D. Agriculture

CONTENTS

D.1 Profile of National Agriculture

D.1.1 Agricultural Production

Turkey is a major producer of cereals (wheat, barley), cotton, tobacco, pulses (chickpeas and lentils), dried fruit (hazelnuts, seedless rains, figs apricots), fresh fruits (apples and citrus), tomatoes and tea. The total corps planted area is estimating 26 million hectares (ha) in 2000. Cereal production occupies about 60% of Turkey's cropland.

Table D.1.1 Trend of Agricultural Planted Area by Crop Categories unit:1,000ha

	Field crops[*1)]		Vegetables	Vine	Fruit	Olive	Total
	Planted	Fallow	gardens	yards	trees area	trees area	area
1981	16,711	8,204	568	800	1,397	833	28,513
(%)	(58)	(29)	(2)	(3)	(5)	(3)	(100)
1985	17,908	6,025	662	625	1,489	821	27,530
(%)	(65)	(22)	(3)	(2)	(5)	(3)	(100)
1990	18,868	5,324	635	580	1,583	866	27,856
(%)	(68)	(19)	(2)	(2)	(6)	(3)	(100)
1991	18,776	5,203	652	586	1,560	877	27,654
(%)	(68)	(19)	(2)	(2)	(6)	(3)	(100)
1992	18,811	5,089	663	576	1,565	871	27,575
(%)	(68)	(18)	(2)	(2)	(6)	(3)	(100)
1993	18,940	4,887	654	567	1,615	872	27,535
(%)	(69)	(18)	(2)	(2)	(6)	(3)	(100)
1994	18,641	5,255	709	567	1,618	881	27,671
(%)	(69)	(18)	(3)	(2)	(6)	(3)	(100)
1995	18,464	5,124	785	565	1,340	556	26,834
(%)	(69)	(19)	(3)	(2)	(5)	(2)	(100)
1996	18,635	5,094	785	560	1,344	568	26,986
(%)	(69)	(19)	(3)	(2)	(5)	(2)	(100)
1997	18,605	4,917	775	545	1,364	658	26,864
(%)	(69)	(18)	(3)	(2)	(5)	(2)	(100)
1998	18,751	4,905	783	541	1,389	600	26,969
(%)	(70)	(18)	(3)	(2)	(5)	(2)	(100)
1999	18,450	5,039	790	535	1,393	595	26,802
(%)	(69)	(19)	(3)	(2)	(5)	(2)	(100)
2000	18,207	4,826	793	535	1,418	600	26,379
(%)	(69)	(18)	(3)	(2)	(5)	(2)	(100)

Source: Prepared based on the "The Summary of Agricultural Statistics, 1981,1982,1983,194,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997, 1998,1999,2000,2001, State Institute of Statistics Prime Ministry of Turkey (SIS)"

Note: [*1)] Field crops area mainly occupied by cereals such as wheat, barley and maize.

With a wheat production 21million tons, barley production 8 million tons, maize production 2.3 million tons in 2000, Turkey is one of the world's biggest wheat and barley producers. Besides cotton, sugar beat and tobacco is another important industrial crops, the production of these crops are 2 million ton, 17 million tons and 243 thousands tons respectively. In 2000, average yield of wheat in Turkey was 2.2 tons/ha, one–third of that in advanced countries (world average 2.6 ton/ha). Other cereal's yield is low as well as wheat. This indicates the potential and need for technology transfer and productivity improvement.

Table D.1.2 Trend of Planted Area, Yield and Production by Major Cereals

Year	Planted Area (1,000ha)				Yield (ton/ha)				Production (1,000ton)			
	Wheat	**Barley**	**Maize**	Rice	**Wheat**	**Barley**	**Maize**	Rice	**Wheat**	**Barley**	**Maize**	Rice
1981	9,250	2,965	580	73	1.8	2.0	2.1	2.7	13,000	5,900	1,240	198
1985	9,350	3,350	567	62	1.8	2.0	3.4	2.6	17,000	6,500	1,900	162
1990	9,450	3,350	515	53	2.1	2.0	4.1	2.6	20,000	7,300	2,100	138
1991	9,630	3,450	518	40	2.1	2.3	4.2	3.0	20,400	7,800	2,180	120
1992	9,600	3,440	525	43	2.0	2.0	4.2	3.0	19,300	6,900	2,225	129
1993	9,800	3,485	550	45	2.1	2.2	4.5	3.1	21,000	7,500	2,500	135
1994	9,800	3,500	485	40	1.8	2.0	3.8	3.0	17,500	7,000	1,850	120
1995	9,400	3,525	515	50	1.9	2.1	3.7	3.0	18,000	7,500	1,900	150
1996	9,350	3,650	550	55	2.0	2.2	3.6	3.1	18,500	8,000	2,000	168
1997	9,340	3,700	545	55	2.0	2.2	3.8	3.0	18,650	8,200	2,080	165
1998	9,400	3,750	550	60	2.2	2.4	4.2	3.2	21,000	9,000	2,300	189
1999	9,380	3,650	518	65	1.9	2.1	4.4	3.1	18,000	7,700	2,297	204
2000	9,400	3,629	555	58	2.2	2.2	4.1	3.6	21,000	8,000	2,300	210

Source: Prepared based on the "The Summary of Agricultural Statistics, 1981,1982,1983,194,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997,1998,1999,2000,2001, State Institute of Statistics Prime Ministry of Turkey (SIS)"

Table D.1.3 Trend of Planted Area, Yield and Production by Pulses

Year	Sown Area (1,000ha)				Yield (ton/ha)				Production (1,000ton)			
	Dry beans	**Cow vetches**	**Chic pears**	Lentil (red)	**Dry beans**	**Cow vetch**	**Chic pears**	Lentil (red)	**Dry beans**	**Cow vetch**	**Chic pears**	Lentil (red)
1981	105	122	200	-	1.5	0.8	1.2	-	160	100	235	-
1985	150	212	399	-	1.1	0.7	1.0	-	170	169	400	-
1990	171	259	890	276	1.2	0.7	1.0	0.8	210	175	860	630
1991	178	257	878	253	1.2	0.6	1.0	0.8	214	172	855	440
1992	168	260	856	230	1.2	0.7	0.9	0.7	200	165	770	430
1993	162	270	820	199	1.2	0.6	0.9	0.8	200	185	740	570
1994	163	265	760	165	1.1	0.6	0.9	0.6	180	165	650	510
1995	170	270	745	165	1.3	0.6	1.0	0.9	225	160	730	515
1996	172	260	780	145	1.3	0.7	1.0	0.9	230	160	732	520
1997	175	252	721	130	1.3	0.6	1.0	0.8	235	165	720	410
1998	172	235	665	108	1.4	0.6	0.9	0.9	236	140	625	440
1999	174	233	625	97	1.4	0.6	0.9	0.8	237	130	560	300
2000	176	225	636	82	1.3	0.6	0.9	0.9	230	134	548	280

Source: Prepared based on the "The Summary of Agricultural Statistics, 1981,1982,1983,194,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997,1998,1999,2000,2001, State Institute of Statistics Prime Ministry of Turkey (SIS)"

Table D.1.4 Trend of Planted Area, Yield and Production of Major Industrial Crops and Fodder Crops

