by the Administration for all direct discharges of household and/or industrial wastewaters into water receptor media on the condition of compliance with the principles of the Water Pollution Control Regulation. The inspections to be conducted by the Administration are based on instantaneous, 2-hourly and 24-hourly composite samples of effluent. Therefore, monitoring is supposed to be based on spot samples and composite samples.

According to the Regulation on Water Pollution Control, "the relevant units of the Ministry of Agriculture and Rural Affairs shall specify in detail the method of calculating the required amounts of fertilizers and shall conduct inspections regarding their overuse." Nevertheless, the Ministry has rarely practised this yet.

Solid Wastes Control Regulation (14 March 1991). The intended purpose of the Regulation is to ban the disposal, transportation, storage of all kinds of wastes and waste materials which might be disposed directly or indirectly to the receiving bodies and have an adverse impact on these bodies; to protect plant and animal generations, natural assets and ecological system by regulating the management of some consumption goods which might have persistent impacts. To this end, for all kinds of household waste, waste from industrial plants, [other than hazardous waste], waste from commercial activities and construction debris, provisions are made in the Regulations to encourage waste minimization, recycling and reuse, collection, transportation, disposal, composting, incineration, rehabilitation of existing disposal sites.

The Regulation consists of provisions, which require treatment of leachate from the sanitary landfills and composting facilities to the extent required in the Water Pollution Control Regulation for receiving water bodies. The quality criteria of the compost to be used for agricultural practices are also included in the regulation. When the C/N ratio is greater than 35, nitrogen should be added into the compost reactor providing the optimum conditions for composting reaction. The organic material content should be 35% of the solid material in the compost, which will be used for soil conditioning.

Regulation on Aqua-products (28 June 1973). The intended purpose of the Regulation is to regulate fishing and fish farming practices, to set limits, principles, methods, prohibitions, responsibilities, measures, control and inspections in the production and marketing of aqua-products, and disposals of polluting and hazardous materials into harvest zones to protect fish stocks and exploit aqua-products economically

Nutrient Limits. Tolerable limits in the receiving water bodies for the hazardous substances, which are banned to be disposed into the production zones in inland waters and seas are addressed in the Regulation.

Tolerable limits regarding nutrients in the said Regulation are as follows:

Ammonia ion	0.02 mg/l,	Phosphate ion	15.0 mg/l.

Pesticides. There are some limitations set in the Aqua products Law for pesticides in the water bodies. These limitations are given in Table A3. 3.

Table A 3. 3: Pesticide Concentration Limits in Inland Water Bodies.

International name of active ingredient	Banned (1) Allowed (2)	Tolerable limit microgram/l
1- ALDRIN	(2)	0.04
2- BHC	(1)	2.0
3- CLORDANE	(1)	37.5
4- CPYONRAHE	(1)	2.0
5- ENDRIN	(1)	0.2
6- HEPTACHLOR	(1)	0 2
7- LINDANE	(1)	0.2
8- DDT	(1)	0.6
9- DICOFOL	(2)	100.0
10- DIELDRIN	(1)	0 3
11- ENDOSULFAN	(2)	0 2
12- PERTHANE	(1)	3.0
13- TDE (DDD)	(1)	3.0
14- TOXAPHENE	(1)	3.0
15- CHLOROBENZILATE	(1)	550.0
16- DILAN	(1)	16.0
17- TETRODIFON	(2)	1100 0
18- STROBAN	(1)	2.5
19- PARATHION-ETHYL	(1)	1.0
20- MONOCHROTOPHOS	(2)	7000.0
21- DICROTOPHOS	(2)	600.0
22- DIOXATHION	(2)	14.0
23- DIAZINON	(2)	0.9
24- DICHLORVOS	(2)	0.07
25- EPN	(2)	0.1
26- ETHION	(2)	0.01
27- AZINPHOS-METHYL	(2)	0.2
28- MALATHION	(2)	1.8
29- PARATHION-METHYL	(2)	96.0
30- MEVINPHOS	(2)	0 16
31- PHOSPHAMIDON	(2)	3.8
32- TRICHLORPHON	(2)	8.1
33- CARBARYL	(2)	1.3
34- ANILAZINE	(2)	15.0
35- ATRAZIN	(2)	12600.0
36- CUPPER SULFATE	(2)	150.0
37- 2, 4-D ISOPROPYLESTER	(2)	800.0
38- 2, 4-D BÜTYLESTER	(2)	1300.0
39- 2,4-D BÜTYL+IZOPROPYLESTER	(2)	1500.0
40- DALAPON	(2)	6000.0
41- DICAMPA	(2)	5800.0
42- CAPTAFOL	(2)	31.0
43- DIQUAT	(2)	12300.0
44- DIÜRON	(2)	380.0
45- FENTIN HYDROXIDE	(2)	33.0
46- PARAQUAT	(2)	3700.0
47- SILVEX	(2)	1200.0
48- SIMAZINE	(2)	5000.0
49- SODIUM ARSENITE	(1)	36500.0
50- TRIFLURALIN	(2)	11.0
51- VERNOLATE	(2)	5900.0

Note: (1). These chemicals are banned in Turkey. They are included in the Table, since they have long-term residual impact on the environment. **(2).** Chemicals, which are licensed and used in Turkey.

Regulation on Environmental Impact Assessment (6 June 2002): The EIA Regulation was enacted in 1993. It was amended in 1997 and in 2002. Assessments are required for a wide range of economic activities, including agro-industries and major infrastructure projects. There are two categories of activities listed in the annexes of the regulation: (1) The projects for which Environmental Impact Assessment (EIA) Procedures are applied; (2) The projects for which Initial Environmental Evaluation [IEE] is applied. These reports must be prepared during the planning phase for an investment, since the activity can only be approved, authorised or licensed to proceed after an "EIA Positive Certificate" is issued. Public comment on the draft report is obtained through the Local Environmental Committees. The MoE is responsible for monitoring the process and issuing permits for EIA after all applicants' requirements are met. The Local Environmental Committees are responsible for the IEE study procedures.

According to the EIA regulation dated 6 June 2002, the following agro-industry projects are subject to the EIA process:

- Poultry plants (60,000 or greater number of chicken and 85,000 or greater number of chicks).
- Pork fattening farms (30 tonnes or more, 3,000 heads or more).
- Sow farms (900 head or more).
- Integrated meat processing plants.
- Sugar plants.
- Pulp and celluloid processing plants.
- Paper pulp production from timber or from other fibrous materials.
- All kinds of paper, cardboard and plasterboard producing plants with a capacity of 200 tonnes per day.

Agriculture, forestry, aqua product and food sector projects, which are subject to an IEE Study:.

- Unrefined and refined vegetable oil, or integrated oil plants.
- Fat production plants.
- Starch production plants.
- Alcoholic drinks production plants by fermentation or the malting process.
- Aqua-products processing plants.
- Milk and dairy products plants with a capacity of 5,000 l/day
- Slaughterhouses, which are subject to 1st and 2nd Class permits in compliance with the Regulation on Establishment, Inauguration, Operation and Inspection Principles of Red Meat and Red Meat Products Enterprises issued in the Official Gazette No. 24167 on 11th Sept 2000.
- Rendering plants.
- Poultry enterprises with a capacity of >10,000 chickens/day or equivalent poultry slaughterhouses or processing plants.
- Fattening farms for small and large ruminants (capacity being 500 or more for large ruminants, 1000 or more for small ruminants).
- Fish farm projects having a capacity of 30 tonnes/year or more.
- Cigarette manufacturing plants.
- Restructuring of agricultural land.
- Projects with the objective of intensive agriculture on arable or non-arable land.
- Water management projects for agricultural purposes.
- Transformation of forest land into other land uses.
- Yeast culture.

Annex 4. Selected Micro-catchments in the AWRP

Ilyasli (Bafra/Samsun) MC (Kizilirmak).

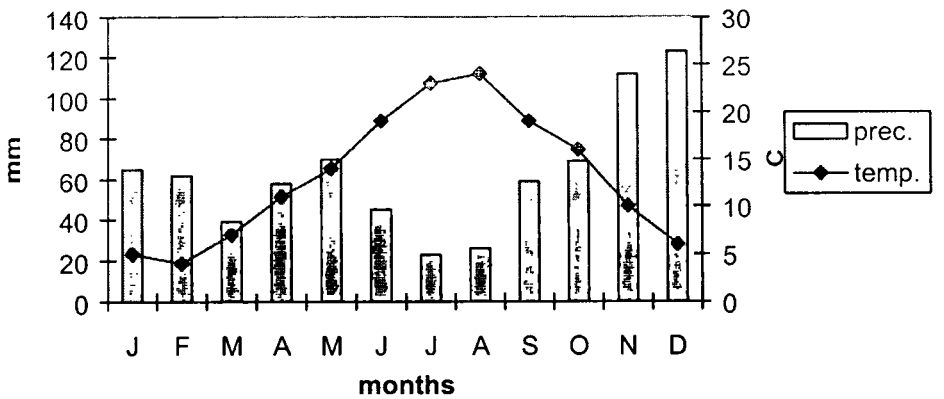
Location. İlyaslı Micro catchment area is located in the Kizilirmak Basin; within the administrative territory of Bafra District in Samsun and it covers 8 villages. These are listed together with their population in Table A4 1. The total catchment area is 7,010 hectares (0.1% of the Kızılırmak Basın). Topography is given in Table A4 2; soils data in Table A4-3 and temperature/precipitation are shown on the chart.

Table A4 1. Ilyasli MC. Population and villages.

Settlement name	Population	Households	Settlement name	Population	Population
Eynegazi	257		Kuslagan	234	
Ilyasli	728		Pasaseyh	738	
Kamberli	707		Terzili	694	
Kozagzi	273		Turkkoy	482	
			Total	4,113	

Topography and Geology. The geological formations of the area consist of yellow-reddish fragile and loose mudstone, sandstone and conglomerates with clay and sparsely distributed joints. This unit dates back to the eosin age (Oligocene in upper layers). The altitudes of villages vary from 50 to 250 meters and all villages except Kozagzi are located along Ilyasli Brook. Land gradient in the villages of Kozagzi and Kuslagan is 10-20% while it varies from 15-35% in other villages.

Climate. The Kizilirmak Delta has a typical Black Sea coastal region climate, i.e. mild winters (winds mainly from the north and north west), high precipitation and a rather high temperature. Historical data from the meteorological station near Bafra recorded a mean precipitation of 726 mm/year and a mean annual temperature of about 13.4 °C. In winter the minimum is 4 °C, in summer the maximum is 23 °C.



Hydrology. No study or data are available as to the area's hydrologic system. Earlier, the State Hydraulic Works (DSI) carried out land surveys of land fit for irrigation in the Delta within the framework of the Bafra Plain Irrigation Project. Ilyasli catchment area starts at the point where this survey finished. Therefore, it is outside the hydrologic survey. Visual observations on the hydraulic system gives the following picture. Spring and surface waters in the upper parts feed the İlyaslı stream. This stream flows for 7-8 km from west to east and then joins Kizilirmak near Cayagzi. The body of Derbent Dam is located about 2 km to the east of this point. To the north of this conjunction point Bafra District is reached after 10 km and then after 20 km. there is the Kizilirmak Delta wetland and the Black Sea.

Irrigation is not possible since there is not enough water and the ground is too steep. Water needed for tobacco farming, especially for nursing seedlings is pumped to tanks from the Ilyasli Stream and

transported. These tankers, each with a capacity of about 2 tonnes, are hauled by tractors to farming plots and nurseries; hoses then water the plots. The flood plains of Ilyasli Stream, which are mostly in narrow strips, cannot be used for permanent cultivation. Rather, these stripes are used for growing vegetables such as green pepper and tomatoes using stream water. Drinking water is supplied from wells whose depths vary from 10 to 25 meters belowground. Farmers state that the minimum stream flow is in July and August, when the rainfall is lowest. Still, the stream has enough water to meet small-scale irrigation needs.

Agricultural activities

Little information is readily available about agricultural activities. Table A4.2 gives the chemical fertilizer application in 2000.

Table A4 2. Fertilisers used in agricultural land

Type of fertilizer	Amount applied (tonnes)
CAN	440
DAP	470
Composed fertilizers	230

Source: Samsun Provincial Directorate of Agriculture

Biological Data. There is no historical study and data on the ecology and biological diversity of the area. Some information derived from a short tour as well as from interviews with people is summarized below:

Fauna. Large mammals. Both local people and official from the local forestry office stated that there are plenty of boar *(Sus scrofa scrofa)* and wolf *(Canis lupus)* in mountains and forests surrounding the area. It is further stated that the former damage crops in both summer and winter. Other information is that there has recently been and increase in the population of roe dear *(Capreolus capreolus capreolus)*. These animals even make their way down to villages, as they are no longer shot by local people. Roe is an animal having its natural environment in the Kizilirmak Delta and Central Black Sea Region. It has faced the threat of extinction for the last 30 years because of the destruction of their habitat and through hunting
Avifauna. No recorded data exist as to the avifauna of the area. The following bird species have been so far observed during the field trip: Syrian woodpecker *(Dendrocopus syriacus)*, Crested lark *(Galerida cristata)*, Pied wagtail *(Motacilla alba)*, Red backed Shrike *(Lanius collurio)* and Chaffinch *(Fringilla colelebs)*. These birds are frequently observed in habitats such as forests, bushes and stream banks
Flora. Forests cover a rather large part of this 7,010-hectare area. There are natural forests, though in small parcels, especially on hilltops. Dominant trees in these forests include hornbeam *(Carpinus betulus)*, beech *(Fagus sylvatica)*, English oak *(Quercus robur)* and pine *(Pinus nigra)*. One can also see oriental plane *(Platanus orientalis)* especially along streams.

Other significant eco-systems. Kizilirmak Delta is one of the Turkey's most valuable wetlands. It is considered to be the largest coastal wetland and has been able to preserve the natural characteristics of the Black Sea region. The delta plain is 0-15 m above the sea level and the total surface of the area is about 56,000 ha. Today approx. 80% of the total delta plain is cultivated and intersected by roads and canals. The eastern part of the delta consist of about 20 lakes and together with the surrounding extensive redbuds and marshes covers an area of ca. 10,000 ha. The eastern part of the delta has two connections with the sea. Karabogaz Lake on the western side has one connection as well. Liman lake and Karabogaz has fairly brackish water because of the sea outlets. 310 bird species (146 breeding species) have been recorded in the delta. Almost 40% of all Turkish breeding bird species have been recorded in the delta and also 70% of all species on the Turkish list were observed in the delta. These numbers clearly point to the international ornithological importance of area. Furthermore the Kizilirmak Delta is a good example of the economic benefits of wetland ecosystem. The delta is the main recharge area for ground water and thus of major importance for irrigating fields. Other human activities of economic importance include fishing, animal husbandry and reed cutting.

Cernek Lake and its surrounds were declared a Permanent Wildlife Reserve in 1979 (4,000 ha). In 1994 the majority of the eastern half of the delta was declared a "nature site". In 1996, a management plan for the

delta was completed and enforced by the Ministry of Public Works and Resettlement. The plan regulates all land-use and is especially important for the restriction it places on the construction of holiday homes. In 1998, the delta was designated as Ramsar site, one of nine in Turkey.

In 1948 the first drainage channels were built in the delta and a total of 55,000 ha (including low-lying areas south of Bafra) were protected from flooding: embankments were built along most of its lower reaches. The Altınkaya reservoir (35 km south of Bafra) was completed in 1990 followed by the Derbent reservoir immediately north in 1992: the two dams together store 6.000 hm^3 and produce a total of 1.889 GWh/p.a.). The Bafra irrigation project ultimately aims to irrigate 35,000 ha. Part of this plan concerns the reclamation of 12,119 ha in the lowest-lying part of the eastern half of the delta (i.e. the wetland). In 1992, as part of the scheme, DSİ started to construct a 35 km-long interceptor channel, which would have effectively cut off the eastern lake area from its main water supply. After 8 km of digging, construction was cancelled and the area was left to comply with wetland conservation. The wetland is polluted by agricultural run-off and untreated Bafra sewage, flowing to the Cernek Lake through the Badut channel, leading to eutrophication. However, in 2001 Bafra Municipality constructed sewage treatment system.

Environmental Problems.

Pollution. In the Ilyasli catchment area no observation could be made on any serious pollution problems that may significantly affect the Black Sea and Kizilirmak Delta. However, there are probably major sources of pollution: Agricultural and Organic.

Agricultural pollution. This is related to chemicals such as agricultural pesticides and fertilizers used in tobacco fields and nurseries. Here in this area, pesticides and fertilizers are used not based on any scientific analysis (i.e. soil analysis or analysis on pests), but rather by listening to what other farmers say. However, little data are available on either agricultural pollution or current use of fertilizers and nutrient needs of the soil. What limited information is to hand has been obtained by interpolating data relevant to the flat and irrigated parts of the delta. It is still possible, even from this limited data, accompanied by field interviews, to say that pesticides are used in extremely intensive and uninformed ways especially in tobacco farming.
Organic pollution. Organic pollution comes from dwellings and animal shelters. Each household is engaged in animal husbandry. According to surveys made by the Provincial Directorate of Agriculture, the animal stock in the region consists of 2,070 cows and 1,270 sheep as well as 8,950 poultry. Although these figures may not be very reliable (i.e. the same report gives two different sets of figures for the number of cows and poultry), still they can be taken as giving an approximate picture of the actual situation. Each day, manure is taken out of shelters and piled nearby. This practice involves risk of pollution both to soil and water as well as a threat to human health. Animal shelters are constructed on smooth or levelled spots on hillsides and dung is piled on flat surfaces. Thus, the risk of leakage from dung to soil is higher on such spots than it is on steeper slopes. The settlement pattern in the area consists of small and independent farming enterprises. Drinking water wells are located close to animal shelters. Seepage from dung heaps may reach these wells through groundwater reserves and thus increase phosphate and faecal coliform contamination. There is no sewage system collecting domestic wastes. Such effluent is mostly discharged to septic tanks. This is certainly another contamination factor for groundwater reserves. The first gathering point for contaminants, which flow either by surface water or mix with groundwater, is the Ilyasli stream. The contaminant load gradually increases as the stream flows north towards the Kizilirmak delta. Water with a high chemical load coming from irrigated plots and intensive horticulture areas of the Delta is discharged partly to wetlands through drainage canals or directly to the Black Sea.