Year	Sown Area (1,000ha)			Yield (ton/ha)			Production (1,000ton)		
	Sugar beets	Sunflower	Alfalfa	Sugar beets	Sunflower	Alfalfa	Sugar beets	Sunflower	Alfalfa
1981	360	500	143	30.1	1.1	-	11,165	575	1,622
1985	322	643	169	30.4	1.2	-	9,830	800	2,104
1990	380	716	197	36.8	1.2	-	13,985	860	1,848
1991	401	567	172	38.5	1.4	-	15,474	800	1,675
1992	400	613	195	37.7	1.6	-	15,126	950	1,658
1993	423	597	206	36.9	1.4	-	15,620	815	1,581
1994	412	586	194	31.4	1.3	-	12,944	740	1,570
1995	312	585	214	35.7	1.5	-	11,170	900	1,803
1996	422	575	229	34.4	1.4	-	14,543	780	1,935
1997	472	560	217	38.9	1.6	-	18,400	900	1,905
1998	504	586	230	44.5	1.5	-	22,282	860	1,750
1999	423	595	245	40.4	1.6	-	17,102	950	1,594
2000	410	542	250	39.1	1.5	-	18,821	800	1,807

Source: Prepared based on the "The Summary of Agricultural Statistics, 1981,1982,1983,194,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997,1998,1999,2000,2001, State Institute of Statistics Prime Ministry of Turkey (SIS)"

Table D.1.5 Production Trend of Selected Vegetables

Year	Production (1,000ton)						
	Cabbages	Black cabbages	Spinach	Cucumber	Tomatoes	Eggplants	Potatoes
1981	435	130	130	510	3,600	700	180
1985	550	171	136	780	4,900	680	207
1990	575	124	160	1,000	6,000	735	192
1991	560	124	160	1,010	6,200	750	200
1992	585	117	153	1,050	6,450	750	195
1993	580	117	157	1,050	6,150	750	192
1994	595	104	170	1,140	6,350	810	190
1995	573	102	180	1,250	7,250	750	200
1996	575	103	180	1,300	7,800	850	210
1997	577	102	181	1,400	6,600	847	211
1998	612	100	191	1,475	8,290	915	203
1999	621	96	200	1,650	8,956	976	220
2000	622	103	205	1,825	8,890	924	205

Source: Prepared based on the "The Summary of Agricultural Statistics, 1981,1982,1983,194,1985,1986,1987,1988,1989,1990,1991,1992,1993,1994,1995,1996,1997, 1998,1999,2000,2001, State Institute of Statistics Prime Ministry of Turkey (SIS)"

D.1.2 Farm Size

Another characteristic of Turkish agriculture is the small farm size. There are just over 4 million farm households in Turkey. 67% of these farms each owns between 0.1-5 hectares (ha) of land, (22% of total agricultural land), while only 33% of households own more than 5

ha – comprising 78% of available agricultural land. Farm out put therefore remains low in comparison to the country's enormous potential and farmers' average income is also low. Small farm size and lack of economies scale, coupled with increases in input prices, dependency or rainfed agriculture, and lack of efficient market mechanisms are leading to a rapid rural exodus.

Turkish agriculture, especially cereal production, is heavily dependent on seasonal rainfall. While there are about 8.5 million hectares (ha) of land under potential perennial irrigation, only about half of this area, 4.5 million ha. Has been equipped with requisite irrigation infrastructure. It is known that the expansion of irrigated lands helps to improve production, create rural employment and alleviate migration from rural to urban area. Towards this end, it is envisaged to irrigate an additional 1.7 million ha in the Southeastern Anatolia Project area by 2015.

D.1.3 Agricultural Polices

Inflation and the high interest rates have been a major constraint in the development of agricultural sector. The unstable exchange rate increase the degree of price uncertainly faced by farmers, both in the export and domestic markets. Reassuringly, the Government has embarked upon a deep and wide-ranging reform process, which will include and benefit the agriculture sector on a priority basis.

The Government has had a wide range of programmes aimed at supporting agriculture production through the establishment of large-scale irrigation schemes, the provision of cheep credit, the subsidization of inputs, the provision of extension services and the financing of research. The Turkish Government has traditionally intervened in the agriculture sector in order to support producer prices, to subsidize inputs and credit and to reduce the consumer process of staple food. Although producer price support has been very costly to the government, it has failed to stabilized farm incomes. As a result, procurement support has been substantially reduced in recent years, while the production, importation and marketing of fertilizer, agricultural chemicals and farm machinery, expect seed supplies, have all been fully privatized.

Turkey jointed the Customs Union with the EU in January 1996. However, agricultural commodities were exempt from this Union, while processed products were included. Ultimately, unrestricted trade in primary agricultural commodities is a possibility, but this would require considerable adjustment of Turkish agricultural policies. Turkey's agriculture will face severe problems and difficulties, unless radical reform are made to improve productivity and quality, to bring about overall stability, to ensure that prices are internationally competitive. The Turkish Government signed a stand-by Agreement with IMF in December 1999 committing itself to gradually phase out existing agricultural support and credit subsidy to farmers and replace them with a direct income support system targeted at

poor farmers and to meanwhile rationalize the agricultural policies commensurably.

Other important agricultural policy reform include the establishment of agricultural producers' union, adoption of agricultural insurance system, privatization of State Economy Enterprises, development of agricultural commodity exchanges and to strengthen research and development activities. In the long run, the goal is to face the inevitable reduction of a rural population dependant, mainly on farming, from the present 40% to 10% and to promote agro-industry, as well as the adoption of international standards for agricultural commodities in the process of integration with EU in the near and medium term.

D.2 Agricultural Production Trend by Province

D.2.1 Number of Agricultural Holdings by Farm Size

Three provinces, Artvin, Erzurum and Bayburt, compose the Study Area. The total number of farm households of the three provinces, is 106,000. For Bayburt and Erzurum, which are provinces located in the upper catchments, farm households with 2.9 to 4.9 ha of farmland counts up to nearly 30% of the total. On the other hand, in Artvin Province, located in the lower catchments, 35% of the farm households have only 1.0 to 1.9 ha of farmland. The ratio of farmers with small landholdings tends to increase in the lower catchments.

Table D.2.1 Number of Agricultural Holdings by Size

Size of land	Artvin		Erzurum		Bayburt		Total		Turkey	
(ha)	Number	%	Number	%	Number	%	Number	%	Number	%
< 0.5	3,142	9.8	2,445	3.8	127	1.4	5,714	5.4	251,686	6.2
0.5 - 0.9	8,112	25.3	5,839	8.9	537	5.8	14,488	13.7	381,287	9.4
1.0 - 1.9	11,293	35.0	11,966	18.3	1,645	17.7	24,904	23.4	752,156	19.5
2.0 - 4.9	8,174	25.2	18,907	29.0	2,416	25.9	29,497	27.7	1,274,609	32.5
5.0 - 9.9	1,334	4.1	13,419	21.0	2,161	23.2	16,914	15.7	713,149	17.5
10.0 - 19.9	120	0.4	8,098	12.3	1,341	14.4	9,559	8.8	383,323	9.5
20.0 - 49.9	61	0.2	3,996	6.0	1,063	11.4	5,120	4.8	173,774	4.4
50.0 - 99.9	-	-	515	0.7	24	0.2	539	0.5	24,201	0.7
> 100.0	-	-	-	-	-	-	-	-	12,637	0.3
Total	32,236	100.0	65,185	100.0	9,314	100.0	106,735	100.0	4,068,432	100.0

Source: Prepared based on the EKONOMIK VE SOCIAL GOSTERGELER, SIS, 1998

D.2.2 Planted Area

The total planted area for the three provinces is 308,798ha (2000), 62% of which or 193,000 ha are under cereals such as wheat and barley, followed by fodder crop (18 % of the total). The majority of these crops are cultivated in the Provinces of Bayburt and Erzurum, which are located in the middle and upper catchment of the Coruh river. In Artvin, which is located in the lower catchment, fruits centering on hazelnut, and tea occupy 42% of the total, followed by cereals (31%) and fodder crops (17%). Artvin also has the largest share of the

planted area for vegetables among the three Provinces.

Table D.2.2 Planted Area by Crop Categories as of 2000

Province	Artvin		Erzurum		Bayburt		Total	
Category	Area	%	Area	%	Area	%	Area	%
Cereals	11,309	31.0	150,810	69.8	30,882	55.3	193,001	62.4
Pulses	917	2.5	11,299	5.2	3,596	6.5	15,812	5.2
Industrial & oil crops	25	0.1	9,658	4.5	1,470	2.7	11,153	3.6
Tuber crops	1,366	3.7	6,935	3.2	1,399	2.4	9,700	3.1
Fodder	6,071	16.6	34,819	16.0	17,289	30.8	58,179	18.9
Vegetables	1,633	4.6	1,630	0.8	1,261	2.2	4,524	1.5
Fruits, olives, tea, etc.	15,179	41.5	1,183	0.5	67	0.1	16,429	5.3
Total	36,500	100.0	216,334	100.0	55,964	100.0	308,798	100.0

Source: Prepared based on the Agricultural Structure, 2000, SIS

D.2.3 Production Trend and Yield

During the past decade (1991-2000), the total planted area and production of cereal in the three provinces has decreased while significant increase was seen for vegetables. The production of cereals, which constitutes the largest proportion of crop production, was 206,000 tons in 2000, after the gradual decrease from 292,000 tons in 1991.

The production of fodder crops also decreased from 652,000 tons in 1991, to 575,000 tons in 2000. However, the production of vegetables tended to increase along with its increase in planted area. Not being recorded in the statistics, other minor agricultural products, such as mushrooms and herbs are also produced in the three Provinces. However, production of these products largely fluctuates due to their dependency on natural conditions.

Table D.2.3 Trend of Planted Area and Production of Crop Categories by Provinces

Crops／Province		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1.Cereals	ha	236,893	236,329	232,663	207,820	206,254	208,794	204,274	202,161	214,448	193,001
	ton	292,718	294,967	275,931	237,251	251,232	252,777	251,953	281,451	289,951	206,259
Artvin	ha	19,677	18,607	16,082	15,734	16,327	18,481	14,466	13,216	12,727	11,309
	ton	34,399	36,057	27,591	28,131	25,842	24,797	23,690	22,120	16,197	19,976
Erzurum	ha	184,657	182,955	175,009	163,353	161,933	162,364	161,560	157,754	170,847	150,810
	ton	210,349	208,501	191,713	167,617	186,242	189,159	187,720	213,114	227,136	159,565
Bayburt	ha	32,559	34,767	41,572	28,733	27,994	27,949	28,248	31,191	30,874	30,882
	ton	47,970	50,409	56,627	41,503	39,148	38,821	40,543	46,217	46,618	26,718
2.Pulses	ha	11,974	18,146	18,123	12,650	11,059	12,574	13,971	15,314	15,195	15,812
	ton	5,618	8,693	7,814	7,152	5,022	5,366	5,356	5,873	5,929	4,998
Artvin	ha	992	1,082	1,054	1,094	801	886	978	971	953	917
	ton	1,203	1,253	1,219	1,066	811	854	1,102	1,121	1,100	931
Erzurum	ha	9,078	7,663	9,250	9,597	8,548	9,761	11,063	10,795	10,744	11,299
	ton	3,694	4,101	3,876	5,727	3,833	4,131	3,879	4,357	4,521	3,920
Bayburt	ha	1,904	9,401	7,819	1,959	1,710	1,927	1,930	3,548	3,498	3,596
	ton	721	3,339	2,746	359	378	381	375	395	308	147
3.Industrial & Oil	ha	9,282	9,737	9,473	8,589	9,098	12,039	12,458	12,248	10,592	11,153
	ton	165,763	184,307	130,524	120,696	130,868	201,604	222,349	261,938	215,106	237,250
Artvin	ha	99	92	73	34	187	205	48	37	34	25
	ton	72	91	71	26	325	324	58	47	43	25
Erzurum	ha	8,088	8,518	8,462	7,934	8,289	10,900	11,245	10,880	9,177	9,658
	ton	131,179	154,843	105,330	103,263	112,812	169,599	187,968	213,238	169,220	195,867
Bayburt	ha	1,095	1,127	938	621	622	934	1,165	1,331	1,381	1,470
	ton	34,512	29,373	25,123	17,407	17,731	31,681	34,323	48,653	45,843	41,358
4.Tubercrops	ha	13,955	12,852	13,210	12,646	13,365	13,146	13,239	11,758	11,007	9,700
	ton	228,405	215,108	217,179	205,945	203,895	188,380	175,794	172,804	208,884	141,861
Artvin	ha	2,431	2,414	2,122	2,060	2,076	2,089	2,108	1,881	1,535	1,366
	ton	31,379	34,162	30,191	29,968	23,108	21,328	23,324	15,135	21,374	19,543
Erzurum	ha	9,395	9,208	9,713	9,696	10,421	10,182	10,254	8,515	8,112	6,935
	ton	160,589	160,036	163,208	167,205	173,051	159,157	143,729	144,602	174,481	114,631
Bayburt	ha	2,129	1,230	1,375	890	868	875	877	1,362	1,360	1,399
	ton	36,437	20,910	23,780	8,772	7,736	7,895	8,741	13,067	13,029	7,687
5.Fodder	ha	61,565	62,945	65,322	45,914	46,530	49,025	48,880	54,757	56,020	58,179
	ton	652,638	763,569	647,591	579,576	622,146	598,431	507,386	569,323	589,920	575,659
Artvin	ha	6,052	6,256	5,800	6,518	7,192	6,873	6,461	5,080	5,857	6,071
	ton	21,620	22,454	20,035	17,317	20,184	21,476	19,883	14,676	12,933	15,661
Erzurum	ha	32,951	30,099	30,815	31,719	31,923	34,203	34,685	33,051	33,142	34,819
	ton	611,595	666,340	545,230	520,144	559,847	535,439	446,203	458,327	481,625	498,243
Bayburt	ha	22,562	26,590	28,707	7,677	7,415	7,949	7,734	16,626	17,021	17,289
	ton	19,423	74,775	82,326	42,115	42,115	41,516	41,300	96,320	95,362	61,755
6.Vegetables	ha	1,490	1,571	1,427	1,495	3,968	3,399	4,366	4,063	3,335	3,369
	ton	20,466	21,156	21,587	21,393	26,206	25,086	34,225	42,198	31,312	32,314
Arvin	ha	492	534	534	585	2,448	2,406	1,695	1,656	1,572	1,633
	ton	6,713	7,533	7,833	8,594	12,727	11,344	13,997	10,477	10,620	11,590
Erzurum	ha	697	773	766	663	696	738	1,847	2,308	1,660	1,630
	ton	6,412	7,207	6,793	6,561	7,241	7,537	14,023	30,522	19,465	19,463
Bayburt	ha	301	264	127	247	824	255	824	99	103	106
	ton	7,341	6,416	6,961	6,238	6,238	6,205	6,205	1,199	1,227	1,261
7.Fruits	trees	4,756	4,742	4841	4,864	5,022	4,866	4,768	4,421	4,228	4,283
(1,000trees)	ton	53,482	54,093	50,755	13,3472	117,712	119,028	124,314	132,752	140,112	106,201
Artvin	trees	3,878	3,791	3,889	3,890	4,038	3,910	3,817	3,819	3,620	3,659
	ton	36,486	37,806	35,938	105,749	90,621	92,145	99,092	115,564	126,293	91,753
Erzurum	trees	852	923	924	939	948	920	915	569	576	580
	ton	16,779	16,027	14,534	26,629	26,008	25,801	24,140	16,546	13,215	14,082
Bayburt	trees	26	28	28	35	36	36	36	33	32	44
	ton	217	260	283	1,094	1,083	1,082	1,082	642	604	366

Source: Prepared based on Agricultural Products and Structure, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, SIS

The yields of major crops are generally lower than the national average. The yield of wheat, which is the main product of the area, is 1.1 tons/ha, which presents only 48% of the national average. While the decrease of production of major crops during the past decade has occurred due to decrease of planted area, there has been very little improvement of yield per hectare during this period.