Degradation. Erosion. Agricultural plots in the catchment area have been split up into smaller pieces as a result of inheritance. Farmers think that contour tilling is uneconomic on such small plots, thus they plough the soil in the direction of the inclination aggravating the problem of erosion. Erosion is a significant threat by tilling after wheat harvest, for this leaves the soil unprotected against autumn rains. Since soil wash also increases the amount of soil nutrients carried away in colloids, another side effect of erosion is pollution and even eutrophication of wetland to the south of the Delta.

Forest clearing. This is prevalent. Villagers interviewed stated that the forestland is under their proprietorship by title. However, officials from the Local Forest Conservancy maintain that the catchment

is not covered by forest cadastre and it will become clear later when cadastral work is completed that areas cleared for farming have been designated as "forest land" on maps. Nevertheless, under Article 2B of the present Forestry Law No. 6381, it is possible to exclude from the forestry regime those cleared areas which have been gained from forests before 1981. As a rough estimate, it can be said that 60 % of the forest cover in the area is damaged or degraded. Apparently, this deforestation accompanied by erosion further accelerates the loss of topsoil and indirectly contributes to pollution. Forests provide ecological corridors for fauna in the area's micro-catchments. Animals such as boar, wolf, fox and roe deer may travel between catchments using these corridors. Further forest clearing will obviously end this migratory route and consequently the habitat of many fauna species.

Baglicadere (Zile/Tokat) Micro-catchment (Yesilirmak Basin).

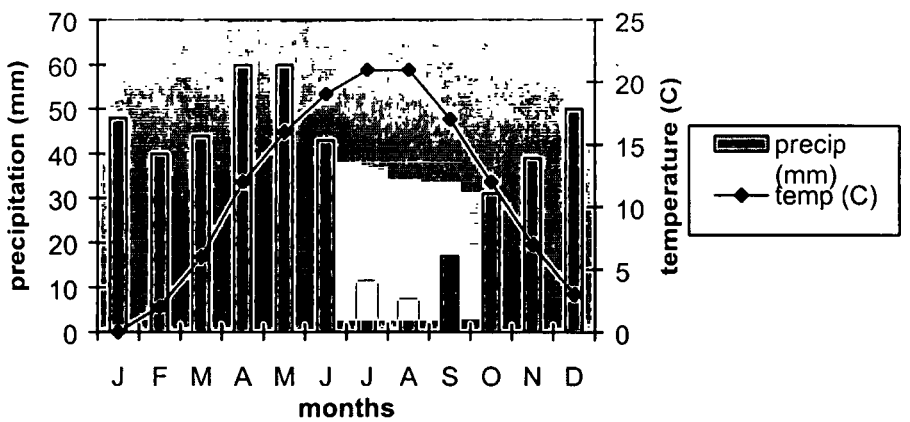
Location. Baglicadere micro-catchment, at a distance of 7 km from Zile district centre is in the administrative territory of Zile District, Tokat Province and covers an area of 7,000 hectares within the Yesilirmak Basin. Villages and populations are given in Table A4 3.

Table A4 3. Population of Bağlicadere MC.

Settlement	Population	Households	Settlement	Population	Households
Sarac	185	34	Palanli	201	51
Kepez	156	32	Buyukkarayun	207	71
Yalnizkoy	145	62	Akdogan	107	27
Cokcaabdal (Akguller)	116	30	Total	1,117	347

Topography. The valley, extending in an east-west direction, divides the catchment along two main axes. In various parts of the valley there are small streams such as the Degirmen Dere, the Baglica Dere, and the Demircilik Dere. The catchment as a whole has very steep slopes. Fourteen percent of the area has slopes in the range of 0-20, 8% have gradients of 21-40 and 78% have 41-60 gradients. However, these slopes become smoother in the southern and southeastern parts compared to the northern sections. Intensive agricultural activities were observed in these parts. Slopes become steeper to the north where soil has eroded away and plant cover has disappeared. Some patches of relatively less destroyed juniper and oak coppice are found on the northern hills.

Climate. According to data provided by the meteorology station in Zile, the average annual precipitation in the region is 450 mm, the average temperature is 11.5 °C and there is snow cover for 24 days. June and July are the hottest months - 21 °C, while December and January are the coldest months - 0 to 2.5 °C.



Biological information. No study could be found on the biological diversity and eco-system values. Taking a broad look at the area's flora, it can be said that originally, it was covered with dense oak and pine forests before human intervention. At present, juniper seems to have replaced oak, the main reason being over grazing and logging. In geographical terms the catchment constitutes a transition zone from Central Anatolian steppe ecosystems to forest ecosystems of the Black Sea region. The diversity of flora is a typical

indicator. The presence of astragalus and verbascum species and especially the fact that astragalus is dominant is an indicator of both over grazing and the ecologic conditions unique to steppe ecosystems.

Apart from the above, probably the best proof that the catchment is in a transition zone between two ecosystems is the very rare presence of oleaster and wild hazelnut trees on hills. It is possible to say that the area is also rich in terms of thyme, wild barley and couch grass. No data could be found on the fauna of the area. However, people interviewed state that there are boars (*Sus scrofa scrofa),* wolves *(Canis lupus)* and foxes *(Canis vulpes).* While people state that boars are shot for damaging crops, no statement is made about wolves. Nor is there any information on avifauna. Quick observations confirm the presence of such steppe birds as the short-toed lark *(Calandrella brachydactyla),* Crested lark *(Galerida cristata),* Wheatear (*Oenanthe oenanthe*) and Chukar *(Alectoris chukar).* According to local people, the great bustard (*Otis tarda)* was seen in the area until 1980's but is seen no more.

Agricultural activities. The total arable land in the micro-catchment is 2,325 ha, out of which only about 21 ha is irrigated. Almost all of the catchment is cultivated where tilling by tractor is possible, while other parts with steep slopes are left as rangeland.

Husbandry.

Each household has several cows and sheep (Table A4.4) as well as a few chickens in Kepez and Yalnizko. There are some feed farms in five villages of the Baglicadere micro-catchment. (Table A4 5).

Table A4 4. Number of Livestock in Bağlıcadere Micro Catchment

Villages	cattle (head)	buffalos (head)	sheep (head)	Goats (head)	Beehives (number)
Sarac	436		91	0	0
Kepez	250	15	340	0	0
Yalnizkoy	269		95	0	0
Akguller	103		165	0	0
Palanli	-		-	0	0
Buyukkarayun	0		0	0	0
Akdogan	113		100	0	0
Total	1171	15	791	0	0

Source: Tokat Provincial Directorate of Agriculture.

Table A4 5. Feed barns in the Bağlıcadere Micro catchment

Feed barns	Sarac	Kepez	Yalnizkoy	Akguller	Palanli	B. karayun	Akdogan
Sheep feed barn (head)						150	100
Cattle feed barn (head)	220			40	110	50	20

Source. *Tokat Provincial Directorate of Agriculture.*

Environmental problems.

Habitat Destruction. In the Bağlıcadere catchment, the destruction of natural flora is the most important environmental problem. Birds are significant indicators of healthy ecosystems. Birds such as the great bustard, Chukar and larks live in steppe ecosystems. The disappearance of the great bustard is an indicator that there is extreme human pressure. Because of human habitation, the destruction of pastures and hunting, the great bustard was one of the first to leave the area.

Another striking indicator of human pressure and flora destruction (of natural grasslands) is the wide distribution and dominance of astragalus species and the rare presence of such plants as thyme, wild barley and couch grass only in less accessible places. This is explained by the fact that astragalus and verbascum

are not edible. Also, the shrinking of oak coppices can be explained by the demand for fuel and fodder. Local people state that there is tangible improvement after the banning of goats from forests in 1980.

Sixty-four percent of total micro catchment area is prone to severe erosion (Table A4. 6). The cumulative result of land mismanagement, loss of flora accompanied by severe erosion is what may be called an environmental disaster. Especially in the northern parts of the catchment area, many spots on the hills and slopes have turned barren because of erosion; even the parent rock is visible in some parts. It is meaningless to talk about any ecosystem restoration in such areas

Table A4.6. Degree of Erosion in the Micro-catchment. (Units hectares)

Village name	Degree of Erosion				Gully erosion	Land slide	Total
	nil or very slight	Moderate	severe	very severe			
Yalnizkoy	0.0	0.0	57.0	122.0	0.0	0.0	179.0
Sarac	5.0	50.0	215.0	928.0	0.0	0.0	1,198.0
Palanli	8.0	44.0	122.0	0.0	0.0	0.0	174.0
Kepez	0.0	0 0	94.0	560.0	0.0	0.0	654.0
Akguller	0.0	53.0	229.0	0.0	0.0	0.0	282.0
Akdogan	0.0	2.0	27.0	0.0	0.0	0.0	29.0
Total	13.0	149.0	744.0	1,610.0	0.0	0.0	2,516.0

Source: AGM Chief Engineering Office in Tokat.

Also, there is need to attach importance to other negative impacts of erosion, both inside and outside of the catchment. Sediment carried away by erosion reaches irrigation and drainage canals in the lower parts, increasing the amount of soil nutrients in these canals and filling them up rapidly. One of the major problems faced the Tokat Branch of State Hydraulic Works (DSI) is the difficulty in operating irrigation systems efficiently because of heavy run off from such catchments as Baglicadere.

Kazova (Tokat) Micro-catchment (Yesilimak Basin)

Location. Kazova micro-catchment is on the Tokat-Turhal highway. The catchment is surrounded by a mountain range to the south and a DSI drainage canal to the north Büyükbağlar village is located to the west, where the drainage canal joint Yeşilırmak River and Ulas village is in the east. There are 8 villages in the catchment: Ulas, Cerci, Songut, Bagbası, Gulpinar, Guzeldere, Buyukbaglar and Kucukbaglar.

Table A4 7. Population of Kazova Micro-basin (Yesilirmak Basin).

Settlement	Population	Settlement	Population
Ulas	630	Guzeldere	231
Cerci	641	Buyukbaglar	472
Baglarbası	412	Kucukbaglar	921
Gulpinar	208	Total	3,515

Topography. The topography of Tokat province becomes more rugged to the north. There are smooth and fertile alluvial plains on both sides of the rivers Kelkit and Yesilirmak. In administrative terms, these fertile plains are attached to the districts of Niksar, Erbaa and Turhal. Under the "Upper Yesilirmak Project" irrigation will cover 1,953 hectares on the right bank and 2,960 hectares on the left. The Kazova micro-catchment area is within this project's remit. Already there is pumped irrigation on the right bank

Climate. Since the province of Tokat is located in a transition zone from the mild climate of coastal Black Sea region to the continental climate of Central Anatolia, climatic conditions are harsher. Precipitation is less than the coastal region. Average annual temperature is 9.8 ^{0}C and average annual precipitation is 475 mm. This is below the country average.

Biological environment. No study could be found on the biological diversity or ecosystem parameters of the catchment area. Nevertheless, observations suffice to conclude that all the selected locations, with the exception of mountainous terrain to the south, have long been turned into farmland. The bed of Yesilirmak was examined at selected points in the catchment area. It is observed that Yesilirmak's banks are barren on both sides, and floodplains have been turned into farmlands. Therefore, it is rather difficult to assert that the catchment has any area of natural significance.

Agricultural activities.

Little information is readily available about agricultural activities. Table A4 8 gives the fertilizer application in 2000.

Table A4 8. Fertilisers used on agricultural land.

Type of fertilizer	Amount applied (tonnes)
N	10,090
P	5,435
K	512
Manure	556,625

Source: Tokat Provincial Directorate of Agriculture.

Environmental Problems

Two major environmental problems can be observed in this micro-catchment: pollution that derives from agricultural activities and sedimentation caused by erosion in the upper parts of the catchment

Pollution from agricultural activities. No data could be found on this subject. To date, the Tokat Provincial Directorates of Agriculture and Environment have not conducted studies on pollution in the drainage canals. On the other hand, the DSI does not hold the view that there is water pollution in drainage canals. Yet there is intensive farming in the area, mainly vegetable cultivation. Pesticides are also used haphazardly. Officials state that fertilizer use was not based upon any soil analysis. Although these agricultural chemicals seem to pose no serious problem for the time being, they constitute a potential environmental threat in the medium term. According to statements by local authority personnel, there are fish deaths in Yesilirmak, especially around Amasya. They add that this event usually takes place during the sugar plant's production period in Turhal. Probably, this is because of a drastic decrease in dissolved oxygen due to organic waste discharges. Furthermore, it can be expected that N concentrations in the water rise as a result of nitrous compounds existing in effluent being discharged. In case this plant fails to introduce a biological treatment facility and necessary measures are not taken to prevent pollution in the Yesilirmak upper reaches, (including Kazova MC) it is inevitable that agricultural and domestic pollutants will have a cumulative effect on the Yesilirmak and create serious pollution problems in the Black Sea.

Erosion. Erosion as a problem does not originate in the Kazova micro-catchment. Sediment washed down from unprotected upper catchments such as Turhal and Zile creates problems in Kazova. These problems cover two points. The first is that sediments fill and clog the drainage canals. Farmers use drainage canals for irrigation. Therefore, waterborne plants grow fast in drainage canals filled with sediment and the water flow is blocked. Additionally, N, P and K, carried by sediments are used by canal plants and thus to some extent, this nutrient rich water becomes subject to natural filtration. This is a kind of natural treatment, but the origin of the problem is unnatural. The second erosion problem, according to the regional directorate of DSİ, is caused by meanders in the Yesilirmak encouraging excessive sedimentation. Meanders, in turn, block river rehabilitation works. However, contrary to this assertion of the DSI, many practices in the world (i.e. the Rhine in Holland and Danube in Austria) indicate that meanders play an important role in river rehabilitation. Nevertheless, this cannot be a pretext for belittling the importance of the threat of erosion in the area

Kabaktepe (Kayseri/Pinarbasi)-Sariz Micro-basin.

Location. Kabaktepe micro basin with an area of about 5,750 ha is located to the south of Pınarbaşı town as a N-S elongated basin around Kabaktepe Stream. Its N-S maximum length is 17 km, while its width is about 5 km. The western watershed varies between 1,950 to 2,250 meters in elevation (increasing towards south), and there are peaks between 1,900 to 2,300 m on the eastern boundary. Population and household figures of the 3 villages are given in Table A4 9. Golcuk and B. Kabaktepe Villages are within the administrative territory of Pinarbasi town, while K. Kabaktepe administratively belongs to Sariz town. The younger generation have been migrating to the urban areas (In the case of Kucukkabaktepe to Britain)

Table A4 9. Population of the Kabaktepe (Kayseri/Pinarbasi-Sariz) Micro-basin.

Settlement	Population	Households
Buyukkabaktepe	175	33
Golcuk	200	45
Kucukkabaktepe	120	20
Total	495	98

Topography. The northwestern, the far western and the far Eastern parts of the Southern half and the most southern part of the basin[17] consisted of carbonate rocks of marine sedimentation dated between the Devonian and Cretaceous periods (375-80 my BP). The oldest calcareous rocks, from Devonian and Permian time (375-250 my BP), are located at the southern and the eastern parts of the basin while relatively younger carbonate rocks of Cretaceous time are situated in the western zone of the basin. Cretaceous rocks include some serpantinic lenses on the northwestern part cause unfavourable conditions for plant growth. All the Palaeozoic and Mesozoic rocks appear as mountainous zones with steep scarps, which are more than 30% and display severe erosion. Their peaks reach to about 2,300 m in the east and 2,250 m on the western boundary of the basin.

About 775 ha (1/8 of the total basin) of the mountainous zone are rocky outcrops and therefore, are left without any rehabilitation proposals. At the northern part of Kabaktepe, the lower slopes and the mid-eastern part of the basin are characterised by tertiary flysch rocks, consisting of alternate conglomerates – sandstone and marls of the Eocene period. The permeable/impermeable layers of these rocks cause landslides and result in jagged topography. Kabaktepe is located at the southern part of the basin with a 2,277 m peak as a volcanic (andesite) dome (2-3 km in diameter) of the tertiary period.

The north and the middle basin parts to B. Kabaktepe village consists of Plio-Quatenary co-alluvial/alluvial fan material and therefore, shows an undulating topography with flat to gentle sloping surfaces. Slope inclination in this zone varies between 0 to 12%. Kabaktepe valley bottom extending between 10-150 m in width has the youngest (Holocene) material of the MC consisting of clay, silt, sand and pebbles.

Climate. Because, Kabaktepe Micro Catchment is located between 1,000 to 2,250 m high, it has a typical continental climate. There are two meteorological stations close to the Basin. Pinarbasi Meteorological Station to the north of the Catchment at 1,500 m altitude, and Sariz Meteorological Station located at SE of the Catchment at 1,470 m altitude. Since K. Kabaktepe and B. Kabaktepe villages are closer to Sariz Station, its meteorological data are taken and have been interpolated according to the area's elevation. The mean precipitation of the basin varies between 550-720 mm and much of the precipitation falls in wintertime. The mean annual temperature is 7.4 °C while that of the coldest month is -1 °C.

Hydrology. Kabaktepe stream emerges at about 2000 m in the south and flows northward for about 14.5 km in the basin and joins the Degirmendere River on the northeast boundary of the basin. After this junction the Değirmendere River marks the boundary for the last ¼ of the basin at the north-eastern corner.