Table D.2.4 Production and Yield by Crops as of 2000

Province	Artvin			Erzurum			Bayburt			Total		
Crops	Area ha	Prod. ton	Yield ton/ha	Area ha	Prod. ton	Yield ton/ha	Area ha	Prod. ton	Yield ton/ha	Area ha	Prod. ton	Yield ton/ha
1.Cereals												
Wheat	5,972	8,188	1.4	97,373	88,663	1.0	18,015	14,636	0.8	121,360	111,487	1.1
% of Turkey	0.1	0.1	60	1.0	0.4	43	0.2	0.1	35	1.3	0.5	48
Barley	1,784	3,380	1.9	49,080	64,883	1.4	10,050	9,462	0.9	60,914	77,725	1.4
% of Turkey	0.1	0.1	83	1.4	0.8	61	0.3	0.1	39	1.7	1.0	61
Rye	15	20	1.3	3,793	4,959	1.3	2,750	2,579	0.9	6,558	7,558	1.2
% of Turkey	0	0	72	2.6	1.9	76	1.9	1.0	50	4.5	2.9	67
Maize	3,398	8,098	2.4	538	1,030	1.9	44	32	0.7	3,980	9,160	1.5
% of Turkey	0.6	0.4	57	0.1	0.1	45	0	0	2	0.7	0.4	36
2.Pulses												
Dry beans	617	931	1.5	1,392	1,619	1.2	52	31	0.6	2,061	2,581	1.1
% of Turkey	0.3	0.4	98	0.8	0.7	92	0.1	0.1	46	1.2	1.1	85
Cow vetches	300	-	-	8,587	1,163	0.1	3,365	-	-	12,252	1,163	0.1
% of Turkey	0.1	-	-	3.8	0.9	17	1.5	-	-	5.4	0.9	17
3.Industrial & Oil												
Sugar beets	-	-	-	6,673	191,720	28.8	1,470	41,358	28.3	8,143	233,078	28.5
% of Turkey	-	-	-	1.6	1.0	62	0.4	0.2	61	1.9	1.2	62
4.Potatoes	1,292	19,096	14.8	6,849	114,218	16.7	1,399	7,687	5.5	9,540	141,001	12.3
% of Turkey	0.6	0.4	57	3.3	2.1	64	0.7	0.1	21	4.7	2.6	47
5.Fodder (Alfalfa)	1,618	10,012	-	17,851	84,360	-	9,935	44,708	-	29,404	139,080	-
%of Turkey	0.6	0.7	-	7.1	5.5	-	4.0	3.0	-	11.7	9.0	-

Source: Prepared based on the Agricultural Structure, 2000, SIS

D.2.4 Production Value

The total production value of the major crops for the three provinces is TL. 93,176,617 million for the year 2000, 55% of which are produced in Erzurum, followed by Artvin with 40%. On the other hand, the production of Bayburt amounts to only 5% of the total.

As for the breakdown of production value by crops, fruits hold 35%, followed by tuber crops with 22% and cereals with 22%. For fruits alone, 34% of the production comes from tea, and 20% from nuts, both of which are produced in Artvin, especially in the Black Sea area. The Government in terms of buying price and credits heavily subsidizes tea and hazelnuts producers.

Table D.2.5 Production Value of Major Crop Categories as of 2000

Province	Artvin		Erzurum		Bayburt		Total	
Crops	Million TL	%	Million TL	%	Million TL	%	Million TL	%
Cereals	2,896,535	7.8	15,156,611	29.8	2,429,503	44.4	20,482,649	22.0
Pulses	631,962	1.8	1,751,085	3.4	81,936	1.5	2,464,983	2.6
Industrial	43,351	0.1	7,019,253	13.8	1,514,199	27.7	8,576,803	9.2
Oil crops	-	-	1,499,833	3.1	-	-	1,499,833	1.6
Tuber crops	2,828,288	7.6	16,269,071	32.1	1,109,811	20.3	20,207,170	21.7
Vegetable	3,002,971	8.1	4,358,705	8.5	243,993	4.5	7,605,669	8.2
Fruits	27,546,107	74.6	4,705,157	9.3	88,246	1.6	32,339,504	34.7
Total	36,949,214	100.0	50,759,715	100.0	5,467,688	100.0	93,176,617	100.0

Note: values are presented at 2000 current prices
Source: Prepared based on the Agricultural Structure, 2000; SIS

Average unit prices of the products for 2000 range as: TL.102,727 – 174,792/kg for wheat, barley and maize; TL.897,361/kg for hazelnuts, TL.213,854/kg for apples, TL.230,733/kg for tomatoes, and TL.406,067/kg for beans. Unit price of fruits tends to be the highest, while that of cereals is generally low. Vegetables also show a high unit price.

D.3. Features of Agriculture in the Study Area

D.3.1 Agriculture Type

Six (6) Sub-Catchments, Upper Coruh (UC), Middle Coruh (MC) Tortum (TR), Oltu (OL), Berta (BT) and Lower Coruh (LC), compose the Coruh river basin（Study area）. Each of the Sub-Catchments in the Study area may be characterized in terms of type of agriculture as follows.

Upper Coruh (UC) Sub-Catchment： Cereals + fodder crops

The UC Sub-Catchment is dominated by relatively large-scale agriculture. The main crops cultivated include wheat, barley and fodder crops. The wheat production comprises 43% of the total of the Coruh river catchment and 13% of the total of the three provinces. Fodder crop production accounts for 70% of the Coruh river catchment and 28% of the three provinces total. Recently, strawberry cultivation with mulching and irrigation has been introduced through a project implemented by TEMA under the financial cooperation of GTZ.

Middle Coruh (MC) Sub-Catchment： Cereals + fruits + tuber crops + pulses + vegetables + fodder crops

Crops are more diversified in the MC Sub-Catchment. The important crops are cereals followed by fruits, vegetable, tuber crops and fodder crops. Yusufeli district has the largest agricultural area in Artvin province, accounting for 50% of the planted area of wheat and

barley, and 30% each of tuber crops, dry beans, vegetables and fodder crops, respectively. Also this district is a main producing area of rice. However, about 40% of the total agricultural land area will be under water by the influence of the dam construction in Yusufeli district.

Tortum (TR)： Cereals + tuber crops + vegetables + fodder crops

The TR Sub-Catchment also produces various kinds of crops. Cereals are the most important crops, followed by tuber crops, fodder crops, and vegetables. The planted area of maize shares 50% of the Erzurum Province total.

Oltu (OL)： Cereals + fodder crops production area

The OL Sub-Catchment mainly produces cereal crops such as wheat and barley, and fodder crops. The production of tuber crops is also large, having 32% of that in the whole catchment.

Berta (BT)： Fruits + vegetables + tuber crops

A wide range of crops including fruits, vegetables and tuber crops are produced by small-scale farmers in the BT Sub-Catchment. 50% of the total planted areas in Artvin Province are in Ardanuc District.

Lower Coruh (LC): Fruits + vegetables + pulses

The LC Sub-Catchment produces various crops such as fruits, vegetables, tuber crops and dry beans. The planted area of fruits including tea and hazelnut accounts for 23% of the whole catchment. Furthermore, the planted area of maize shares 70% of the total planted area of maize in the catchment.

Table D.3.1 Planted Area of Major Crops by District and Sub-Catchments unit: ha

Province District	Sub-Catchments	Cereals			Potato	Dry Beans	Vegetables	Alfalfa	Fruits
		Wheat	Barley	Maize					
Artvin									
Merkez	LC, BT	41	16	253	58	140	325	38	425
Ardanuc	BT	545	255	118	141	139	300	36	410
Borcka	LC	108	-	1,611	74	205	423	117	3,284
Murgu	LC	10	-	147	66	62	42	24	261
Savsat	BT	64	50	116	183	24	15	43	65
Yusufeli	MC	440	350	171	389	208	552	341	895
Coruh river watershed		1,208	671	2,416	911	778	1,657	599	5,340
% of Provincial Total		100.0	100.0	79.8	75.0	99.4	90.0	77.1	45.8
Other Districts		0	0	611	303	4	185	177	6,309
Provincial Total		1,208	671	3,027	1,214	782	1,842	776	11,649
Erzurum									
Ispir	UC, MC	1,070	663	21	248	72	334	670	147
Narman	OL	3,383	1,334	31	194	59	46	217	35
Oltu	OL	3,044	1,600	79	274	18	119	296	251
Olur	OL	892	442	10	80	24	37	75	255
Pazaryolu	UC	818	428	10	16	-	90	149	56
Senkaya	OL	4,210	2,262	5	431	26	287	60	126
Tortum	TR	1,074	743	217	638	256	727	450	530
Uzunrere	TR	159	84	36	69	24	199	56	331
Coruh river watershed		14,650	7,556	409	1,950	479	1,839	1,973	1,731
% of Provincial Total		17.8	20.4	95.5	29.2	44.1	85.1	14.3	99.9
Other Districts		67,316	29,429	19	4,719	600	323	11,806	2
Provincial Total		81,966	36,985	428	6,669	1,079	2,162	13,779	1,733
Bayburt									
Merkez	UC	8,061	4,185	-	74	-	324	3,923	35
Aydintepe	UC	702	306	-	96	7	-	422	-
Demirouzu	UC	3,072	2,473	-	3	-	1	1,431	2
Provincial Total		11,835	6,658	-	173	7	325	5,776	37
Total Coruh river watershed		27,693	14,885	2,825	3,034	1,264	3,821	8,348	7,108
% of Provincial Total		29.1	34.3	81.7	37.6	67.6	88.3	41.0	53.0
Provincial Total		95,009	43,314	3,455	8,056	1,868	4,329	20,331	13,419

Source: Prepared based on Village Inventory, Artvin, Erzurum, Bayburt, 1997, SIS

D.3.2 Cropping Season

Wheat, which is one of the major crops in the Study area, is grown both in the summer-cropping season (planting: May-Jun., harvest: Sep.-Oct.) and in the autumn/winter-cropping season (planting: Nov.-Dec, harvest: May). As vegetables are easily damaged by frost in general, open culture is limited to the summer cropping season. As it frosts from October to May, facilities such as greenhouses are indispensable to prolong growing period of summer vegetables such as cucumber, tomatoes, green pepper, etc, in early spring and late autumn. Furthermore, though summer is the suitable season for cultivating most crops, rainfall is scarce. Thus for stable production, watering is indispensable.

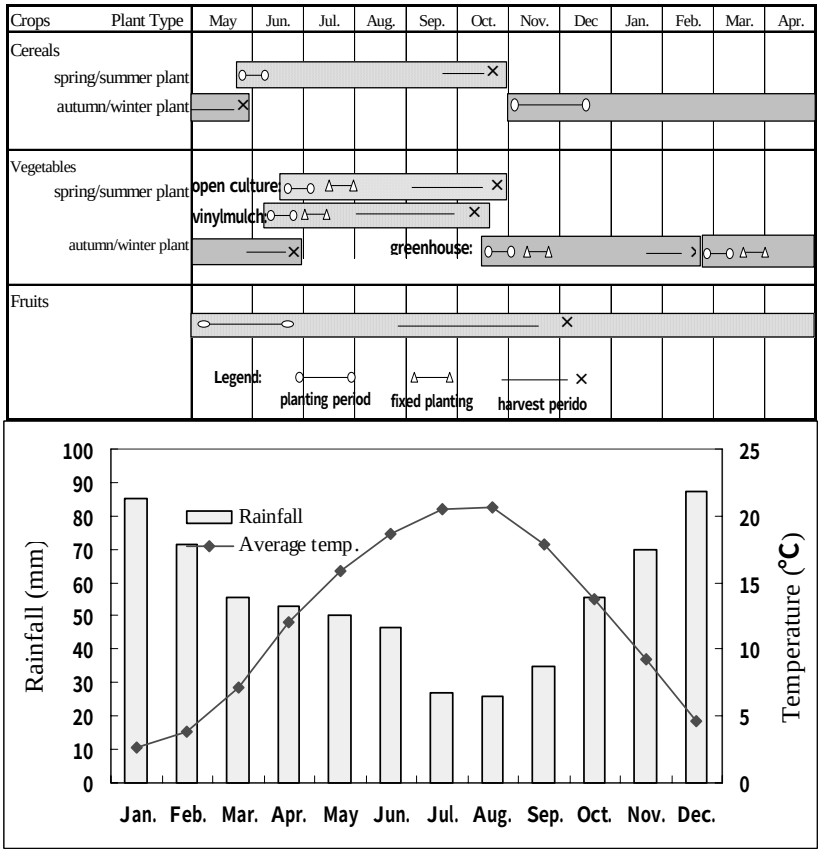


Fig. D.3.1 General Cropping Season in the Study Area

D.3.3 Agricultural Inputs

D.3.3.1 Fertilizer use

The usage of chemical fertilizers as of 2000 is 31.9 kg/ha in Artvin Province, followed by 19.7 kg/ha for Erzurum and 13.7 kg/ha for Bayburt. These usages are all below the national average. The small amount of fertilizer application, coupled with infertile soils may be one of the reasons for lower yield of major crops.

But in the Catchment, organic fertilizers such as manure made from animal dung are commonly used. The increase in the usage of chemical fertilizer in the past 5 years is also low, with the exception of Artvin Province. The usage of chemical fertilizers in Artvin has increased by nearly fivefold. Chemical fertilizers were turned on for the cultivation of tea.

Table D.3.1 Amount of Fertilizer Applied by Element

	Artvin	Erzurum	Bayburt	Turkey
21% Nitrogen (ton)	7,906	32,906	6,959	6,563,279
Applied per ha (kg)	24.0	12.0	7.3	25.0
16-18% Phosphorus (ton)	1,589	20,571	6,084	3,697,359
Applied per ha (kg)	4.8	7.5	6.4	14.0
48-52% Potassium (ton)	996	712	74	164,190
Applied per ha (kg)	3.0	0.3	0.1	0.6
Total Chemical fertilizer (ton)	10,491	54,189	13,117	10,424,828
Total applied per ha (kg)	31.9	19.7	13.7	39.5

Note: Applied per ha is calculated by total agricultural land/amount of fertilizer in each province.
Source: Prepared based on the EKONOMIK VE SOSYAL GOSTERGELER, 2000; SIS

D.3.3.2 Tractor use

There are approximately 3,000 tractors in the Study area, of which more than 50% are tractors exceeding 50HP. Only 10% of the total are in Artvin Province, located in the LC Sub-Catchment, due to the small landholding size of the farms and the steep topography. In Erzurum and Bayburt, located in the UC Sub-Catchment, where flatlands develop, the agricultural machines has been diffused widely, each having 44% of the total agricultural machines in the Study area.