[17] Geological data is taken from R.F. Lebküchner 1957), 'Kayseri ve Avanos-Ürgüp Havalisi ile Bogazlıyan Havalisinin Uzunyayla'ya Kadar Olan Kısmının Jeolojisi Hakkında Rapor' M.T.A. Rapor No: 2658, Ankara.

(The sedimentation carried by Degirmendere may gradually fill the reservoir of Bahçecik Dam that will be used to irrigate about 36,282 ha and for power generation when completed.). Spring water around K. Kabaktepe and B. Kabaktepe feed Kabaktepe stream, which is one of the tributaries of Degirmendere. These springs at the basin's northern part around Golcuk feed Degirmendere by its southwesterly brooks.

The flow rates of the main springs, which are subject to project implementation, have recently been measured by GDRS experts during preparation stage of the Project. The flow rates vary between 3-30 lt/sec around K. Kabaktepe village, 20-25 lt/sec around B. Kabaktepe Village and 2 lt/sec in Gölcük village. The flow rates of the Kabaktepe River that will be subject to bend construction are 50 lt/sec in the southern part and 350 lt/sec in northern part (The flow rate of the river increases towards north gradually Around the Golcuk river, the flow rates of the brooks of Degirmendere River are as followings:
Haticecikan Dere 12 lt/sec, Nisanyurt Dere 25 lt/sec

All the above-mentioned flow rates were measured in May 2001; the month when all the springs reach the maximum flow rate. Therefore, they will be re-measured in the driest month (August) and the irrigation frame of the project will be revised accordingly. In total, 7 ponds will be constructed in the Kabaktepe micro-catchments to collect water from the above-mentioned springs. By this way some rainfed fields will be transformed into irrigated fields and the trefoil will be harvested three times in a year.

Biological environment. There is no previous study on the biological diversity and the ecology of the MC. The information about fauna and flora, which is given below have been derived from the short tour in the area as well as from local people through the interviews.

Fauna. *Large Mammals.* Local people state that there are numbers of wolves (*Canis lupus*), rabbit (*Lepus carpensis*), squirrel and varieties of mole.
Avifauna. The following species have been list by the local people: partridge (*Alectoris chukar*), fieldfare (*Urdus pillar*s), quail (*Coterie sp.*) and Gocmen (local name). The population of partridge and quail has decreased due to over hunting. Hunting for partridge and red hawk is seasonally limited, and there are some provisions endorsed by the Kasseri Provincial Hunting Commission to protect the population
Fish. In the past, rivers and permanent brooks were trout habitat. But, due to new construction of road and bridge, spawning migration of trout from Zamanti stream has been obstructed, and egg laying locations have been destroyed. Thus, the trout population in the rivers of the MC has dramatically declined.

Flora. Since Kabaktepe Catchment is at a high elevation, it is a transition zone between forest and alpine grasses. Therefore, natural grasses constitute the dominant flora of the basin. These areas merge with the forest zones and are the main catchment pasture zones. Sparse juniper trees at the upper watershed areas are the proof of severe degradation and consequent retreat. Sparse Oak Forest occupies relatively lower parts of the slopes, below the juniper trees. Planted poplar and willow (*Salix alba*) trees appear in the valley bottoms of the main rivers and their tributaries. Beside the above-mentioned flora, there are other herbaceous plants that are used either for aromatic or medicinal purposes by the local people as follows: Trefoil (*Trifolium sp.*), St John's wort (*Hypericum sp.*), Common mullein (*Verbascum thapsus*), Sage (*Salvia sp.*), *Thymelaea tartonraiva* (coban yastigi), wild thyme (*Polytrichus sp.*), orchid (*Orchidaceae sp.*), milkvetch (*Astragalus sp.*) and common berberry (*Berberis sp.*).

Land Use. The lithological setting of the basin dictated the present land use and as well as directed the plans of the proposed micro basin project. For example; the present agricultural activities, which are predominant around Golcuk village, are based on the relatively larger arable land derived from lithology. In the same manner, the balanced arable and pastoral mix (about 50% each) is the main sources of income in B. Kabaktepe, while husbandry and related fodder harvesting are the main occupation in K. Kabaktape village. Table A4.10 gives the land use pattern in the micro-catchment.

Table A4 10. Land Use of Kabaktepe (Kayseri/Pinarbasi-Sariz) Micro-basin (ha).

Village	Product-ive forest	Degraded forest	Energy forest	Reforest -ation	Settle-ments	Arable land	Range land	Rocky, lake etc.	Total
Buyukka-baktepe	0	102	0	0	41	89	1,058	11	1,299
Golcuk	0	142	0	0	13	420	575	0	1,150
Kucukka-Baktepe	0	438	0	0	37	351	1,740	765	3,331
Total	0	682	0	0	91	860	3,371	776	5,780

In the same way, the land with 20-30% slope on the old Palaeozoic and Mesozoic rocks are being used as pasture and classified as pastureland and planned as 'Forest Interior Pasture Rehabilitation Zone' in the project. Land with slopes between 12 to 20%, which mainly developed in flysch rocks, is planned as 'reforestation for soil preservation' and 'oak rehabilitation'. The Kabaktepe stream bottom is completely dedicated to fodder harvesting (grass and trefoil) throughout its course. Through the project, more trefoil will be planted in the valley bottom and through this, two to three harvests per year will be possible.

Agriculture. In the basin, rainfed wheat and barley is grown and generally, these fields occupy inclined surfaces (except the gentle slopes near Golcuk village). Since the local seeds and agricultural practices are not very productive, the farmers claim more forest land for farming, consequently accelerating erosion. Through implementing the project, farmers will use more productive hybrid seeds thus concentrating farming on the lower slopes and leaving the upper slopes for natural regeneration of grass and trees.

At present farmers in Gölcük plant wheat and barley alternately; farmers in B. Kabaktepe grow wheat, barley, and rye; and in K. Kabaktepe the plant wheat, rye and fodder. At present Gölcük has about 390 ha of arable land, but every year about half of it is left as fallow. Table A4 11gives principal crop production.

Table: A4 11. Agricultural products according to the first 4 crops.

Fruit/ Vegetable	Unit	Buyukkabaktepe		Golcuk		Kucukkabaktepe	
		(*)	Yield(**)	(*)	Yield (**)	(*)	Yield (**)
Apple	Trees			50	50.0	80	50.0
Cherry	Trees					20	10.0
Sour/black cherry	Trees	50	10.0				
Beans	da			10.0	150.0	5.0	250
Onion	da					4.0	100
Wheat	da	750	140	700	140	100	120
Rye	da	500	200			40	160
Sainfoin	da					80	250
Trefoil	da					60	500
Barley	da	750	160	500	170	80	100
Potato	da					6	1,000

Note. (*) Rainfed/**Irrigated.** (**) In terms of kg/tree or kg/da. 150 ha is left fallow each year. Fallow land will decrease during the project implementation by sowing chickpea or fodder and cereals side by side.

Husbandry

Table A4 12. Present state of the livestock in the villages of the Kabaktepe MC.

Villages	Cows	Sheep	Goats	Beehives
Büyükkabaktepe	150	1000	90	75
Gölcük	100	500	0	0

Küçükkabaktepe	60	800	15	1,000
Total	310	2,300	105	1,075

According to a survey made by Provincial Directorate of Agriculture, the animal stock in the region consists of 310 cows, 2,300 sheep and 105 goats plus some poultry, (Table A 4.12). Because Golcuk has a large arable area, the farmers obtain their main income from crops rather than husbandry. Therefore, in they gradually sold their sheep and bought tractors. (Their number increased to 16). Consequently, husbandry has declined. These tractors are used in their own fields as well as in the fields of B Kabaktepe. Excess hay production is sold to other villages. In last years, because of adverse economic conditions, (increasing fuel-oil prices), demand has dropped and tractors are not fully used. In Golcuk, about 80% of the dung is used for heating, while only 20% is used as manure. Instead, farmers use chemical fertilizers (mainly 20/20 DAP) about 10-12 kg/da. More or less same situation exists in Büyükkabaktepe village: 50% dung is used for heating. In Kucukkabaktepe village, dried dung is used for domestic heating. The villagers declared that cattle dung is used for fuel, but sheep droppings are used for manure. Since they have more sheep than cattle, the dung, which is used for fuel, is about 20% of total.

The farmers in Büyükkabaktepe produce cereals for subsistence and are mainly occupied with husbandry. They graze animals in the harvested fields and in pastures. In winter, they feed them with silage, which is made of the fodder grown on the Village land. By doing this, they do not need to purchase any fodder or commercial feed. Presently, Kucukkabaktepe is concentrating on husbandry and beekeeping activities Therefore, they sell lamb, wool and honey. Most part of Kucukkabaktepe and its environ use 'Forest Interior Pastures'. Through the project these areas will be rehabilitated by creation of lens-type terraces within the sparse juniper relicts. So there will not be typical reforestation in this area. The altitude is very high and the land is situated at the boundary of the forest and alpine meadows. Since planned activities in the Kabaktepe micro basin are very small scale, (constructing bends at some locations of the river bed for irrigation by accumulating water or building pools for collecting spring water for irrigation purpose), they hardly have a negative impact on the present ecosystems. It may be predicted that accumulating the present water sources upstream might diminish the water quantity downstream and adversely impact some other points of the MC in terms of water availability. But the opposite is the case. Because of the high altitude of the region, the land is more suitable for pastures/rangelands than the forest. The excess water from the slopes concentrates in the valley bottom of Kabaktepe and makes this flat zone a kind of 'grassland'. But the high water table (especially long lasting stagnant water) in the flood plain does not permit grasses to grow. The planned withdrawals will divert spring water and bends on the valley bottom will create better conditions by preventing stagnant water on the valley. The excess water will be used to create new irrigated fields for productive fodder through irrigation canals.

Table 4.13 Grazing animals in forests and on rangelands.

Village	Rangeland in Forest area (ha)	Number of ruminant animals grazed		Rangeland outside forest (ha)	Number of ruminant animals grazed	
		Large	Small		Large	Small
Buyukkabaktepe	1,027.0	150	1,090	178.0	150	1,090
Golcuk	0.0	150	500	207.0	150	500
Kucukkabaktepe	644.0	70	815	0.0	70	815
Total	1,671.0		2,405	385.0	370	2,405

Environmental Problems.

Erosion. Erosion is less severe in Kabaktepe MC compared to other MCs (see Table A4 14). The causes of erosion in the Kabaktepe Micro-catchment, may be explained by the following anthropogenic activities. Illegal fuelwood cutting: local people have long been cutting trees for domestic heating, as well as for construction purposes. Nomads (shepherds), who come from outside the area to graze sheep in the pastures of the MC, also cut trees to stay warm and to prepare cheese. As a result of this overuse, the forest has become very sparse. In addition, the melting springtime snow on the uplands encourages slope wash, resulting in gully erosion on the slopes.

Table A4 14. Erosion in the MC (Units hectares)

Village Name	*Degree of Erosion*				Gully erosion	Land slide	Total
	nil or very slight	moderate	severe	very severe			
K. Kabaktepe	210.0	677.0	269.0	0.0	0.0	0.0	1,156.0
Golcuk	65.0	311.0	133.0	0.0	0.0	0.0	509.0
B. Kabaktepe	329.0	1 075.0	507.0	0.0	0.0	0 0	1.911.0
Total	604.0	2.063.0	909.0	0.0	0.0	0 0	3,576.0

Source: AGM Chief Engineering Office in Kayseri.

Forest clearing to gain fields. The fields acquired from forests are usually located on relatively steep slopes and have thin soils. Vertical tilling leave ruts, some of which turn into gullies. In addition sheet floods on the bare soil transports soil to the river basins.

Overgrazing on the pasture areas. Overgrazing on the pastures of the Micro-catchment has been practised for ages without any interference and without any rehabilitation. When the fine-grained (silt and clay) soil on the inclined parts of the pastures loses its vegetation cover completely, the soil is easily removed by sheet and gully erosion. Until 14 years ago nomads from Adana, Maras and Aydın Provinces used to come seasonally to the MC to graze their animals on the pastures of Kabaktepe River Basin. Then they were banned. For 12 years, this allowed the province to recover from this over-grazing. However, two years ago the ban was lifted and again the pastures of B. Kabaktepe and K. Kabaktepe villages were opened, despite an application by the villagers to the Provincial Rangeland Commission, to re-impose the ban.

Agricultural and Organic Pollution: This is mainly derived from pesticides and fertilizers, which are used in cereals and fodder fields. Organic pollution is derived from dwellings and from animal manure. The manure, which is taken out of barns and piled nearby is likely to cause groundwater pollution. In addition, there is no village sewage system. Domestic wastes are discharged into pits dug by the villagers near their houses. Pit seepage might cause groundwater, and in turn spring water contamination.

Orcan Stream (Turkoglu/Karamararas) Micro-catchment (Ceyhan Basin).

Location. Orcan Stream micro basin is located about 25 km south of Kahramanmaras city around the SW-NE flowing Orcan Stream within Ceyhan Basin. The stream is located about 6 km west of Türkoğlu town, within the administrative boundaries of Kahramanmaraş. Orcan micro-basin, of about 7,750 ha, covers almost all the river basin except the last 3 km terminal part of the river. There is one town (Yesilyore) and 7 villages in the basin. About 16,000 people live in the basin according to the 1997 census. (Table A4 15).

Table A4 15. Population of Orçan Stream Micro-catchment.

Settlement	Population	Households	Settlement	Population	Households
Yesilyore Municipality	4,197	980	Kırmakaya Village	1,216	230
Bahcelievler quarter	*1,171*	*250*	Doluca Village	1,481	255
Fatih quarter	*1,285*	*300*	Uzunsogut Village	1,805	350
Cicekli quarter	*771*	*180*	Aydınkavak Village	552	115
Camlica quarter	*971*	*250*	Yavuzlar Village	489	85
			Yolderesi Village	955	185
Hapurlu Village	1,169	210	Total	16,062	3,390

Topography. The topography of the basin in the west traces the 1,000m peaks, while the altitude increases to 1350-1500m in the SW and south. The elevation of the basin decreases to 650-800m in the east and to 800-550m in the NW part. (The lowest point is 545 m at the Orcan Bridge at the northern terminal point). About 4/5 of the basin is located to the east of the river while 1/5 of the area is on its western flank.

Geological Setting of The Micro Catchment[18]: The oldest rocks of the basin are from the Paleozoic age (between upper Cambrian to lower Ordovician, which is older than 450 my BP) and consist of alternate layers of sandstone, quartzite, shale and mudstone and outcrop at the midwest (Demirciler oba and their surroundings) and northeast corner of the basin (around Hopurlu).

The remaining part of the basin consists of dolomites, which are embedded in the shale from the Mesozoic Period (Triassic and Jurassic time between 225 to 130 my BP). Because soluble dolomites comprise much of the basin, a number of isolated karstic depressions have been formed at in the middle and eastern sections of the basin. These gentle sloping depressions created a vast farming areas with gentle sloping to flat surfaces. Thus, the total land suitable for agriculture (3,716 ha), comprises almost half of the basin.

The valley of the Orcan Stream is also related to karstic formations more than the fluvial processes. The River takes a number of short but deeply incised ephemeral tributaries from the narrow western side (because most parts of this section consists of impermeable rocks), while there are broad dissolved depressions with faint (internal) drainage in the eastern side because of dissolving character of the limestone and dolomites.

Climate. The climate is a transition type of Mediterranean Climate with rainy winter and spring and its mild temperature. The mean precipitation is 710 mm (most of it falling in winter and spring) and the annual mean temperature is 16.5 °C. The coldest month is 4.5 °C in January and the warmest month is 28 5 °C in August. Meteorological data are taken from records of Kahramanmaras Meteorological Station, located in the centre of the Province at 500-m elevation. Since the entire basin is higher than this elevation, precipitation and temperature figures should be interpolated accordingly (i.e. temperatures will be lower and precipitation will be higher than above values).

Hydrology. The season-round flowing Orçan stream originates on the SW edge of the basin from 1400 m peaks, and after a short distance (about 2 km) reaches a flat bottom and flows in this bed about 18 km farther and joins the Delicay stream, which is one of the main tributaries of Aksu river (Aksu is one of the main tributaries of Ceyhan). The width of the Orcan stream varies between 250 and 700m. The Orcan stream usually floods in March Its flow rate diminishes dramatically between July and September

Biological environment. There is no detailed survey of the biological diversity and ecology of the basin. However there is some information about the forest features of the Micro-catchment. Data about fauna and flora that is given below have been gathered from consultations with the local people.

Fauna. *Large mammals.* Foxes (*Canis vulpes)* (abundant), wolves *(Canis lupus)*, rabbit (decreasing due to over hunting), wild boar (*Sus scrofa scrofa)* (almost extinct due to over hunting), pine martin (decreasing) badger, (decreasing), otter (almost extinct), deer (*Dama dama*). *Birds* Partridge, Ruddy shelduck
Flora. Red pine (*Pinups brutia*) is predominant at the western slopes while degraded oak (*Quercus sp*) forest occupies the eastern part of the basin. In addition to trees, there are herbaceous plants used locally either for aromatic or medicinal purposes. These are: Wild thyme (*Thymus thapsus*), Sage (*Salvia sp*), Tulsi (*Ocimum basilicum*) common or field mint *(Mentha arvensis),* and Chamois (*Rupicapra rupicapra).*

Through the project, the flat dry farming areas will be transformed into irrigated fields. Consequently, farmers are expected to abandon cultivating the steep sloping fields, which were acquired through forest clearing. It is planned to plant fodder species (especially sainfoin) on the upper slopes of the MC.

Land Use.

Table A4. 16 gives the land use in the micro-catchment.

[18] Hüseyin Korkmaz, 2002, "Kahramanmaraş Havzasının Jeomorfolojisi", Kahramanmaraş Valiliği İl Kültür Müdürlüğü Yayını No: 3 pp.197, Kahramanmaraş

Table: A4 16. Land use in Göğden Micro Catcthment (ha.).

Village	Productive forest	Degraded forest	Energy forest	Reforest-ation	Settle-ments	Arable land	Range land	Rocky, lakes, etc.	Total
Yesilyore Municipality	0	651	0	0	100	932	0	14	1,697
Hopurlu	0	430	0	0	25	617	0	34	1,106
Kırmakaya	0	381	0	0	25	248	0	35	689
Doluca	0	540	0	0	30	185	0	0	755
Uzunsogut	0	1.526	0	0	30	544	0	70	2.170
Aydınkavak	0	363	0	0	20	454	0	0	837
Yavuzlar	16	303	0	0	20	277	0	32	648
Yolderesi	0	660	0	0	25	185	0	0	870
Total	16	4,854	0	0	275	3,442	0	185	8,772

Agricultural Activities. At present, mainly wheat and cotton is grown in the irrigated fields. Also cucumber (dominantly), green beans, and to a lesser extent; tomato, green pepper and eggplants are grown for salads. In rainfed areas mainly cereals (wheat, barley and rye) are grown and sometimes chickpeas and lentils. In addition, pistachio, grape, almond and olive are secondary products. Trabzon hurmasi (local name) has become a favourite orchard fruit in recent years.

Table A4 17. Agricultural products according to the first 4 crops.

Fruit/ vegetable cereals	Unit	Yesilyore Municipality		Hopurlu Village		Kırmakaya Village		Doluca Village	
		(**)	Yield(*)	(**)	Yield (*)	(**)	Yield(*)	(**)	Yield (*)
Date	Trees	2,000	40.0	200	50.0	1,000	30.0	1,000	50.0
Walnut	Trees	2,000	5.0			200	12.0	200	12.0
Vine	Trees	500	7.0			2,000	5.0		
Olive	Trees	1,000	12.0						
Almond	Trees			3,020	2010.0				
Plum	Trees							1,000	50 0
Antep peanut	da			4,000	2.5	1,000.0	2.0		
Tomatoes	da	50.0	1,000.0	40.0	500.0	50.0	1,000.0	50.0	2,000
Beans	da							300.0	1,000.0
Cucumber	da	50.0	1,500.0	30.0	1,000.0	50.0	1,000.0	50.0	1,500
Wheat **irrigated**	da	1028/ **1500**	80/ **200**			186/ **100**	80/ **150**	100/ **50**	120/ **220**
Barley	da							150	300
Chickpea **irrigated**	da							100/ **100**	100/ **140**
Stuffed Pepper	da	30.0	500.0			30.0	50.0	50.0	500.0
Cotton	da			273	300				
Rye	da							1,000	200
Lentil	da					30.0	150.0		

(*) In terms of kg/tree or kg/da. (**) Dry/**Irrigated.** Source:

Table A4 17 continued. Agricultural products according to the first 4 crops.

Fruit/ vegetable	Unit	Uzunsogut Village		Aydinkavak Village		Yavuzlar Village		Yolderesi Village	
		(**)	Yield(*)	(**)	Yield (*)	(**)	Yield(*)	(**)	Yield (*)
Date	Trees			1,000	50.0	500	20.0	1,000	20.0
Walnut	Trees	50	6.0						
Vine	Trees	3,000	5.0	2,000	3.0				
Olive	Trees	700.0	10.0			400.0	7 0		
Almond	Trees			2,000	10.0				
Antep Peanut	da	500,000	3.0			1,000.0	2.5	20,000	4.0
Tomatoes	da	30.0	2,000.0			50.0	2,000.0	70.0	3,000.0
Beans	da			10.0	750.0				
Cucumber	da	200.0	2,000.0	350.0	1,500.0	100 0	1,500.0	20.0	2.000.0
Wheat	da	1312/	150/	400/	200/	752/	200/	170/	80/
Irrigated		**100**	**200**	**138**	**300**	**50**	**225**	**126**	**200**
Barley	da	353	250					50	250
Chickpea	da					25	100	15	50
Stuffed Pepper	da			50.0	500.0	50.0	500.0		
Cotton	da								
Rye	da							70	150
Lentil	da	30	120						

(*) In terms of kg/tree or kg/da. (**) Dry/**Irrigated.**

Husbandry.

Table A4.18 gives animal numbers in the MC and Table A4 19 gives the number of grazing animals.

Table A4 18. Present state of the livestock in the villages of the Orcan MC

Village	Cows	Sheep	Goats	Beehives
Yesilyore Town	400	2,000	1,000	200
Hopurlu Village	150	1,700	300	20
Kırmakaya Village	50	200	300	250
Doluca Village	150	150	1,000	0
Uzunssgut Village	200	500	600	1,750
Aydınkavak Village	75	440	40	200
Yavuzlar Village	100	190	70	25
Yolderesi Village	100	30	800	15
Total	1,225	5,210	4,110	2,460

Table A4.19 Grazing animals in forests and rangelands.

Village	Rangeland in Forest area (ha)	Number of ruminant animals grazed		Rangeland outside Forests (ha)	Number of ruminant animals grazed	
		Large	Small		Large	Small
Yesilyore Town	7.0	500	3,500	7.0	500	3,000
Hopurlu Village	16.0	150	2,000	16.0	150	2,000
Kirmakaya Village	15.0	50	500	15.0	50	500
Doluca Village						0
Uzunsogut Village	2.0	0	0	2.0	0	
Aydınkavak Village						
Yavuzlar Village						
Yolderesi Village						
Total	40.0	700	5,500	40.0	700	5,500

Environmental Problems.

Degradation. Forest/pasture degradation due to tree cutting, forest clearance and overgrazing are the major environmental problems. The local forest authorities have stated that about 240 ha, which is almost bare at present, was once a healthy forest. Only *Pinus pinea* trees are left because local people preserved them for their pine nuts.

Erosion. Severe erosion (see Table A4.20) has resulted from over cutting of fuelwood especially at the southwest part of the Micro-catchment. The composition of rock (clayey limestone) also fosters erosion in this section since the characteristic of this type of rock is less permeable than dolomite. Thus, slope wash-water induces gully and rill erosion and changes the land to steep slopes. The other parts of the basin prone to erosion appear in the unresisting and impermeable Paleozoic rocks around Hopurlu and at the western part of Demirciler Oba and Yesilyore settlements. All these severely eroded areas are planned to be 'Forestation for Soil Prevention Zones' or 'Maquis Rehabilitation Zones.'

Table A4. 20. Erosion in the MC. (Units: hectares).

Village Name	Degree of Erosion				Gully	Land	Total.
	Nil or very slight.	Moderate.	Severe.	Very severe.	erosion.	slide.	
Yol deresi	4.0	50.0	190.0	405.0	11.0	0.0	660.0
Yesilyore	6.0	75.0	337.0	233.0	0.0	0.0	651.0
Yavuzlar	6.0	15.0	261.0	37.0	0.0	0.0	319.0
Uzunsogut	30.0	186.0	555.0	755.0	0.0	0.0	1,526.0
Kirmakaya	0.0	31.0	85.0	258.0	7.0	0.0	381.0
Hopurlu	2.0	6.0	230.0	192.0	0.0	0.0	430.0
Doluca	10.0	36.0	10.0	484.0	0.0	0.0	540.0
Aydinkavak	0.0	61.0	268.0	34.0	0.0	0.0	363.0
Total	58.0	460.0	1,936.0	2,398.0	18.0	0.0	4,870.0

Source: AGM Chief Engineering Office in Kahramanmaras.

Gogden (Mut) Micro-basin (Goksu Basin).

Location. Gogden micro basın ıs located about 30 km ENE of Mut town, which belongs to Icel Province. The micro basin covers only 25 km of the upper and middle parts of Gogden Stream. There are three villages within the catchment (Table A4.21). Haciahmetli; in the upper part, İbrahimli; in the lower west part at about1200 m altitude and Comelek located on the lower- east part between 1,150-1,200 m. The people of this village are well educated because it has a well-established secondary school. The village has a Development Cooperative and publish a periodical journal.

Table A4 21. Population of Gogden (Mut) Micro-basin (Goksu Basin).

Settlement	Population	Households	Settlement	Population	Households
Haciahmetli	650	380	Comelek	700	274
Ibrahimli	150	45	Total	1,500	699

Topography.

Table A4 22. Topographical information of Gogden (Mut) Micro-basin (Goksu Basin).

Altitude	Area (ha)	%	Altitude	Area (ha)	%	Slope (%)	Area (ha)	%
0-250:	0	0	1251-1500:	2,034	18.9	0-20:	5,730	39.3
251-500:	0	0	1501-1750:	4,298	39.8	21-40:	5,660	38.9
501-750:	0	0	1751-2000:	4,229	39.2	41-60:	3,177	21.8
751-1000:	147	1.4	2001+	0	0	60+:	0	0
1001-1250:	80	0.7	Total	10,788	100	Total	14,567	100

Two streams join the north-south flowing Goksu River outside the basin. The two arms originate in high karstic plateaus at 1,800 m elevations. Erkec stream flows from the east and Kurudere from the west, and enters a gorge near Haciahmetli village. It enters a very narrow canyon after 14 km and flows about 11 km more in this confined valley and joins with the Sason stream. This is the southern boundary of the protected part of the basin. The height of the catchment varies from 750 to 2,000m. About 80% of the land is higher than 1,500m while 40% is above 1,750m. (See Table A4 22).

Geographical information. The project area transverses limestone and marls, which belong to lower Miocene marine sedimentation. Therefore, the Gogden micro basin represents the youngest marine carbonate rocks of Turkey from 25 my BP. Because of the soluble character of carbonates all the valleys are very deep. Because the rocks weren't affected by Alpine Orogenesis its stratums lie almost horizontal and constitutes shallow karstified limestone plateaus at the watershed level.

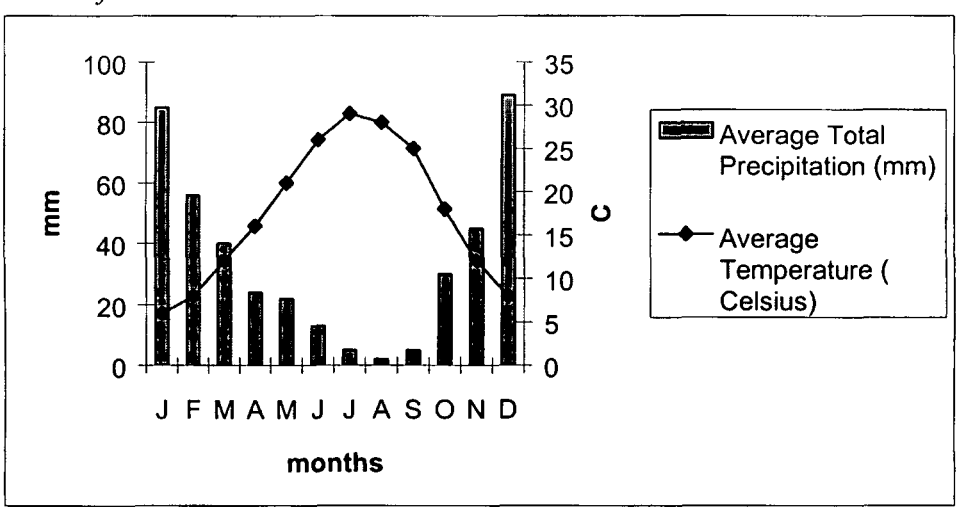
Table A4 23. Soil information of Gogden (Mut) Micro-basin (Goksu Basin).

Soil capability class	Area (ha)	(%)	SCC	Area (ha)	*(%)*	Soil depth	Area (ha)	(%)
I	190	1.3	V	0	0	>90·	0	
II	5	0.0	VI	1,583	10.9	50-90:	0	
III	414	2.8	VII	12,376	85.0	21-50:	1,717	25.9
IV	0	0.0	Total	14,568	100	0-20:	4,907	74.1

The karstified plateaus are used for crops (barley and chickpea are planted in the shallow dolines which have a bottom red soil) and the farmers graze their goats in summer. In order to mitigate the grazing pressure in these karstified plateaus 'Pasture Rehabilitation Areas' are planned in project areas. The larger flat zones on the plateau and at moderately sloped banks of Gogden River are planned as agricultural areas.

There is severe erosion in the uplands at the edge of karstic plateau. The marl (clayey limestone) nature of the rocks accelerates the erosion, because the marl is not as permeable as pure limestone. All these severely eroded slopes are classified in the project as 'Soil Prevention Zone by Constructing Terraces.'

Climate. *There is no meteorological monitoring station in the Gogden Microbasin. The nearest meteorological station is situated in Mut town at 275m elevation. Since there is a big difference between elevation of the MC and of Station the data of Mut is hardly representative of the area. Therefore, precipitation and temperature values of Mut must be interpolated according to the altitudes of the area. The precipitation and temperature values of Mut are seen below.* .



Biological Environment. The local people have identified the following species.

Fauna. At one time, it is stated that there were numbers of bears (Ursus arctors), chamois (Rupicapra rupicapra), jackal (Canis aureus) and black vulture (Aegypius monachus) in the MC, but they all have disappeared because of over hunting as well as food scarcity for the wild animals due to habitat degradation. For the same reason, foxes (Vulpes vulpes) and rabbits (Lepus carpensis) have decreased.
Flora. There are several herbaceous species in the area[19]. These include wild thyme (*Thymus thapsus*), wormwood (*Artemisia absinthum*), tumbleweed (*Gundelia tourneforti*), St. John's wort (*Hypericum sp*), Coban Cokerten, Demir dikeni, (*Tribulus terrestris L.*), ozan arpası, tavsan kuyrugu, tavsan topugu, koyun emzigi, crocus (*Crocus sativus*), topalak (*Cyperus rothundus*), mushroom/field mushroom (*Agaricus campestris*), pitrak, cetrefil, kuzu kulagi, bird's foot trefoil (*Lotus corniculatus*), yemlik (*Scorzonnera sp*), madimak (*Polygonum cognatum*), marjoram (penny royal), stinging nettle (*Urtica urens*), hardal (*Sinapis arrensis*) reed (*Phragmites australis*), esek biberi-gerdeme (*Lepidium sativum*), coban kahvesi, Kuzu kulagi-eksi kulak (*Rumex acetosella*) (decreased due to overgrazing) and salkaba (*Urginea maritime*).

Land Use.

Table: A4 24. Land use in Göğden Micro Catchment (ha).

Village	Productive forest	Degraded forest	Energy forest	Reforest-ation	Settle-ments	arable land	Range land	Rocky, lakes, etc	Total
Hacıahmetli	0	1,990	0	0	21	5,169	2,670	0	9,850
Ibrahimli	455	779	0	0	6	120	52	26	1,438
Comelek	109	3,007	0	0	23	1,700	2,312	470	7,621
Total	564	5,776	0	0	50	5,351	5,034	496	17,271

Agricultural Activities.

Table A4 25. Agricultural products according to the first 4 crops.

vegetable/ cereals etc.	Unit	Haciahmetli-c.h.		Ibrahimli		Comelek	
		(**)	Yield(*)	(**)	Yield (*)	(**)	Yield (*)
Apple	Trees	28,800	90			19,200	90
Walnut	Trees	720	20			1,500	20
Vine	Trees	71,400	9			7,000	9
Olive	Trees			2,500	30		
Apricot	Trees	12,100	50				
Peach	Trees					1,450	20
Onion	da	130	600			250	600
Tomatoes	da	270	2,000			250	2,000
Pepper	da	120	500			100	500
Beans	da					150	150
Cucumber	da	70	4,000				
Wheat **irrigated**	da	2,000/ **3,000**	90/ **300**	350	90	5,000	390
Barley **irrigated**	da	6000	100	100	100	400/ **100**	100/ **325**
Chickpea	da	2,500	60			1,000	60

(*) In terms of kg/tree or kg/da. (**) rainfed/**irrigated.**
Source. Icel Provincial Directorate of Agriculture.

[19] **Flora.** The names of the flora were collected from local people. Afterwards their scientific names were found in a Dictionary of Turkish Plant Names (in English) by Prof. Dr. Turhan Baytop (1997), [Türk Dil Kurumu Yayını No 578, Ankara]. If it is not found in the dictionary, the local name of the plant is left.

The total arable land is 5,351 ha., of which about 20% is irrigated. The fields are usually on stony inclined surfaces. Apple and walnut are sold out of the province. Mechanisation is low. Farmers grow wheat, barley and chickpea by rainfed/fallow methods. Wheat and barley are grown for subsistence, only chickpeas are sold. Apples, grapes, nuts, apricots (recently) and cherries (recently) are grown in irrigated areas. Tomato, green pepper, onions and beans are also cultivated in home gardens for their own use. The fields are usually inclined and stony. Within the scope of the project, water from 22 springs will be collected and about 900 ha will be irrigated. About 20% of the area is used for grazing.

Husbandry. Goats and sheep are mainly grazed on pastureland whereas cattle are stall-fed in barns.

Table A4 26. The present state of livestock in the villages of Gogden MC.

Village	Cows	Sheep	Goats	Bechives
H. Ahmetli- C.H	52	3,700	4,500	1,120
İbrahimli	31	50	1,200	150
Comelek	49	100	4,000	1,000
Total	132	3,850	9,700	2,270

Source. Icel Provincial Directorate of Agriculture.

Table 4.27 Grazing animals in forests and on rangelands.

Village	Rangeland in Forest area (ha)	Number of ruminant animals grazed		Rangeland outside forests (ha)	Number of ruminant animals grazed	
		Large	Small		Large	Small
H. Ahmetli- Ç.H	2,670	0	8,200	3,866	0	8,200
İbrahimli	52	30	1,250			
Çömelek	2,312	50	4,100			
Total	5,034	80	13,550			8.200

Source. Icel Provincial Directorate of Agriculture

Environmental Problems.