Table D.3.2 Number of Tractor by District

	2 wheel (Hp)		4 Wheel (HP)					Total No. of Tractor
	1-5	>6	1-10	11-24	25-34	35-50	>50	
Artvin								
Merkez	1	-	10	-	2	-	10	23
Ardanuc	3	-	3	7	11	38	68	130
Borcka	6	4	6	-	-	1	5	22
Murgu	-	-	-	-	-	5	2	7
Savsat	-	-	-	1	2	15	111	129
Yusufeli	1	-	6	2	-	5	-	14
Coruh Basin	11	4	25	10	15	64	196	325
Other Districts	-	-	1	-	-	-	-	1
Total	11	4	26	10	15	64	196	326
Erzurum								
Ispir	-	-	2	-	6	33	52	93
Narman	-	-	9	-	-	43	213	265
Oltu	1	-	-	-	-	28	215	244
Olur	1	1	1	-	1	8	79	91
Pazaryolu	-	-	26	2	31	31	8	98
Senkaya	-	-	-	-	1	18	488	507
Tortum	2	3	6	1	-	14	38	64
Uzunrere	1	-	1	2	2	4	7	17
Coruh Basin	5	4	45	5	41	179	1,100	1,379
Other Districts	20	7	143	142	206	1,312	2,806	4,636
Total	25	11	188	147	247	1,491	3,906	6,015
Bayburt								
Merkez	1	6	72	97	65	462	299	1,002
Aydintepe	-	2	25	9	12	16	60	124
Demirouzu	-	-	42	-	-	140	67	249
Total	1	8	139	106	77	618	426	1,375
Coruh basin total	17	16	209	121	133	861	1,722	3,079
Province total	37	23	353	263	339	2,173	4,528	7,716

Source: Prepared based on Village inventory, Artvin, Erzurum, Bayburt, 1997, SIS

D.3.3.3 Greenhouse

The greenhouses in the Study area have been developed mainly for vegetable production. The scale of the greenhouses averages some 318 m^2, and tends to be larger as it approaches the lower catchments. The districts where greenhouses are well developed correspond to the areas having irrigation facilities. Many of the established greenhouses depend on ORKOY credit.

Combined credits for both the development of small-scale irrigation facilities and the construction of greenhouses are common. Credits can be made for greenhouses between 250$m^2$and 500m^2 in size. Recently, demands by the farmers of the forest villages for combined credits to construct 500m^2 greenhouses and small-scale irrigation facilities have increased.

Table D.3.3 Greenhouse Condition by Districts

Province／ District	No. of Village	No. of Greenhouse Households	Total Greenhouse Size (m^2)	Average Greenhouse Size (m^2)
Artvin				
Merkez	36	7	2,204	315
Ardanuc	49	8	3,000	375
Borcka	36	-	-	-
Murgul	10	2	1,000	500
Savsat	61	-	-	-
Yusufeli	59	48	18,000	278
Coruh basin	251	65	24,204	367
Total	311	65	24,204	367
Erzurum				
Ispir	90	-	-	-
Narman	43	-	-	-
Oltu	65	5	1,000	200
Olur	40	20	5,000	250
Pazaryolu	35	-	-	-
Sencaya	69	3	300	100
Tortum	51	-	-	-
Uzundere	10	55	16,000	290
Coruh basin	403	83	22,300	268
Total	1,046	83	22,300	268
Bayburt				
Merkez	123	-	-	-
Aydintepe	23	-	-	-
Demirozu	29	-	-	-
Total	175	-	-	-
Coruh basin total	829	148	46,504	318
Provinces total	1,532	148	46,504	318

Source: Prepared based on Village Inventory, 1997, SIS

D.3.4 Irrigation

D.3.4.1 Irrigation Condition

Two organizations (GDRS and DIS) are involved in the irrigation program in a Turkish country. GDRS is the responsible agency for development of small-scale irrigation facilities smaller than 500 liter/sec. After construction is completed by GDRS, the irrigation facilities are transferred to the Muhtars and the villagers become responsible for operation and maintenance. However, GDRS does not provide any technical extension services, including advice on operations and maintenance for irrigated agriculture, and MARA does not have any responsibility for construction of irrigation facilities. Therefore, there are no agencies responsible for the extension of irrigation techniques.

A lot of streams flows in the Coruh river in the Study area. The irrigation facilities where with these streams and water spring in the head of a river exist in the Study area. In the Study area, during the period from the 1980s to mid-1990s GDRS constructed irrigation facilities such as intake structures and main canals, but these have generally not been properly maintained and are now becoming less functional. Concrete canals may be damaged, and earth canals lose large amounts of water through seepage. Insufficient and unreliable irrigation water seriously decreases the effective irrigated areas and thus crop production, and limits efficient usage of the limited areas of cultivable land.

On the other hand, GDRS in cooperation with ORKOY is implementing small-scale irrigation facilities. The scope of small-scale irrigation facilities managed by ORKOY is under 4 liter/sec with a pond capacity of up to 300 tons and an irrigation area of under 50ha. GDRS is in charge of constructing irrigation facilities and primary arterial water canals, and ORKOY is responsible for developing intake facilities from the water canals to the respective farm households.

As GDRS put priority on the irrigation project which is expected to bring about larger economic impact, high value crops will also be introduced in the irrigation area. Difficulty in promoting irrigation development in those villages is harsh geographic conditions which will raise the project cost.

D.3.4.2 Irrigation Method and Evapotranspiraton (ETo)

The average irrigation area in the Study Area is presumed to be 20-30% of the total arable land area. As for the irrigation method, the irrigation between ridges or the border irrigation is general, and the drip irrigation is adopted in greenhouse.

Precipitation and ETo based on data in the main meteorological observing station located in the Study Area are shown in the following. The amount of the rainfall decreases in summer

(Jun.-Oct.) which is the cultivation period of crops, and the flowing quantity of the river which becomes a head of a river decreases, too. Moreover, the crops production becomes difficult as ETo rises at this time, and becomes the maximum, and irrigation does not exist in the amount of crops of the moisture demand.

Thornwaite's Climatic Classification

Artvin (L:41.11N)

Month	Avrage Temperature (°C)	Calorix Index	Evarotranspiration ratio (n)	Correction value	Evapotranspiration Potential (n)'	Monthly Precipitation (P)	Variation of Soil Moisture	Soil Moisture	Quantity of Short Water (d)	Quantity of Excessive Water (s)
1	2.7	0.39	6	0.83	5.0	85.1	0	100	0	80
2	3.8	0.66	10	0.83	8.3	71.4	0	100	0	63
3	7.1	1.70	24	1.03	24.7	55.6	0	100	0	31
4	12.0	3.76	46	1.11	51.1	53.1	0	100	0	2
5	15.9	5.76	70	1.25	87.5	50.3	-37	63	0	0
6	18.6	7.31	90	1.26	113.4	46.8	-67	0	4	0
7	20.5	8.47	100	1.27	127.0	27.0	0	0	100	0
8	20.6	8.53	100	1.19	119.0	25.8	0	0	93	0
9	17.9	6.90	82	1.04	85.3	35.1	0	0	50	0
10	13.8	4.65	59	0.96	56.6	55.6	0	0	1	0
11	9.2	2.52	34	0.82	27.9	70.0	42	42	0	0
12	4.6	0.88	13	0.80	10.4	87.1	58	100	0	19
Total	Av.12.2	51.53			716.2	662.9			248	195

Bayburt(L:40.15N)

Month	Avrage Temperature (°C)	Calorix Index	Evarotranspiration ratio (n)	Correction value	Evapotranspiration Potential (n)'	Monthly Precipitation (P)	Variation of Soil Moisture	Soil Moisture	Quantity of Short Water (d)	Quantity of Excessive Water (s)
1	-7.1	0.00	0		0.0	24.8	25	75	0	0
2	-5.4	0.00	0		0.0	27.1	25	100	0	2
3	-3.0	0.00	0		0.0	36.6	0	100	0	37
4	6.8	1.59	36	1.10	39.6	57.8	0	100	0	18
5	11.6	3.58	60	1.24	74.4	67.6	-7	93	0	0
6	15.0	5.28	75	1.25	93.8	53.4	-40	53	0	0
7	18.8	7.43	90	1.27	114.3	21.2	0	0	40	0
8	18.4	7.19	90	1.18	106.2	14.6	0	0	92	0
9	14.5	5.01	74	1.04	77.0	20.9	0	0	56	0
10	8.8	2.35	41	0.96	39.4	39.7	0	0	0	0
11	2.6	0.37	16	0.83	13.3	35.0	22	22	0	0
12	-3.4	0.00	0		0.0	27.5	28	50	0	0
Total	Av.6.5	32.80			557.9	426.2			188	57