The greatest problem in the area is accelerated erosion. More than 90% of the land is subject to severe erosion (Table A4.28). Only about 4% of the total micro-catchment is productive forest while 33% is degraded. Pastures constitute about 30% and are severely degraded.

Table A4 28. Erosion in the MC. (Units: hectares).

Village Name	*Degree of Erosion*				Gully erosion	Land slide)	Total
	nil or very slight	moderate	severe	very severe			
H. Ahmetli-C.H	189,674.0	414,322.0	3,058,753.0	2,551,225,0	0.0	0.0	6,213,974.0
Ibrahimli	4,585.0	5,411.0	871,430.0	1,089,438,0	0.0	0.0	1,970,864.0
Comelek	0.0	548,375.0	2,068,066.0	3,765,891,0	0.0	0.0	6,382,332.0
Total	194,259.0	968,108.0	5,998,249.0	7,406,554,0	0.0	0.0	14,567,170.0

Source: Head of the AGM Chief Engineering Office in Icel.

Annex 5. AWRP-project performance monitoring component.

Discussion of the monitoring concept.
Performance of the AWRP needs to be monitored and revisions in application of the proposed measures need to be amended accordingly. Therefore, parameters need to be defined to track the project outcomes.

As to review, the following are the problems set forth in the project documents

1. Over-application of fertilizers, resulting in discharge of fertilizer compounds by Kizilirmak and Yesilirmak to the Black Sea,
2. Over-application of pest control chemicals resulting in excessive pesticides and herbicides discharge from Kizilirmak and Yesilirmak to the Black Sea,
3. Pollution carried by rivers to land, canals and to Black sea, as well as to groundwater resources,
4. Inappropriate manure and waste management, including intensive animal feeding activities in stables, improper handling of industrial wastes, insufficient municipal solid waste disposal applications, discharge of industrial and municipal wastewater to rivers without treatment
5. Erosion

Parameters, addressing each category should be set and translated into analytical terms in order to develop the monitoring component of the project:

Table A5.1: Development of a Monitoring Model, by parameter.

Problem to which monitoring methodology is to be addressed	**Translation to a Parameter to be Monitored**	**Translation to Analytical Terms**
Fertilizer in the rivers, Black sea, soil and ground water resources	N, P, K Flow & level of river/ground water	NO_2, NO_3, NH_4, ON, TKN, TP, OP. Water flow and level
Pesticides and herbicides in the rivers, Black Sea, soil and ground water resources	C, Cl, N, P, S Flow and level of river and ground water	Cl-S containing organic compounds Water flow and level
Pollution of rivers, Black Sea, soil and underground water resources by industrial & municipal solid wastes and wastewater	As per Water Pollution Regulation Table1: Inland water resources Flow & level of river/ground water	As per Water Pollution Regulation Table1: Inland water resources Water flow and level
Pollution of rivers, Black Sea, soil and ground water resources by manure	C, bacteria Flow & level of river/ground water	TOC, TC, Total and Faecal Coliform. Water flow and level
Erosion of soil	Soil level, meteorological parameters	Soil depth, wind, rain humidity, speed/direction, temperature.

Next is the determination of sampling/monitoring points and sample/data collection frequency.
Sampling/monitoring points should be selected as to allow monitoring impacts of:

1) agro-industrial wastes
2) agricultural activities
3) meteorological events
4) natural events
5) farming activities

In the ideal case, a maximum of four sampling points should be chosen in the streams regarding pollution parameters in GEF component to ensure that the sample is representative:
(a). Upstream site, unaffected by the pollution source under consideration;
(b). Just below the source of pollution or dilution;
(c). Where the stream is in the worst condition due to a specific pollution source.
(d). A point midway between the bottom of the oxygen sag and the recovery of the oxygen level
There must be at least four times for sampling per year, two of which corresponding to minimum and maximum water levels in streams.

For micro-catchment rehabilitation projects, two sampling points are required, one upstream and one at the outlet of the micro-catchment to monitor both pollutants and sediments arising from erosion.
Meteorological parameters can be monitored continuously at a station, located at a representative point.

As to review sampling/data collection frequency, it is appropriate to take each sample type separately: Table A5.2 gives a monitoring model by surface and ground water and by soils.

Table A5. 2: Development of a Monitoring Model, by sample type.

Rivers and sea	Needs continuous monitoring for quality in general sense, identifying the level of pollution, however fertilizer and pesticide input is seasonal and can be measured two times a year, early after winter and next after harvesting Manure parameters in rivers and sea can be monitored every month, in order to see the trend.
Ground water	Needs to be monitored in the same way, with the same parameters, as rivers and sea, as per Water Pollution Regulation. Communiqué for Sampling and Analysis Methods, Article 10
Soil	meteorological parameters need to be monitored continuously, soil depth can be observed a couple of times a year, if not continuous; while pollution parameters are to be handled the same way with rivers and sea.

Note. Frequency of sampling from ground surface water, advised by Water Pollution Regulation, Communiqué for Sampling and Analysis Methods, Article 10.
Regularly: once every month. Occasionally: after every heavy rain.

It should be noted that, water quality parameters in rivers and sea, are assumed to be already monitored or are handled by the current institutions; therefore need not be the part of the aim of this project. However data generated by the other Institutions should be exchanged systematically for evaluation.
As discussed above and listed in Table A5. 1 is essential to measure these parameters and therefore there is a need to considered them within the scope of investment program of the project.

Table A5. 3. gives a comparison with "water and soil monitoring system." This was taken from the report by report by Prof. N. Kolonkaya. Table A5 4 lists parameters, techniques and equipment required to undertake water and soil monitoring.

Table A5. 3. A comparison with "water and soil monitoring system" report by Prof. N. Kolonkaya.

Parameter	Surface Water		Ground Water		Soil	
	Table 7 (*)	Water Pollution Regulation Table1:Inland water resources	Table 7 (*)	Water Pollution Regulation, Communiqué for Sampling and Analysis Methods, Item10	Table 7 (*)	
Temperature		+		+		
PH	+	+	+	+	+	
Dissolved O_2		+		+		
O_2 Saturation		+		+		
Free CO_2				+		
Cl		+		+		
SO_4		+		+		
Salinity	+		+			
Total dissolved solids	+	+	+	+		
Colour		+		+		
Na		+		+		
Conductivity	+		+			
Suspended solids	+		+			
Turbidity	+		+			
NO_2-N	+	+	+	+		
NO_3-N	+	+	+	+	+	
NH_4-N	+	+	+	+		
Organic-N	+		+		+	
TKN		+		+		
Total P	+	+	+	+	+	
COD		+		+		
BOD		+		+		
OC		+		+		
Emulsified oil & grease		+		+		
Detergents		+		+		
Phenolic Substances		+		+		
Mineral oils & derivatives		+		+		
Total Pesticides		+	+	+	+	
Herbicides			+		+	
Hg		+		+		
Cd		+		+		
Pb		+		+		
As		+		+		
Cu		+		+		
Total Cr		+		+		
Cr+6		+		+		
Co		+		+		
Ni		+		+		
Zn		+		+		
CN		+		+		
F		+		+		
Free Cl		+		+		
S		+		+		
Fe		+		+		
Mn		+		+		
B		+		+		
Se		+		+		
Ba		+		+		
Al		+		+		
α and β radioactivity		+		+		
Faecal coliform	+	+	+	+		
Total coliform	+	+	+	+		

(*) "water and soil monitoring system" by Prof N. Kolonkaya.

Table A5. 4: Parameters, Techniques, Equipment.

Parameter	Surface Water	Ground Water	Soil	Air	Allowed-advised Most Appropriate Analytical Technique (**)	Equipment
Water Temperature	+	+			Thermometer	Thermometer
NO_2-N	+	+	+		Colorimetric	Photometer+kit
NO_3-N	+	+	+		Colorimetric	Photometer+kit
NH_4-N	+	+	+		Titration	Glassware+digital burette
TKN	+	+	+		Kjeldahl	MacroKjeldahl set
Total P	+	+	+		Colorimetric	Photometer+kit
Organic P	+	+	+			Photometer+kit
OC	+	+	+		Persulphate-UV oxidation	TOC Analyser
Total Pesticides	+	+	+		GL-Chromatography	GC-ECD/FPD/FID
Herbicides			+		GL-Chromatography	GC-ECD/FPD/FID
Faecal coliform	+	+			Membrane filtration	Filtariton set+vacuum pump
Total coliform	+	+			Membrane filtration	Filtariton set+vacuum pump
Water flow	+					Flowmeter
Water flow		+				Flow meter+datalogger
Water level		+				Level sensor
Soil dept			+			Dept indicator
Wind direction				+		Sensor+datalogger
Wind speed				+		Sensor
Relative Humidity				+		Sensor
Barometric pressure				+		Sensor
Air Temperature				+		Sensor
Rain				+		Rain gauge
	+					Water Sampler
			+			Soil sampler

(**) As per Water Pollution Control Regulation, Communiqué for Sampling and Analysis Methods,
Item 4: sampling should accomplish TS 5090;
Item 8: storage of samples should accomplish TS 5106;
Item 9: on sampling methods, sampling points and frequencies should be followed;
Item 9 D-1) and D-2) water level and flow rate needs to be monitored at every sampling point;
Table I. recommended analysis methods should be accomplished.

Estimated cost of equipment is given in Table A5. 5.

Table A5.5: Equipment List and Cost.

Equipment List	Quantity per set	Unit Price ($)
Thermometer	1	100
General lab-ware	1	5,000
Photometer	1	5,000
Various photometer kits, 250 test/pk	4	400
Digital burette		600
Filtration set	1	4,000
Vacuum pump	1	4,000
Macro Kjeldahl set	1	12,000
TOC analyser	1	25,000
GC-ECD/FPD/FID	1	40,000
Surface water sampling equipment	1	2,000
Surface water flow meter+data logger	1	5,000
Ground water flow sensor+data logger	1	4,000
Ground water level sensor	1	4,000
Meteorological sensors: wind speed and direction, temperature, humidity, pressure, rain gauge, data logger and reporting	1	6,000
Soil sampler	1	1,000
Soil depth indicator	1	200

Annex 6. Field Trip Minutes, Sema Alpan, (National Consultant). July 2002.

Area: Samsun-Bafra/Ilyasli MC. Date: 29 July 2002.

Participants
Mr. Mehmet Cubukcu (Provincial Director of Environment)
Mr. Yuksel Ordulu (Provincial Directorate of Environment)
Mrs. Zehra Sirimsi (Provincial Directorate of Agriculture)
Mrs. Asuman Sezer (Provincial Directorate of Agriculture)

Mr. Cubukcu assigned one of his colleagues and a vehicle for the field trip. The meeting was held in Mrs. Zehra Sirimli's office. Mrs. Sirimli is the chief of personnel in the Directorate in charge of the GEF sub-project. The staff who are in charge of implementing the project were not fully informed about the content, objectives and steps to be taken in the project. They were confused about the coordination among different components of the AWRP and amongst various institutions. The office provided some useful, but not very reliable baseline data on a survey dealing with regional animal stock. (Two tables gave different figures).

Meeting at the Agriculture Office in Bafra.

Participants:
Mr. Dursun Hacioglu (Director)
Mr. Mehmet Gures (Agriculture Engineer)
Mustafa Ozturk (Veterinary)
Sedat Yilmaz (Technician)

In Bafra, the nearest town to Ilyasli, a short visit was made to the local Director and his colleagues. Briefly they explained the situation in the project area and their activities particularly on greenhouse vegetable and strawberry cultivation as alternatives to tobacco. They also stated that these kinds of alternative farming practices would certainly encourage local participation. During the field visit to the Ilyasli micro-catchment, accompanied by two local village heads (Mr Orhan Tarim muhtar of Ilyasli Village and Mr Fatih Simsek muhtar of Kamberli Village) approximately 50% of the whole catchment could be observed. We had the opportunity to see pilot greenhouses, strawberry fields and drip irrigation systems.

A small group meeting was held in Ilyasli Village with the participation of representatives from the local Agriculture Office, the MoE and local people. Although locals were mainly supporting the project they were expecting some income generating activities and irrigation as well. The declining price of tobacco was one of their common complaints. They were also not comfortable to have a common manure collecting and storing system, as they were unclear about how to share the product.

Area: Tokat. Date: 30-31 July 2002.

A general meeting was organized by Mr. Mesut Tandogan on the 30th July. Mr. Tandogan works at the Local Forestry Office as Department Chief. Those present were as follows:
Mr. Mesut Tandogan (Head of Dept. Local Forestry Office)
Mrs. Rabia Duzdemir (Agriculture Eng. Local Forestry Office)
Mrs. Senay Kandemir (Agriculture Eng. Local Agriculture Directorate)
Mr. Osman Sahin (Agriculture Eng. Local Agriculture Directorate)
Mr. Ahmet Yucer (Agriculture Eng. Local Agriculture Directorate)
Mr. Muzaffer Idi (Agriculture Eng. Local Agriculture Directorate)
Mrs. Yasemin Ispirli (Expert/Eng. Provincial Environmental Directorate)
(No attendance by the Provincial Directorate of Rural Affairs)

Briefly we explained the basic purpose of our visit. Local officers gave a presentation about their activities and the state of the environment in the areas concerned. They all highlighted habitat destruction in Baglicadere MC and pollution in the Kazova MC, which appeared as major environmental problems in Tokat province and the surrounding areas. Mrs. Ispirli mentioned that due to the very recent establishment

of the local office of the MoE it does not have any data on pollution. After the meeting, a half-day field trip to Kazova Plain was organized. During the trip, some agriculture fields, drainage and irrigation canals, a pumping station and flood plains of the Yesilirmak were visited.

There is intensive farming in the area, mainly consisting of vegetable growing. Local officials stated that fertilizer use was not based upon any soil analysis. During this visit visual impressions were noted and information obtained from interviews with local villagers. In the evening of the same day we visited Mr. Ayhan Yuksel, the Local State Hydraulic Works (DSI) director. Mr. Yuksel explained the DSI activities in the region and their possible contribution to the MC Project. However, he does not share the view that pollution is one of the major problems particularly in the drainage canals. According to Mr. Yuksel, erosion and sedimentation are the region's priority problems.

On 31st of July, we went to Baglicadere MC. Almost all local officers who attended the previous meeting joined us. During the field trip, destruction of natural flora was observed to be the most important environmental problem. The combined result of land mismanagement, loss of flora accompanied by severe erosion adds up to what may be called an environmental disaster in the area. It was striking to observe less degradation on one of the hills; because of there are tombs, which are considered as holy places. Also, the people conserve the gardens and trees surrounding them.

We were worried about the new afforestation strategy because of the possible introduction of invasive and exotic species. However Mr. Tandogan assured us that attention would be paid to native species. We also highlighted that the same approach should be adopted in rangeland rehabilitation. Information was gathered from elderly people about local flora and fauna.

Area: Orcan Micro catchment (Kahramanmaras). Date: 22nd. July, 2002.

Meetings were held in Yesilyore Town, Yolderesi and Doluca Villages all in Orcan MC.
Meeting inYesilyore Town:
Participants:
Murtaza Kalli, Mayor.
Ahmet Tepebasi, Head of Kayseri Division of AGM.
Bahattin Acar Sari, Representative of Provincial Directorate of Rural Services.
Assistant Prof. Dr. Recep Gundogan in the Kahramanmaras Sutcu Imam University, Faculty of Agriculture.
About 30 inhabitants including some officers of Municipality.

The Mayor explained that there are 9 officers and 21 workers in the Municipality and the town has clean drinking water, a post office and other necessary infrastructure. He stated that the annual household earnings range between 0.3 to 1 billion TL. He complained that because the Government started to cut some part of the municipal budget based on the **Natural Disasters Decree**, he could hardly pay salaries of the technical personnel in the municipality.

The villagers said that only 5% of the inhabitants can purchase coal for heating and the rest cut trees (especially oak) from the forest as well as using prunings from their garden trees. They confessed that they have cut oak and pistachio (*Pistacia lentiscus*) trees for charcoal making for generations. They also stated that they take leaves and branches of sandalwood (*Arbutus unedo*) and oak trees (kermes mesesi) as winter-feed for their goats and cows. The villagers stressed that they were well aware about the relationship between accelerated erosion and forest degradation, but their misuse was derived from poverty. Because the Government said this project will improve their economic situation they won't do illegal cutting during implementation. An option might be to subsidize coal for some years for local people (especially women). The villagers decided not to hunt in habitat reservation areas for a reasonable period.

The villagers also promised not to graze in the pastures, subject to rehabilitation. (They are well aware that to do without pastures for some period will create considerable future benefit). The farmers wished to obtain young turkey as well as modern turkey coops (hut). This turkey breeding project proposal may be re-evaluated within the context of the present project. During the meeting it became clear that the farmers are ready to use drip and sprinkler irrigation. However, high equipment investment costs is their concern

(according to the project proposal, Government will bring pressured water to the fields, but farmers must pay for the irrigation equipment). Dr. Recep Gundogan stressed the necessity to leave newly planted fruit gardens (productive walnut, almond, cherry) to the legal entities of the Village.

Meeting in Yolderesi Village.

Ahmet Yildiz (Muhtar-Headman), and the same officers mentioned for Yesilyore Town plus about 20 villagers participated in the meeting.

The Muhtar and villagers suffered from low household income (about 0.7 to 0.8 billion TL) resulting in the migration of inhabitants to other places as field-workers during summer. They also confessed to the long-time cutting of trees for heating purposes. They complained that villagers of Doluca take some of their irrigation water. This is because they get their water from Kurtpinari spring, which is close to Doluca Village. The irrigation canal passes through Doluca and these villagers take what they want, resulting in insufficient water for the needs of Yolderesi. Mr. Yildiz stressed that water rights of both villages must agreed at the spring location and it must be delivered in two separate irrigation canals. The Muhtar explained that due to conflicts between village inhabitants -derived from political reasons- they stopped protecting the forest. Therefore, forest degradation has accelerated in the last three years. The Muhtar and other villagers asked about the lack of well water and asked for artesian water. Since deep drilling for water is the responsibility of the DSI, the project will not be able to undertake this.

Meeting in Doluca Village.

A meeting was held with the Headmen of Doluca Village (Mr Ali Sari) and the above mentioned project officers and with a few villagers. The Muhtar and villagers rejected the accuses of Yolderesi villagers about capturing their water rights from the Kurtpinari spring and indicated that the outflow of the spring was reduced to 70 lt/sec in the recent years and this was hardly sufficient for their needs. They added that this kind of problem could be solved with trickle and sprinkler irrigation systems.

Area: Gogden Microcatchment (Mut/mersin). Date: 24th July, 2002.
Meeting in Gogden MC was held in Comelek town. Participants:
The Mayor of Comelek.
Huseyin Ozbakir (Head of Mersin Division of AGM).
Alparslan Tunc (Forest engineer in Mersin Division of AGM).
Sedat Yildirim (Chief of the Forest Region in Mut).
A teacher from the Primary School, plus about 40 inhabitants.

The Mayor informed in the meeting that there is a "Development Cooperative" in the town that sells pesticides, and some kitchen material (sugar, oil and so forth) with a low mark-up. He said that the citizens are relatively well educated and that they publish a journal periodically. The villagers suffered from a lack of irrigation water. They said that they have enough rainfed fields, but they cannot produce enough fodder because they are unable to irrigate the fields. They stressed that at present, they plant wheat, barley and chickpea, and will plant more maize and clover for silage. They believe that, in this way, stall-feed animal husbandry with will improve their financial conditions. They also added that the high price of the fodder adversely affected animal husbandry and also indirectly wild animals. The villagers stressed that they are ready to use sprinklers and drip irrigation if enough water can be brought to the fields.

The villagers are happy that they started to protect their forest five years ago under the **Forest Law.** The **legal entity of the town** obtains money for this mandate and revenues are spent on the needs of the town. They also stressed that since 1998, all the governmental works dealing with contractors in the area are being given to the Town Legal Entity. They are happy because on a 44 ha area, existing wild pistachio plants (*Pistacia lentiscus*) will be grafted, and additional pistachio plants will be planted on the border of the forest; afterwards this land will be left completely to the responsibility of the legal entity of the town. (The land will not be given but will be rented for 49 years).

The villagers said that they started growing fruit in 1965 and began harvesting fruit after 1970. They said that they also produce grapes on about 50% of horticultural land. (The other half is for fruit growing). They use N fertilizers (15/15, 20/20, and 18/46) and pesticides for irrigated horticulture. They declared that they use about 150 tonnes of chemical fertilizers. They complained that they use chemicals less than their

needs because its price has gradually increased. It was said that only one farmer used organic fertilizers and they are aware that such manure is as productive as chemical fertilizers. They will try to use organic fertilizers during project implementation. Some farmers indicated that they are ready to produce organic products (fruit & vegetables) if the know-how is given to them. On the other hand, they emphasized that they used pesticides indeterminately. They use about 500 to 750kg (in some years 1,000kg) pesticides on 700 ha of irrigated land. They said that the optimum use of the chemicals was learnt from each other, or from the sellers as well as by technicians in the local Agriculture Government Office. However, usually they could not get satisfactory information. The villagers stressed that they were ready to participate in the project with their labour.

Area. Kabaktepe MC (Kayseri). Date: 22 July 2002.

The first meeting was held in the Local Forestry Department.
Participants:
Mr. Zafer Atilla; (Head of the AGM Chief Engineering Office in Kayseri)
Mr. Ahmet Yenikalaycı; (Kayseri Provincial Directorate of Agriculture)
Mr. Sacit Senocak; (Kayseri Provincial Directorate of Agriculture)
Mr. Mehmet Erkantarcı; (ORKOY, in Kayseri)
Mr. Mehdi Aksoy; (Kayseri Provincial Directorate of Rural Services)
Mr. Levent Koçer; (Kayseri Provincial Directorate of Rural Services)
Local meetings. Meetings in Kabaktepe MC were held in three villages· Golcuk, B.Kabaktepe and K.Kabaktepe.

Local Meeting in Golcuk. The first meeting was done in Golcuk village, at the Muhtar's home.
Participants:
Mr. Zafer Atilla; Head of the AGM Chief Engineering Office in Kayseri.
Mr. Ahmet Yenikalaycı; Kayseri Provincial Directorate of Agriculture
Mr. Mehmet Erkantarcı; ORKOY, in Kayseri
Mr. Mehdi Aksoy Kayseri Provincial Directorate of Rural Services, plus a few villagers

The Muhtar and other villagers expressed their regret about their continuing tree cutting activities. The villagers expressed a great desire to cooperate with project staff during the implementation phase. The Muhtar explained that, in the past, pastoral agriculture was much greater than today, however, now cultivation has increased. As a consequence, they have more wheat and barley than fodder in rainfed fields and therefore, animal breeding has gradually decreased because the lack of fodder. He stressed that, at present, there is no stockbreeding. Instead, farmers graze animals in arable and fallow fields. He added that they are ready to start stockbreeding.

The Muhtar said that 80% of animal dung was used for fuel while 20% was used as manure. He explained that all households use nitrogenous fertilizers (20/20) and in total it reaches to about 70 tonnes (in some years 100 t.). The Muhtar and the villagers suffered from lack of irrigation water. They said that they have enough fields (about 600 ha) but they cannot produce enough fodder because they have insufficient irrigation water, (usually they leave 300 ha field as fallow every year). The villagers stressed that they are ready to use sprinkler and drop irrigation systems if enough water is available. The peasants stated that the wild boar population has increased due to a hunting prohibition.

Kucukkabaktepe Meeting.
The meeting was held in the house of vice Muhtar, Mr. Haydar Koca. The governmental project staff who participated in the Golcuk meeting were also present. . In addition, a few relatives of Mr. Koca also participated. Mr. Koca said that the village suffers from a gradual migration. He stated that there were 120 households in the past but, the number has dramatically diminished in the recent years. He mentioned numerous flora and fauna species in their territory; these were mentioned previously. This reflects a relatively less degraded environment. The area also suffered from increasing population of wild boar due to the hunting ban. There will be no reforestation on village land, only pasture rehabilitation. However, a debate between the brother-in-law of the vice Muhtar and Mr. Zafer Attila indicated that the villagers have

some concerns about the project. It appears that they are anxious because they think their rights, derived from the continuous use of the land, might be captured by the government through this project.

Buyukkabaktepe Meeting.

The meeting was held in the house of the Muhtar, Mr Battal Sezer. The governmental staff who participated in the Golcuk and K. Kabaktepe meetings were present. The Muhtar stated that they have a fifty-fifty balance in terms of cultivation and animal husbandry. And they plant more fodder than cereals. Therefore, they produce all the fodder they need. They are awaiting sprinkler and drip irrigation systems so that they will be able to produce more fodder in irrigated fields. Consequently, they will produce more silage and breed more animals.

Annex 7: Environmental Management Plan AWRP.

Environmental Assessment. This project should have a substantial positive impact on the environment, but the degree of the impact is uncertain. Thus, a monitoring and evaluation plan has been drawn up to try to determine the impact (Section I). Some of the proposed activities in the AWRP could result in (local) environmental damage. Therefore, an environmental screening of the various project activities has been made in Section F and mitigation measures are proposed in the Environmental Management Plan [EMP] (Section J) to address possible (negative) environmental impacts. These impacts are summarized in Table 1 below. The EMP also proposes procedures to measure the micro and macro environmental effects (Table 2).

Table 1. EMP for AWRP: Environmental Impacts and Mitigation Measures.

Issues	Anticipated/Potential Environmental Impacts	Effects on Environment	Actions or Mitigation Measures
Road building activities.	This could negatively affect erosion, soils, biodiversity, stream flow, drainage and wetland. Roads will give access to areas that have been degraded and enable mitigation measures to be undertaken thus having positive environmental effects. Roads will also open up remote rangelands and remove over-grazing pressures on homestead pastures. **Probability of occurrence: High.**	Restoration and re-vegetation of watershed areas. More sustainable use of land, greater biodiversity and increased C. storage. Overall reduction of erosion. Reduced dissolved minerals in surface and ground water. Poor alignment/steep slopes result in accelerated erosion.	Enforce road-building standards and provide maintenance budget. Issue directives about re-vegetation of exposed areas, replacing cut trees, explosives use, disposal of excavated soils, etc. Include MoE in road alignment surveys to ensure that biodiversity and wetlands etc. are protected. MoE requested to conduct an IEE if explosives to be used.
Forest and rangeland (non-arable) terracing, ground preparation etc.	Initially, this could lead to surface and gully erosion, poor drainage etc. The initial surface and gully erosion, if any, will be substantially offset by improved infiltration, soil stabilization, increased ground cover (bio-diversity), improved micro-climate, greater C sequestration. **Probability of negative effects low, positive effects high.**	Restoration and re-vegetation of watershed areas. More sustainable use of land, greater biodiversity and increased C. storage. Overall reduction of erosion. Reduced dissolved minerals in surface and ground water. No action and improper terracing etc. will result in continued degradation.	Enforce standards for terracing and provide maintenance budget Re-vegetate area quickly, especially terrace edges and chiefly with indigenous species. Provide training if necessary
Arable ground preparation incl. Terracing.	Initially, this could lead to surface and gully erosion, poor drainage etc. Improved farming practices such as minimum tillage, contour ploughing, hand/ mechanical terrace reduce top soil loss, decrease erosion, improve soil structure increase infiltration encourage fertility build up. **Probability of neg. effects low, positive effects high.**	Less soil loss through water (and wind) erosion. Reduced dissolved minerals in surface and ground water. Continued ploughing up and down the slopes will accelerate erosion.	Enforce standards for terracing and provide maintenance budget. Demonstrate improved farming practices. Provide farmer training. Involve farmer participation in planning/execution of initiatives.
Gully rehabilitation.	Initial actions may cause additional erosion until vegetation established but overall will lead to decreased erosion, improved bank protection, restoration of vegetation cover, soil fertility build-up. **Probability of negative effects low, positive effects very high.**	Soil stabilization and increased vegetation will reduce erosion, mineral loss, improve biodiversity and C sequestration.	Apply appropriate gully plugging methods and terracing standards. Vegetate with grass, shrubs & trees. Demonstrate improved techniques throughout project area. Provide farmer training. Involve farmer participation in planning/execution of initiatives.

Issues	Anticipated/Potential Env. Impacts	Effects on Environment	Actions or Mitigation Measures
Channel work, irrigation, pond and reservoir construct-ion.	Building of irrigation channels and realigning watercourses may cause initial erosion. Poor irrigation practices may lead to surface soil loss, mineral leaching and/or salination. Pond and reservoir construction could deprive downstream areas of water. Better water use should decrease erosion by controlling flash flooding. The provision of more watering points will enable fuller and better use of rangelands. Increased ground cover by increased cropping. **Probability of negative effects low to moderate, positive effects high.**	Properly constructed earth and concrete canals will minimize erosion potential. Ponds and reservoirs will better control water flow and diminish incidence of flash flooding and soil erosion. Greater all-year round use of arable and pastoral lands. Reduce pressure of over-grazing near homesteads and clearing more forest and rangelands for arable farming. This should decrease organic C emissions and improve biodiversity	Apply construction standards. Re-vegetate canal banks with grasses and shrubs etc. Involve MoE for IEE and beneficiaries in site choice, design, planning and execution phases. Ensure that villages that draw water from same sources agree on plan for water sharing. Plan for pond construction to take into account down-stream requirements. Ensure that reservoir plans and construction are approved by MoE and comply with World bank safeguard requirements. Provide farmer training in drip and sprinkler irrigation and propose proper water pricing.
Applica-tion of chemical control agents (CCA) in project nurseries.	Over use or inappropriate use of herbicides, insecticides and pesticides could affect negatively plant population, lead to leaching in ground and surface water and affect the persons applying chemicals. **Probability of negative effects low to moderate, positive effects moderate.**	Inappropriate and/or over use of chemical agents could negatively affect the environment through leaching of the chemicals in ground and surface water and a build up of toxins in the soil. It could also adversely affect the user. (and his/her family).	Only use internationally approved chemicals in correct dosages at appropriate times. [5] Provide training for project workers in storage, handling and use of CCA and disposal of containers. Practice IPM (integrated pest management) where appropriate.
Applicati on of chemical control agents by farmers in their own fields.	Over use or inappropriate use could affect negatively plant population, lead to leaching in ground and surface water and affect the persons applying chemicals. **Probability of negative effects low to moderate, positive effects moderate.**	Inappropriate and/or over use of chemical agents could negatively affect the environment through leaching of the chemicals in ground and surface water and a build up of toxins in the soil. It could also adversely affect the user (and his/her family).	Ensure farmers only use approved CCAs. Get MoE to examine chemical list to ensure that only internationally approved chemicals are allowed.[20] Provide information to farmers and distributors of chemicals on the purchase and use of CCA. Provide training for farmers in storage, handling and use of CCA and disposal of containers. Demonstrate IPM and encourage use where appropriate.

[20] Ensure that the following pesticides, which fall into WHO IA and IB lists are not purchased and used under this project: Azinphos-Methyl, Chlorfenvinphos, Dichlorvos, Dichrotophos, 14-EPN, Methamidophos, Methidation, Monocrotophos, Omethoate, Oxydemeton-Methyl, Parathion-Methyl, Phorate, Thiometon, Phosphamidon, Triazophos, Aldicarb, Benfuracarb, Carbofuran, Furathiocarb, Mewthomyl, Tefluthrin, Zetacypermethrin, Dnoc Ammonium, Cadusafos, Ethoprophos, Fenamiphos, Oxamyl, Brodifacoum, Choumachlopr, Zinc Phosphide, Difenacoum, Floucomafen. Also see Annex 3.

Issues	Anticipated/Potential Env. Impacts	Effects on Environment	Actions or Mitigation Measures
Application of organic and inorganic fertilizers	Over use or inappropriate use could lead to leaching into ground and surface water of N, P & K and pathogens. Proper use/handling of fertilizers increases plant yields. **Probability of negative effects low to moderate, positive effects moderate to high.**	Over use can adversely affect ground and surface water including drinking water, encourage eutrophication, affects fish population negatively.	Provide soil testing and advise on application rates to farmers. Find use for surplus manure. Demonstrate storage and handling and spreading methods Provide farmer training. Involve farmer participation in planning/execution of initiatives.
Multiple rehabilitation activities in forests and rangelands.	Increase biomass cover with indigenous species. Improve biodiversity. Decrease erosion. Improve water infiltration & water flow. Increase C. sequestration. Probability of negative effects very low to negligible, positive effects high to very high.	Steady increase in ground cover. Slow but accelerating growth of biomass. Increase in bio-diversity. Steady accumulation of C in wood, grass & soil. Increase in water quality and flow. Steady reduction in erosion rate.	Provision of native seeds, seedling and cuttings for the various regeneration initiatives. Buffer zones to protect forests. Fencing and enclose rangelands. Full consultation with and participation of local people. Training of local people HQ and support staff. Good M&E.
Environmentally friendly farming and horticultural practices on rainfed and irrigated areas.	Decrease in water (and wind) erosion. Change of N & P levels in soil to optimum amount for specific crops. Decrease in leaching. Optimum use of organic fertilisers. Probability of negative effects very low, positive effects high.	Increase soil water capacity, improve soil structure and fertility. Improve micro-fauna. Moderate increase in C sequestration. Optimum N & P levels in soil. Reduction of chemical control agents in soil and groundwater.	Demonstration of improved practices. Initial provision of seeds if necessary. Full support activities. Training of local people HQ and support staff. Good M&E. Organic farming promoted. Consultation and participation of local people
Over-use of natural resources. *(This is a no-action case and has very severe negative impacts).*	Over exploitation has resulted in degradation, deforestation, erosion, flash flooding, siltation etc. Through discussions and initiatives get farmers to reduce degradation and over-exploitation. With business as usual, negative effects very high, positive effects negligible.	If over-use continues, then watershed degradation will continue. This will not only affect the immediate surroundings, but could have negative impacts on lowland agriculture, bio-diversity, C sequestration and international waters.	Undertake supply and demand resource surveys. Determine present & future land carrying capacity. Propose options for sustainable resource use. Initiate agreed options. Monitor and evaluate various interventions. Involve beneficiaries at the planning stages and in the execution of initiatives.
Carbon sequestration.	The degree of C accumulation will determine the global impact. A significant increase could enable C	Tree planting and management activities, improved management of rangelands,	Ensure that species choice is appropriate for land and climate. Ensure that choice of plant species

	trading to take place and/or allow the Gov. of Turkey to offset some C emissions. **Probability of occurrence: High.**	appropriate farming and horticultural practices will increase carbon sequestration and biodiversity. .	is biased to those indigenous species that have a comparative advantage in C sequestration. Measure and monitor C increase.

Issues	Anticipated/Potential Env. Impacts	Effects on Environment	Actions or Mitigation Measures
Biodiversity.	Better land management &, conservation measures (IPM) improve habitats and migratory routes for species. Considerable increase of indigenous species, especially perennials. Use important biodiversity areas as gene pools. **Probability of occurrence: High.**	Increased biodiversity on all land use types, especially native flora and fauna.	Undertake biodiversity monitoring over lifetime of project. Use beneficiaries to locate important areas of bio-diversity. Ensure sustainable use of biodiversity by public participation. Train local population in M & E.
Soil and Water Quality.	With the introduction of better pastoral (and arable) farming systems, soil and water quality (both surface and ground) will improve. **Probability of occurrence: High.**	More productive lands with increased organic matter and greater carbon sequestration. Reduced minerals, pathogens. & pesticides etc. in soil & water	Undertake soil and water monitoring of selected areas to establish the effect of better farming systems on soil and water quality.
Erosion.	The scale of erosion reduction, if any, will not only influence the immediate area, but affect the whole watershed especially lowland and the delta areas. Probability of significant erosion reduction: Moderate.	Decrease in erosion, besides having positive environmental effect on immediate area will bring benefits to lowland agriculture and the quality and quantity of water flowing into rivers and reservoirs. Decrease maintenance in irrigation canals, extend reservoir/dam life.	Measure erosion rates on selected land-use types and in MC rivers or streams. Train project staff to monitor erosion.