Yusuferi(L:40.21N)

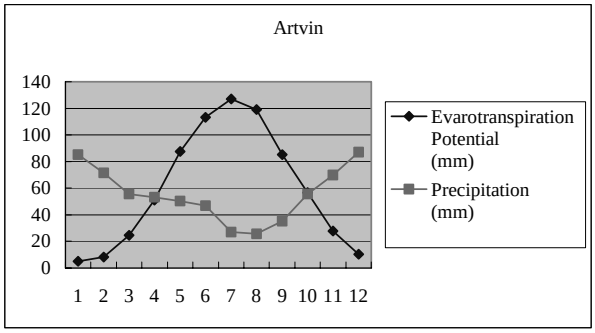
Month	Avrage Temperature (°C)	Calorix Index	Evarotranspiration ratio (n)	Correction value	Evapotranspiration Potential (n)'	Monthly Precipitation (P)	Variation of Soil Moisture	Soil Moisture	Quantity of Short Water (d)	Quantity of Excessive Water (s)
1	3.8	0.66	5	0.84	4.2	19.4	15	41	0	0
2	5.2	1.06	8	0.83	6.6	18.5	12	53	0	0
3	10.0	2.86	25	1.03	25.8	24.1	-2	51	0	0
4	14.8	5.17	50	1.11	55.5	33.0	-23	28	0	0
5	19.3	7.73	80	1.24	99.2	39.3	-28	0	32	0
6	23.4	11.02	110	1.25	137.5	34.7	0	0	103	0
7	26.0	12.13	125	1.27	158.8	26.3	0	0	132	0
8	26.3	12.35	130	1.18	153.4	15.6	0	0	138	0
9	21.7	9.23	90	1.04	93.6	16.4	0	0	77	0
10	14.6	5.07	50	0.96	48.0	19.0	0	0	29	0
11	9.5	2.64	22	0.83	18.3	25.0	7	7	0	0
12	4.8	0.94	7	0.81	5.7	24.6	19	26	0	0
Total	Av.15.0	70.86			806.5	295.9			511	0

Tortum(L:40.18N)

Month	Avrage Temperature (°C)	Calorix Index	Evarotranspiration ratio (n)	Correction value	Evapotranspiration Potential (n)'	Monthly Precipitation (P)	Variation of Soil Moisture	Soil Moisture	Quantity of Short Water (d)	Quantity of Excessive Water (s)
1	-3.4	0.00	0		0.0	28.4	28	64	0	0
2	-2.2	0.00	0		0.0	23.6	24	88	0	0
3	1.6	0.18	7	1.03	7.2	39.5	12	100	0	20
4	7.2	1.74	34	1.11	37.7	50.1	0	100	0	12
5	12.4	3.96	61	1.24	75.6	66.6	-9	91	0	0
6	16.1	5.87	80	1.25	100.0	62.1	-38	53	0	0
7	19.6	7.91	100	1.27	127.0	34.6	-53	0	39	0
8	19.5	7.85	100	1.18	118.0	24.5	0	0	94	0
9	15.3	5.44	75	1.04	78.0	19.2	0	0	59	0
10	9.5	2.64	45	0.96	43.2	32.0	0	0	11	0
11	5.0	1.00	22	0.83	18.3	29.8	12	12	0	0

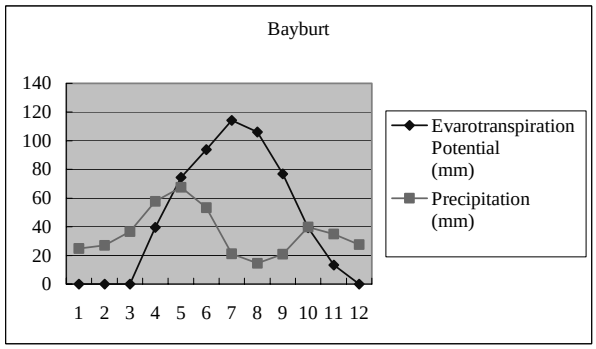
Artvin

Month	Evarotranspiration Potential (mm)	Precipitation (mm)
1	4.98	85.1
2	8.3	71.4
3	24.72	55.6
4	51.06	53.1
5	87.5	50.3
6	113.4	46.8
7	127	27
8	119	25.8
9	85.28	35.1
10	56.64	55.6
11	27.88	70
12	10.4	87.1
Total	716.16	662.9



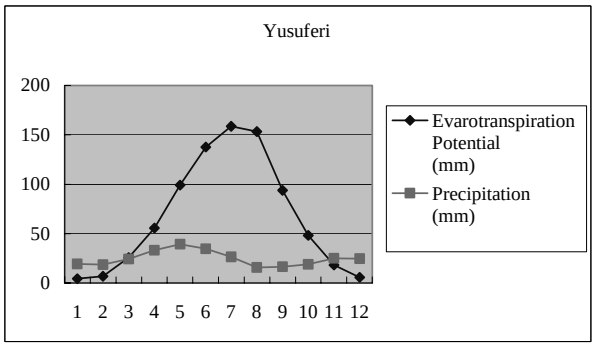
Bayburt

Month	Evarotranspiration Potential (mm)	Precipitation (mm)
1	0	24.8
2	0	27.1
3	0	36.6
4	39.6	57.8
5	74.4	67.6
6	93.75	53.4
7	114.3	21.2
8	106.2	14.6
9	76.96	20.9
10	39.36	39.7
11	13.28	35
12	0	27.5
Total	557.85	426.2



Yusuferi

Month	Evarotranspiration Potential (mm)	Precipitation (mm)
1	4.2	19.4
2	6.64	18.5
3	25.75	24.1
4	55.5	33
5	99.2	39.3
6	137.5	34.7
7	158.75	26.3
8	153.4	15.6
9	93.6	16.4
10	48	19
11	18.26	25
12	5.67	24.6
Total	806.47	295.9



Tortum

Month	Evarotranspiration Potential (mm)	Precipitation (mm)
1	0	28.4
2	0	23.6
3	7.21	39.5
4	37.74	50.1
5	75.64	66.6
6	100	62.1
7	127	34.6
8	118	24.5
9	78	19.2
10	43.2	32

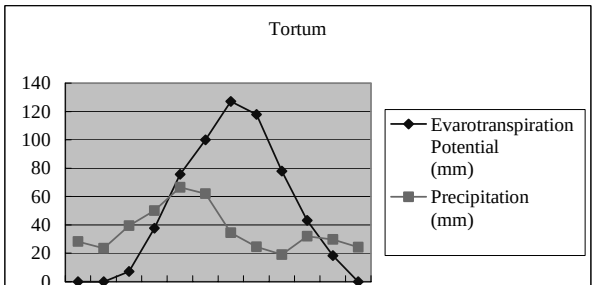


Fig. D.3.2 Evapotranspiraton Potential

D.3.5 Marketing

D.3.5.1 Number of product and marketed crops

Based on an analysis of the Village Inventory Study (SIS) that was conducted in 1997 the type of crops that are cultivated in the Arvin 72 kinds of crops (cereals 5, industrial crops 4, fodder crops 2, tuber crops 2, vegetables 34, fruits 20), Erzurum 63 kind of crops (cereals 7, industrial crops 4, fodder crops 2, pulses 5, tuber crops 2, vegetables 31, fruits 13), Bayburt 30 kind of crops (cereals 5, industrial crops 2, fodder crops 2, tuber crops 1, vegetables 14, fruits 3)

A diversity of crops is produced in the study area, and 72 varieties of agricultural products are cultivated in Arvin province located in the lower basin. Despite the small farmland area of each household in the lower basin, a variety of crops are grown due to stable weather conditions, temperatures, and rainfall volume in contrast to the upper basin.