Table 2. EMP for AWRP: Monitoring Plan.

Road Construction: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Plans and site.	At each site.	Examine plans. Compare to acceptable standards. Inspect site. MoE to conduct IEE for use of explosives.	Before road building commences .	To compare to internationall y acceptable standards.	Use existing facilities.	Builders, PMU and MoE.
Construction	Road building.	At each site.	Physical inspection.	As specified in contracts or plans.	To ensure that standards are being met.	As specified in contract.	Builders, PMU and MoE.
Operate	Road .	At each sites.	Physical inspection.	At specified (yearly) intervals.	To ensure that standards are being met.	Included in the project.	Builders, PMU and MoE.
Decommission. Not applicable (N/A)							

Forest and Rangeland Ground Preparation/Terracing: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed etc.?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Plans and site.	At each site.	Examine plans. Compare to acceptable standards [1]. Inspect site.	Before operation commences .	To compare to internationall y acceptable standards.	Use existing facilities	Contractors, PMU, MoF, KKGM and MoE.
Construction	Ground preparation and terracing.	At each site.	Physical inspection.	As specified in contract or plans.	To ensure that standards are being met.	As specified in contract.	As above.
Operate	Ground preparation and terracing.	At each site.	Physical inspection.	At specified (yearly) intervals.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Note 1. Annex technical specifications of terracing/ground preparation as a guide in the bidding documents.

Arable Ground Preparation/Terracing: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Plans and site.	At each site.	Examine plans [1]. Compare to acceptable standards. Inspect site.	Before operation commences .	To compare to internationall y acceptable standards.	Use existing facilities.	Contractors, PMU, MARA and MoE.
Construction	Ground preparation and terracing.	At each site.	Physical inspection.	As specified in contract or plans.	To ensure that standards are being met.	As specified in contract.	As above.
Operate	Ground preparation and terracing.	At each site.	Physical inspection.	At specified (yearly) intervals.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Note. 1. Annex technical specifications of terracing/ground preparation as a guide in the bidding documents

Gully Rehabilitation: Assessment and Monitoring (A &M) Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed etc.?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Plans and site.	At each site.	Examine plans. Compare to acceptable standards. Inspect site.	Before operation commences .	To compare to internationall y acceptable standards.	Use existing facilities.	Contractors, PMU, MoF, MoE, KKGM and MARA.
Construction	Gully plugging and terracing etc.	At each site.	Physical inspection.	As specified in contract or plans.	To ensure that standards are being met.	As specified in contract.	As above.
Operate	As above.	At each site.	Physical inspection.	At specified (yearly) intervals.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Channel Work, Irrigation, Pond Construction Small Reservoir: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Plans and site.	At each site.	Examine plans. Compare to acceptable standards. Inspect site.	Before operation commences.	To compare to internationally acceptable standards, incl. WB Safeguard standards.	Use existing facilities.	Contractors, PMU, MoF, DSI, MARA.
Construction	Dam wall, pond construction, canal work, irrigation pipes & channels.	At each site.	Physical inspection.	As specified in contract or plans.	To ensure that standards are being met.	As specified in contracts.	As above.
Operate	As above.	At each site.	Physical inspection.	At specified (yearly) intervals.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Nursery Application of Herbicides, Insecticides and Pesticides. Rehabilitation: A & M Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	CCA, sprayers, clothing, drum storage/ disposal. Training,	At each nursery site.	Assess IPM option. Examine CCA etc. Compare to acceptable standards. Ban application of WHO IA and IB list chemicals.	Before operation commences.	To compare to internationally acceptable standards.	Use existing facilities.	Contractors, PMU, MoF, MoE
Construction	N/A						
Operate	Method of application.	At each site.	Physical inspection.	During application.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Farm Application of Herbicides, Insecticides and Pesticides. Rehabilitation: A & M Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed t?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	CCA clothing, sprayers, drum storage/ disposal. Training.	At sample of farm sites.	Assess IPM option. Examine CCA etc. Compare to bench mark. Avoid application of WHO IA and IB list chemicals.	Before operation commences.	To compare to internation-ally acceptable standards.	Use existing facilities.	Contractors, PMU, MARA, MoE.
Construction	N/A						
Operate	Method of application.	At sample of farm sites.	Physical inspection.	During application.	To ensure that standards are being met.	Included in the project.	As above.
Decommission. N/A							

Application of Organic and Inorganic Fertilizers: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Soil for existing chemical content.	At sample sites in farmers' fields.	Standard soil testing equipment.	Before fertilizer application begins.	To determine present NPK and proposed application rate	Use existing facilities.	Contractors, PMU, GDRS, MARA.
Construction	N/A.						
Operate	Effectiveness of fertilizer application.	As above.	As above.	After crop is harvested.	To determine NPK in soil.	Included in the project.	As above.
Decommission. N/A							

Manure Management: Assessment and Monitoring Program.
(See also separate M &E Plan Metcalfe J P 2002).

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Solid and liquid manure in water bodies and landfills etc.	At selected agro-industry sites.	Assess presence of N, (PK) in water or soil.	Before operation commences	To assess amount of NPK.	Existing facilities and new equipment.	Contractors, PMU, KKGM.
Construction	Selected manure management units built by the project.						
Operate	Solid and liquid manure in water bodies, landfills etc.	At selected agro-industry sites	Assess presence of N, (PK) in water or soil.	After construct-ion at set intervals.	To determine if manure management unit working.	Included in the project.	As above plus MoE & KKGM.
Manure use	Application technique	In fields.	Observation.	During application.	To determine effectiveness.	Included in the project.	As above.

Pollution Control of Agro-Industries: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assessed?*	**Why** *Assessed?*	**Install**	**Operate Install**
Baseline	Effluents of existing agro-industries	At selected agro-industry sites.	Assess presence waste discharged in water or soil.	Before remedial measures commences	To assess amount of harmful discharge	Existing facilities?	MoE
Construction	As a result of inspection alterations to existing discharge methods may be proposed.						
Operate	Effluents of existing agro-industries after alterations.	At selected agro-industry sites.	Assess presence waste discharged in water or soil.	After remedial measures.	To assess amount of harmful discharge.	Included in the project.	As above.
Decommission: N/A.							

Note. This is not the responsibility of the Project, but it could assist the MoE in compiling mitigation plans.

Rehabilitation Activities: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Existing quantity and quality of flora.	At sample sites.	Standard flora sampling techniques.	Before operation begins.	To determine quantity and quality of flora	Use existing facilities.	Contractors, KKGM, MoF, PMU .
Construction	Type of operation.	At the sample site.	Number of new plants etc.	After operation	To determine initial success.	As above.	As above.
Operate	Effectiveness of operation.	As above.	Survival rate of new plants etc.	At set intervals over rotation.	To determine success.	Included in the project.	As above.
Decommission. N/A							

Environmentally-friendly Farming and Horticultural Practices: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assessed?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Existing practices.	At selected arable and horticultural sites.	Existing crop yields, NPK, pesticides etc. presence of erosion etc.	Before operation commences .	To assess effect of existing practices.	Existing facilities and equipment.	Contractors, MARA, PMU, Gov. Labs.
Construction	N/A						
Operate	New practice over 3 to 4 years.	As above.	New crop yields, NPK, erosion rate.	At planting and at harvest for 3 to 4 years.	To determine effectiveness of new practices.	Included in the project.	As above.
Decommission. N/A							

Over-use of Natural Resources: Assessment and Monitoring Program.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *Is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Existing resources Existing demand.	At selected villages & resource sites.	Survey demand and sustainable supply.	Before interventions commences.	To assess effect of existing practices.	Existing facilities and equipment.	Research institutes, Government agencies.
Survey work. As a result of surveys, propose measures to balance supply with demand, if any.							
Operate	Modified resources; modified demand.	As above.	Resurvey of demand and sustainable supply.	For up to 10 years. after intervention commences	To determine effectiveness of new practices.	Included in the project.	As above.
Decommission. N/A							

Carbon Sequestration: Assessment and Monitoring Program.

Organic Carbon Assessment in Biomass and Soils.

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *Is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Carbon storage in plants and soil.	At selected sites and scaled up.	Determination of organic C in plant and soil samples in lab.	At the start and at set intervals.	To determine C sequestration in biomass and soils.	Existing facilities plus new equipment?	Research institutes, MoF, MoE, MARA, SIS.
Construction. N/A							
Operate	Carbon storage in plants and soil.	At selected sites.	Biomass and soil measured for C content over time.	Plant and soil C measured at set intervals.	To record change in C storage at different sites.	Included in the project.	Included in the project.
Decommission. N/A							

Biodiversity: Assessment and Monitoring Program (A & M).

Survey of Plants and Animals.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed/ monitored?*	**Where** *assessed/ monitored?*	**How** *assessed/ monitored?*	**When** *assessed/ monitored?*	**Why** *assessed/ monitored?*	**Install**	**Operate Install**
Baseline	Plant and animal species and incidence.	At selected sites.	Sample surveys.	At the start.	determine existing plant/ animal numbers.	Use existing people.	Research institutes, MoE, MoF.
Construction. N/A							
Operate	Monitor plant and animal nos over time.	At the same selected sites.	Sample surveys and local observations.	At specific intervals, in same month.	To record change in flora & fauna.	Included in the project.	Included in the project.
Decommission. N/A							

Soil and Water: Assessment and Monitoring Program.

Measuring soil and water both surface and groundwater.

	The parameter(s)					Cost	Responsibility
Phase	**What** *assessed?*	**Where** *assessed?*	**How** *assessed?*	**When** *assesse/?*	**Why** *assessed?*	**Install**	**Operate Install**
Baseline	Soil and water and quality.	At selected sites.	Soil & water sampled in laboratory.	At the start.	To determine N, P & K plus C, CCA & pathogens.	Use existing facilities.	PMU and research institutes.
Construct. N/A			Soil & water testing equip.				
Operate	Soil and water and quality.	At selected sites.	Soil & water sampled in laboratory.	At specific intervals, but in same months.	To record NPK, CCA & pathogens in soil & water.	Included in the project.	Included in the project.
Decommission. N/A							

Erosion: Assessment and Monitoring Program.

Measuring incidence of erosion: (land and water methods).

	The parameter(s)					Cost	Responsibility
Phase	**What** *is to be assessed?*	**Where** *is it to be assessed?*	**How** *assessed / type of equipment?*	**When** *Is it to be assessed?*	**Why** *assessed (optional)?*	**Install**	**Operate Install**
Baseline	Degree of erosion.	At selected sites on land and in rivers (start and end of MC).	Erosion measuring sticks and determining particulates in water (quantity & quality)	At the start of the project.	To estimate erosion rate with and without project interventions	Existing facilities plus new equipment	Research institutes, GDRS, MoF.
Construction	N/A		Measuring equipment				
Operate	Erosion rate.	As above.	As above.	At set intervals over several years.	To record level of erosion by land and water methods at different sites.	Included in the project.	Included in the project.
Decommission.	N/A						

Institutional Strengthening.

A. Equipment Purchases.

The Monitoring and Evaluation unit will have maps of all the 13 provinces. Each province will have a GPS device and the M & E unit will have two extra ones. Much of the equipment will be provided by the people undertaking the various surveys (see EMP Table 3) and this has been included in the estimated cost. For example, if the forest service undertakes tree measurement within the forest, it already has equipment for tree measurement and general survey work. Contractors will have their own equipment. Additional tree measuring equipment may be required to measure trees outside the forest. The forest services can advise the project about this, but provision has been made for the Project to obtain four sets of tree measuring equipment such as scales, hypsometers, moisture content meters and consumables, (Table 3). The cost for this set of equipment has been estimated at US$ 5,000 and four sets will be required, giving a total cost of US$ 20,000.

Soil testing will be done by four teams. The field work will be done by the project and analysis by contracted laboratories. Some additional equipment is required such as spades, soil augers, plastic bags and other consumables. The cost of each set has been estimated at US$ 1,000 or US$ 4,000 for four sets, (Table 3).

Additional field and laboratory equipment for soil testing may be required. Such equipment is given in Table 3. This equipment cost (field US$ 50,000; laboratory US$ 100,000) should be covered in the contract cost for soil testing, estimated to be US$ 790,000 to 1.185 million. However, if a government, university or private laboratory can do the testing for US$ 500,000 or less, without equipment, then the project could pay for the equipment. It should be noted that N & P determination would be done in addition to testing for organic carbon.

Table 3. Type of equipment for the project.

Type of Equipment	Number of units	Unit cost US$	Total Cost US$	Purchase: Local (L) or International (I)
Additional tree measuring equipment				
Hypsometer	4	150	600	L (I)
Measuring tapes (50 m)	8	15	120	L
Relascope (simple plastic)	4	2.5	10	L
Diameter tapes	8	2.5	20	L
Tree calipers	8	25	200	L
Ladders	4	60	240	L
Scales (50 kg)	4	100	400	L
Spring balance (10 kg)	4	25	100	L
Power saw	4	300	1,200	L
Axe	8	10	80	L
Compass	4	5	20	L
Camera	4	50	200	L
Clip board	4	2.5	10	L
Consumables (sacks, string, paper, pencils, films including developing, fuel, oil etc.)	4 sets for 7 years	4,200	16,800	L
Estimated total cost for above		**5,000**	**20,000**	
Additional field equipment (soil sampling)				
Spades (2 per team) replaced after year 3.	16	10	160	L
Soil auger (2 per team).	8	50	400	L
Camera	4	50	200	L
Consumables (plastic bags, string, paper, pencils, films etc.)	4 sets for 7 years	810	3,240	L
Estimated total cost for above		**1,000**	**4,000**	
Soil testing additional field equipment				
Groundwater flow meter + data logger	4	4,000	16,000	L
Ground water level sensor	4	4,000	16,000	L
Soil sampler	4	1,000	4,000	L
Soil depth indicator	4	200	800	L
Consumables (for 7 years)	4	3,300	13,200	L
Total additional field equipment		**12,500**	**50,000**	
The above costs should be covered in the soil-testing budget of $ 790,000 to 1,185,000 (see next item as well).				

Table 3 continued. Type of equipment for the project.

Type of Equipment	Number of units	Unit cost US$	Total Cost US$	Purchase: Local (L) or International (I)
Soil laboratory –additional equipment.				
Thermometer	1	100	100	L
General laboratory ware	1	5,000	5,000	L
Photometer	1	5,000	5,000	L
Photometer kits (250 tests/pk –4 sets)	1	1.600	1,600	L
Digital burette	1	600	600	L
Filtration set	1	4,000	4,000	L
Vacuum pump	1	4,000	4,000	L
Macro Kjedahl set	1	12,000	12,000	L
TOC analyzer	1	25,000	40,000	L
GC-ECD/FPD/FID	1	40,000	40,000	L
Miscellaneous consumables	1	2,700	2,700	L
Total additional laboratory Equipment		**100,000**	**100,000**	
The above costs should be covered in the soil-testing budget of $ 790,000 to 1,185,000.				
Measuring sticks	2,000	**5**	**10 000**	L
River monitoring of 12 rivers				
Surface water sampling equipment	24	2,000	48,000	L
Surface water flow meter + data logger	24	5,000	120,000	L
Consumables for 7 years	12	1,000	12,000	L
Total additional sampling equipment		**8,000**	**180,000**	
Lab equipment for testing river water (see Annex 5 Tables 4 & 5). The cost of the equipment is similar to the above		100,000	100,000	
The above costs should be covered in the river monitoring budget of $ 720,000 to 1,080,000.				
Micro-catchment rivers (60)				
Silt traps	120	50	6,000	L
Mesh Screens (set)	120	50	6,000	L
Laboratory/office work (for 7 years)	60	350	21,000	L
Consumables (for 7 years per MC)	60	250	15,000	L
Total equipment cost for MCs		**800**	**48,000**	
Simple met stations in each MC				
Simple meteorological equipment. Rain gauge, wet and dry bulb, temperature, tatter flags etc. ($ 160 per station) Consumables for 7 years ($ 140 per MC)	60	**300**	**18,000**	L
Complete met stations in each watershed				
Complex meteorological equipment. Sensors: wind speed and direction, temperature, humidity, pressure, rain gauge, data logger and reporter ($ 6,000). Consumables - 7 yrs ($ 1,400/watershed)	5	**7,400**	**37,000**	L

Calibrated measuring sticks placed throughout the project area will be used to measure the loss (or gain) of soil at specific sites. It is estimated that about 2,000 sticks will be placed in the 13 provinces. The cost of each stick is estimated to be US$ 5, thus the total cost will be US$ 10,000. Project personnel will undertake routine monitoring.

There will be sampling of river flow each in one river of the 12 regions making up the project area. Contracts will be awarded to undertake this work, estimated to be US$ 720,000 to US$ 1.08 million. Additional surface water sampling equipment and river flow equipment is required. This will cost an estimated US$ 280,000 and should be covered in the contract costs. However, if a government, university or private laboratory can undertake the contract for US$ 400,000 or less, without equipment, then the project could purchase the equipment.

One river per micro-catchment will be tested for the quantity and quality of particles in the water. This will be done at the head and foot of the MC. Simple silt traps will be established and measurements will take place at specified intervals throughout the year. These intervals may vary according to rainfall. The monitoring work will be undertaken by project staff with the help of the M&E Unit. The cost of this equipment, plus consumables is estimated at US$ 48,000 (Table 3).

Meteorological stations will be established in the project area. There will be one simple one per micro-catchment and another more complex one per watershed. Project staff and beneficiaries could collect the data each day. The estimated cost of these stations is US$ 18,000 and US$ 37,000 respectively (Table 3).

B. Training/Study Tours.

Environmental training will be undertaken at several levels. There will be formal courses for project staff, farmers and other beneficiaries. There will informal discussions during meetings with village groups etc., there will be demonstrations of environmental- friendly practices and there will be site visits to various MCs within the project and to the former EAWRP area as well as other areas within Turkey. The training will cover land-use planning, environmental management, monitoring and mitigation. As the project proceeds, environmental training will be tailored to the lessons learnt from the project and the changing needs of the beneficiaries. Thus the following table (Table 4) covers the present proposals, but is subject to change.

Table 4. Proposed Training and Demonstration courses.

Type of Training	N°	Organ-ization	Job Trainers	Duration (days)	Timings	Venue	Institute	Cost US$ local
Environmental awareness for specific components; road building, ponds etc.	24	Project staff	MoF, MARA, GDRS	One day	At start of each year	Project area	Consultant and/or MoE	5,000 each for 7 years. (35,000)
Chemical control agents and fertilizers (Training of trainers). Train beneficiaries	24	Project staff	MoE, MoF, MARA GDRS	One week	2 per yr, year 1-4, 1 per yr, 5-7.	Project area	Consultants	20, - 25,000 (220,000 to 275,000).
Integrated Pest Management (IPM) in forests. Train beneficiaries. Demonstrations	24	Project staff	MoF and farmers	One-day	Through-out yr for 7 yrs	IPM area in forest	Forest staff	Part of forest IPM budget
IPM on farm. Train beneficiaries. Demonstrations	24	Project staff	MARA	One day	Through-out yr for 7 yrs	IPM in farm areas	Consultants, MARA staff	Part of farm budget
Environmentally friendly land-use practices. Train	24	Project staff	MoE, MoF, MARA	One day	Through-out yr for	Project area	All staff	Part of general

staff and beneficiaries. Establish demonstrations			GDRS		7 yrs			budget

Type of Training	N°	Organ-ization	Job Trainers	Duration (days)	Timings	Venue	Institute	Cost US$ Local
Environmentally friendly forest practices. Train staff and beneficiaries. Establish demonstrations	24	Project staff	MoE, MoF, GDRS	One day	Through-out yr for 7 yrs	Project area - forests	Forest Staff	Part of forest budget
Environmentally friendly rangeland practices. Train staff and beneficiaries. Establish demonstrations	24	Project staff	MoE, MoF, GDRS	One day	Through-out yr for 7 yrs	Project area – range-land	Forest and rangeland staff	Part of rangeland budget
Environmentally-friendly farming practices (rainfed). Train staff and beneficiaries. Establish demonstrations	24	Project staff	MoE, MARA, GDRS	One day	Through-out yr for 7 yrs	Project area - farms	Farm staff	Part of farm budget
Environmentally-friendly farming practices (irrigated). Train staff and beneficiaries. Establish demonstrations	24	Project staff	MoE, MARA, GDRS	One day	Through-out yr for 7 yrs	Project area - farms	Farm staff	Part of farm budget
Monitoring of equipment. Meteorological, soil and water measuring, forestry equipment etc. Train operators to record data etc. (Training of trainers).	12	Project staff	MoF, MARA, GDRS	One day	At start of each year	Project area	Ministry experts	3,000 each for 7 years, plus 1,000 for handouts. (22,000)
Special studies surveys. Train staff to undertake baseline surveys and re-surveys.	24	Project staff	MoF, MARA, GDRS	One week teaching one week in the field	1 per year for 7 years	Project area	Min. people. International Consultant yr 1, & 2.	6,000 for 7 years (42,000)
Environmental training and demonstration to schools. (try to obtain other funds for nurseries and posters etc.	All schools ?	Project staff	MoF, MARA, GDRS Min Ed.	Half day	Through-out year	Project area	Project schools	4,000 per district. (52,000)
Training in Environmental activities for beneficiaries.	Villages	Project area	MoF, MARA, GDRS	Half day	Through-out year	Project area	Project schools	4,000 per district. (52,000)
Training in survey techniques [1].	24	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	Project cost
Training in survey techniques. To recognize plant and animal species. Train beneficiaries including children to undertake species recognition	24	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	Project cost

This is required to survey local people to obtain indigenous knowledge. Some beneficiaries can be used as trainers and to locate areas of important and/or rare species.

Type of Training	N°	Organ-ization	Job Trainers	Duration (days)	Timings	Venue	Institute	Cost US$ Local
Training in biomass inventory survey work.	14	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	Project cost
Training in demand survey work survey work. Can then undertake demand surveys	24	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	Project cost
Regular maintenance training. Train staff in maintenance techniques for roads, ponds, check dams, canals, terraces, etc. In turn these staff will train beneficiaries.	24	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	Project cost
Training MoE and KKGM staff in aspects of project	8	Project staff	MoF, MARA, GDRS	One-day	2 per year for 7 years	Project area	Project offices	GEF cost
Manure management	Included in GEF project component							
Site visits for staff and beneficiaries	24 visits per year	Project staff and farmers	MoF, MARA, GDRS	One-day	24 per year for 7 years	Project area	Site visits	Project cost
Site visits outside project area for staff and beneficiaries	12 visits per year	Project staff and farmers	MoF, MARA, GDRS	One-day	12 per year for 7 years	EAWRP & other areas	Site visits	Project cost

C. **Consultant Services.** See Page 83, Main Report. (Cost US$ 240,000 to 247,000)

D. **Special Studies.** See Pages 77 to 79 Main Report. (Cost US$ 2.4 to 3.5 million).

Annex 8. Public Consultations and Disclosures on Environmental Aspects of the AWRP.

The International Consultant and the National Consultant signed contracts with the Government of Turkey on 14th June 2002. However, before the contracts were signed, both consultants attended meetings and went on field trips to the projects area. The International Consultant arrived in Turkey on 1st June and joined the 'Preparatory Mission' for Bank Staff and Consultants Therefore, this section dealing with public consultations refers to the time after the first of June 2002.

A Preparatory Mission Handbook [PMH] was prepared by the WB Mission in Turkey. This gives a detailed timetable of meetings and the itinerary for a field trip to the project area (WB Turkey June 2002). A list of meeting with Government of Turkey officials of concerned Ministries in Ankara is given in the report and their names of people attending these meetings are on record at the WB office in Turkey. Similarly, the program for the field trip is given in the PMH and the names of the micro-catchments visited, together with the meetings held with villagers, local Ministry staff and other interested parties is available at the WB office in Ankara.

The International Consultant went on the field trip from the 6th to 12th June and participated in all the meetings with the beneficiaries and government staff. Observations were made on the environmental degradation. In the area, including pollution from agro-industries. There were several site visits to witness at first hand environmental degradation and actions that had been taken in some areas to mitigate the adverse environmental effects. Several meeting were held with villagers in the proposed project areas and there views were sought on the proposed interventions. It should be stated that several meetings had previously been held with the villagers and they had been involved in drawing up action plans for their particular micro-catchments.

On returning to Ankara, the International Consultant participated in a meeting with Bank Staff, Consultants and GoT officials at the Forestry Department on Friday 14th June. A brief report was prepared by the International Consultant and this was incorporated in the World Bank Aide-Memoire. Again this report is available at the WB office in Ankara, together with the names of the people who attended the various meetings and the villages where meetings were held during the field trip.

In accordance with the TOR, the National Consultant made visited the project area between the 19th and 31st July 2002. A record of this trip together with people met and villages visited is given in Annex 6. Annex 4 gives a detailed description of the six micro-catchments visited and Section D of the main report gives a summary of the environmental concerns of these micro-catchments.

Extensive meetings were held with local officials and villagers in each of these six micro-catchments. The views of the villagers were solicited and problems were discussed with solutions agreed by all parties. A list of participants at the various meetings is as follows (Table A8).

Table A 8. Micro-catchments Visited and List of Participants in Meetings.

Province	Date	MC	Venue	Participants
Kayseri	19 July 2002	Kayseri	Kayseri AGM	Mr. Zafer Atılla; (Head of AGM, Chief Engineering Office in Kayseri). Mr. Ahmet Yenikalaycı; (Kayseri Provincial Directorate of Agriculture). *Mr. Sacit Senocak; (Kayseri Provincial Directorate of Agriculture).* Mr. Mehmet Erkantarcı; (ORKOY, in Kayseri). Mr. Mehdi Aksoy; (Kayseri Provincial Directorate of Rural Services). Mr. Levent Koçer; (Kayseri Provincial Directorate of Rural Services).
Kayseri	19 July 2002	Kabaktepe	Golcuk village	Mr. Zafer Atilla; Head of the AGM Chief Engineering Office in Kayseri. Mr. Ahmet Yenikalaycı; Kayseri Provincial Directorate of Agriculture. Mr. Mehmet Erkantarcı; ORKOY, in Kayseri. Mr. Mehdi Aksoy Kayseri Provincial Directorate of Rural Services. Muhtar of golcuk village plus a few villagers.

Province	Date	MC	Venue	Participants
Kayseri	19 July 2002	Kabaktepe	Kucuk-kabaktepe village	Mr. Zafer Atilla; Head of the AGM Chief Engineering Office in Kayseri. Mr. Ahmet Yenikalaycı; Kayseri Provincial Directorate of Agriculture. Mr. Mehmet Erkantarcı; ORKOY, in Kayseri. Mr. Mehdi Aksoy Kayseri Provincial Directorate of Rural Services Mr. Haydar Koca, vice Muhtar of Kucukkabaktepe Village. Some villagers.
Kayseri	19 July 2002	Kabaktepe	Buyuk-kabaktepe village	Mr. Zafer Atilla; Head of the AGM Chief Engineering Office in Kayseri. Mr Ahmet Yenikalaycı; Kayseri Provincial Directorate of Agriculture Mr. Mehmet Erkantarcı; ORKOY, in Kayseri. Mr. Mehdi Aksoy Kayseri Provincial Directorate of Rural Services. Mr Battal Sezer, Muhtar of Buyukkabaktepe Village.
Kahraman maras	22 July 2002	Orcan	Yesilyore town	Mr Murtaza Kallı, Mayor. Mr Ahmet Tepebasi, Head of Kayseri Division of AGM. Mr Bahattin Acar Sarı, Rep.of Provincial Directorate of Rural Services. Assistant Prof. Dr. Recep Gundogan in the Kahramanmaras Sutcu Imam University, Faculty of Agriculture. About 30 inhabitants including some officers of Municipality.
Kahraman maras	22 July 2002	Orcan	Yolderesi village	Mr Ahmet Tepebasi, Head of Kayseri Division of AGM. Mr Bahattin Acar Sari, Rep.of Provincial Directorate of Rural Services. Assistant Prof. Dr. Recep Gundogan in the Kahramanmaras Sutcu Imam University, Faculty of Agriculture. Mr Ahmet Yildiz, Muhtar.
Kahraman maras	22 July 2002	Orcan	Doluca village	Mr Ahmet Tepebasi, Head of Kayseri Division of AGM. Mr Bahattin Acar Sari, Rep. of Provincial Directorate of Rural Services. Assistant Prof. Dr. Recep Gundogan Kahramanmaras Sutcu Imam Univ Mr Ali Sari, Muhtar.
Mersin	24 July 2002	Gogden	Comelek town	Huseyin Ozbakir (Head of Mersin Division of AGM). Alparslan Tunc (Forest engineer in Mersin Division of AGM) Sedat Yildirim (Chief of the Forest Region in Mut) The Mayor of Comelek. A teacher from the Primary School. About 40 inhabitants
Samsun	29 July 2002		Samsun	Mr. Mehmet Cubukcu (Provincial Director of Environment). Mr. Yuksel Ordulu (Provincial Directorate of Environment). Mrs Zehra Sirimsi (Provincial Directorate of Agriculture) Mrs. Asuman Sezer (Provincial Directorate of Agriculture).
Samsun	29 July 2002	Ilyasli	Bafra	Mr. Dursun Hacioglu (Director) Mr. Mehmet Gures (Agriculture Engineer). Mr Mustafa Ozturk (Veterinary) Mr. Yuksel Ordulu (Provincial Directorate of Environment). Mr Sedat Yılmaz (Technician).
Samsun	29 July 2002	Ilyasli	Ilyasli village	Mr Mehmet Gures (Agriculture Engineer). Mr. Yuksel Ordulu (Provincial Directorate of Environment). Mr Sedat Yilmaz (Technician). Mr. Orhan Tarim, Muhtar of Ilyasli Village. Mr. Fatih Simsek, Muhtar of Kamberli Village.
Tokat	31 July 2002	Baglicadere	Tepez village	Mr. Mesut Tandogan (Head of Dept. Local Forestry Office). Mr. Osman Sahin (Agriculture Eng. Local Agriculture Directorate). Mrs. Senay Kandemir (Agriculture Eng. Local Agriculture Directorate). Mr. Muzaffer Idi (Agriculture Eng. Local Agriculture Directorate). The Muhtar and a few villagers.

Attendance at the meetings held in villages was variable. The local Muhtar village head) was informed about the meeting. Sometimes the Muhtar attended the meeting alone, othertimes with representatives from the village and yet other times any villager was invited. Much depended on the size of the venue and the availability of people to attend. But, even in small meetings, the Muhtar reported back to the inhabitants of the village.

While on the field trip, baseline information was collected from government offices and the villagers were questioned about environmental conditions and bio-diversity over their lifetime. Site visits were made with government and local officials. Local people were questioned on various environmental aspects and these were recorded and summarized in Annexes 2 & 5 and the main text under Baseline Information.

At the request of the World Bank, a visit was made by the National Consultant to Malatya an area in the former East Anatolia Watershed Rehabilitation Project. The National Consultant met with representatives from the AGM in October 2002. A summary of the discussion is given in Annex 5, and a list of the representatives in given in Table A 8 2 below.

Table A 8 2. Participants from the AGM at the Meeting in Malatya.

Province	Date	MC	Venue	Participants
Malatya	30 Oct. 2002	Malatya	Malatya AGM	Mr Ismail Hakki Atabay (Head of Dept. Local Forestry Office). Mr Arif Akdere (Agriculture Eng. Local Agriculture Directorate). Mr Gursel Kusek (Agriculture Eng. Prov. Directorate of Rural Affairs).

Participatory planning meeting were also held in five of the six MCs that were visited by the national consultant. No meetings took place in Samsun as it is no part of the main AWRP, but only part of the GEF component. These meeting were held to draw up plans for the specific micro catchments. A list of the participants is given in Table A 8.3 by venue.

Table A 8.3 Micro-catchment Planning: Public Participation Meetings.

Date	Province	Micro-catchment	Venue/village	Participants

The above meetings are part of an ongoing process to fully involve the people at every stage of the process.

The International Consultant (IC) returned to Turkey on the 18th August and remained until the 7th September 2002. The IC and National Consultant produced the Draft Regional Environmental Assessment. This was presented to government on the 6th September at the AGM offices in Ankara. A list of attendees at this presentation is given in Table A 8 4.

Table A 8.4. Participants at the Presentation of the Draft REA: 6 Sept 2002 AGM HQ.

Name	Affiliation	Name.	Affiliation
Mr Keith Openshaw	International Consultant	Ms Sema Alpan	National Consultant
Ms Nedret Durutan	World Bank	Mr Cuneyt Okan	World Bank
Mr Ismail Kucukkaya	AGM	Mr Mahmut Simsek	AGM
Ms Sule Ozguren	TUGEM	Mr Eyup Koksal	TUGEM
MrCelal Yenginol	GDRS Section Director	Ms Rahşan B. Oztekin	ORKOY
Mr Sedat Kadioglu	Min of Environment	Mr Doluay Kanatli	M & E Consultant

It was stated that the overall outcome of the project will be environmentally very beneficial. However, there are some environmental concerns in individual operations and these were described. In order to quantify the scale of the environmental benefits a monitoring and evaluation program was proposed. The A summary of the report was given section by section and questions were taken on each section. After some confusion concerning Annex 2, which details the environmental effect of a particular activity, the presentation was well received. The Draft REA was then presented to the AGM and the National Consultant had a meeting with the translator concerning the technical sections of the report. The National Consultant made herself available to answer questions about the report.

After a review and comments by the WB and other interested parties, the Draft Report was revised, and the revised version together with the Environmental Management Plan Matrices was presented to Government Officials on 26th December 2002. Table A 8.5 gives a list of participants.

Table A 8.5. Participants at the Presentation of the2nd Draft REA: 26th Dec. 2002 ORKOY HQ.

Name	Affiliation	Name.	Affiliation
Ms Sema Alpan	National Consultant	Mr Ismail Kucukkaya	AGM
Mr Atilla Kurmus	Gen. Dir. of Forestry	Mr Mahmut Simsek	AGM
Mr Ali Temerit	Gen. Dir. of Forestry	Ms Dilvin Senyaz	AGM
Ms Sule Ozguren	TUGEM	Ms Nuray Taneri	MoE
Mr Eyup Koksal	TUGEM	Ms Saliha Degirmenci	MoE
Mr Ali Kasaci	KKGM	Ms Rahşan B. Oztekin	ORKOY

Since the presentation in December, the REA was modified further in compliance with the comments and suggestions of the participants listed in Table A 8.5 above and World Bank Staff. Annex 7 was compiled: this gives a summary of the Environmental Management Plan in World Bank Format. Also, the section dealing with Public Consultations was revised to give details about making this report available in Turkish to the general public. The Turkish version of the REA will be discussed in detail by the relevant stakeholders from government organizations, professional bodies and about 12 NGOs at a meeting to be held in Ankara on 20th February 2003. Information about the REA will be sent to interested organizations and the document will be made available to project-affected groups and other parties.

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