However, the variety of agricultural products that are marketed in contrast to the diversity of crops that are cultivated is extremely small, and only 10 to 14 varieties of agricultural products such as wheat, barley, tomato, cabbage, potato, pulses, and hazelnut are sold in the market.

D.3.5.2 Markets and Destinations

The destinations of agricultural products produced in the Study area are largely categorized into four categories: state organizations, cooperatives, merchants (wholesaler, middleman and retailer) and local bazaars. Among these, the main destination for most products from forest villages is the bazaars, which are held regularly (weekends, holidays) near the villages.

Marketed amounts of agricultural products produced in the Study area are limited to a small extent. For example, the 403 villages within the Coruh river catchment of Erzurum Province, which is a major production area for cereals, sold only 10% of their production through cooperatives. The factors making marketing difficult include: long distance from major markets due to remoteness, poor conditions of roads, difficulty in securing stable supply amount, inefficient marketing systems such as collection and shipping, and problems in quality of products as market merchandise.

Table D.3.5 Number of Villages Selling Main Agriculture Products to Establishments

Province / District	No. of Villages	Wheat				Potato				Alfalfa				Tomato				Hazel & Wal Nuts			
		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Arvin																					
Merkez	36	-	-	-	-	-	-	1	6	-	-	-	-	-	-	-	2	-	-	4	6
Ardanuc	49	-	-	1	2	-	-	4	12	-	-	-	3	-	-	1	4	-	1	27	22
Borcka	36	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	5	9	2
Murgu	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2	-
Savsat	61	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
Yusufeli	59	1	-	2	1	-	-	13	12	-	-	-	-	-	-	3	3	-	1	13	11
Coruh Basin	251	2	-	3	4	-	-	17	34	-	-	-	3	-	-	4	9	16	8	55	41
Other Districts	60	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	13	9	23	7
Total	311	2	-	3	4	-	-	18	34	-	-	-	3	-	-	4	9	29	17	78	48
Erzurum																					
Ispir	90	-	-	1	16	-	-	2	14	-	-	-	2	-	-	-	-	-	-	4	6
Narman	43	8	-	1	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Oltu	65	1	-	-	1	-	-	1	3	-	-	-	-	-	-	-	1	-	-	1	-
Olur	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	1	1
Pazaryolu	35	-	-	1	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Senkaya	69	-	1	-	1	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	1
Tortum	51	-	-	-	4	-	-	3	12	-	-	-	1	-	-	1	1	-	-	-	-
Uzunrere	10	-	-	1	-	-	-	1	1	-	-	-	-	-	1	3	4	-	1	7	8
Coruh Basin	403	9	1	5	25	-	-	7	35	-	-	-	3	-	1	4	11	-	1	13	16
Other Districts	643	105	3	118	52	-	-	48	33	-	-	23	21	-	-	-	-	-	-	2	3
Total	1,046	114	4	123	77	-	-	55	68	-	-	23	24	-	1	4	11	-	1	15	19
Bayburt																					
Merkez	123	19	-	36	33	-	-	1	2	-	-	4	3	-	-	-	-	-	-	-	-
Aydintepe	23	9	2	16	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Demirouzu	29	-	-	1	10	-	-	-	-	-	-	4	8	-	-	-	-	-	-	-	-
Total	175	28	2	53	50	-	-	1	2	-	-	8	11	-	-	-	-	-	-	-	-
Coruh basin	829	39	3	61	79	-	-	25	71	-	-	8	17	-	1	8	20	16	9	68	57
Province total	1,532	144	6	179	131	-	-	74	104	-	-	31	38	-	1	8	20	29	18	93	67

Note : A: State organization, B: Cooperatives, C: Merchants, D: Bazaars + Others
Source: Prepared by based on Village Inventory, Artvin, Erzurum, Bayburt, 1997, SIS

D.3.5.3 Seasonal Change in Farm Gate Price

The farm gate prices of cereals and fruits do not fluctuate much throughout the year in the Black Sea region (including Artvin and Erzurum). On the other hand, the price of vegetables largely rises in the off-farm season, which is from November to May.

Table D.3.6 Farm Gate Price of Major Products unit: TL/kg

	2001 Jun.	→ Jul.	Aug.	Sep..	Oct.	Nov.	Dec.	2002 Jan.	→ Feb.	Mar.	Apr.	May	Ave. (2001)
Cereals	3,191	3,353	3,407	3,565	3,743	4,159	4,339	4,586	5,062	5,119	5,323	5,421	3,378
Vegetables	5,426	6,596	3,916	4,358	6,532	6,814	7,332	8,715	10,213	11,061	5,525	8,393	4,760
Fruits	4,358	4,361	4,363	3,810	3,691	4,169	4,383	4,293	4,365	4,256	4,009	4,213	3,776

Erzurum has the only vegetable-fruits wholesale market (Erzurum Hali) in the Three

Provinces. Some details of trading in the Erzurum Hali are:

- Annual average handling amount: 15,000 tons
- Seasonal change in handling amount: 1,200 tons for May–July, 2,200 tons for August–October, 700 tons for November – April.
- Wholesale price: The price differential reaches 2 to 3 times. Rises steeply during November–April and decreases during July – August.
- Merchandise resources: 80 to 90% of the fruits and vegetables come from other Provinces. The rate of products supplied by the farmers in Erzurum Province is only about 10%.

The fruits and vegetables handled in Erzurum Hali are distributed within and outside Erzurum and also reach Bayburt, where there is no wholesale market for fruits and vegetables. The increasing demands for fruits and vegetables have been recently outgrowing the capacity of the present wholesale market in Erzurum. This has encouraged the city of Erzurum to build a new wholesale market of which is currently under construction (planned to be completed in May, 2003).

Artvin Province located in the LC Sub-Catchment, has no wholesale market. The largest supermarket in the Province (MODI supermarket) obtains 70% of the fruits and vegetables from the adjacent Rize Province. Moreover, from autumn to winter, the price of vegetables rises up to more than double of the price in summer.

D.3.6 Village Cooperatives and ORKOY Credit

D.3.6.1 Number of Village Cooperatives

The total number of village development cooperatives in Turkey is 5,550 (with 568 thousand members) of which 2,123 is working in forestry activities (2000). These cooperatives are corporate organizations, which have legal status. Forestry Co-operatives Central Union (OR-KOOP) was legally founded from seven Co-operatives regional Unions, in 1997. OR-KOOP consists of 1,359 forest village development cooperatives, which form 18 Forestry Regional Unions or Village Development Cooperatives Regional Unions in the forest area. Members of these cooperatives total 135 thousand villagers.

There are 128 village cooperatives in the Study area. The activities of these cooperatives are generally of village development, and about 60% is of rural infrastructure improvement. On the other hand, support activities for marketing and production are scarce. The majority of village cooperatives in the Study area are a member of OR-KOOP.

Table D.3.7 Number of Cooperatives by Type

Province / Coruh river catchment	Number and type of cooperatives					Total
	Credit	Marketing	Village development	Production	Others	
Artvin						
Coruh river catchment	5	1	58	2	8	74
Total province	8	1	60	2	8	79
Erzurum						
Coruh river catchment	8	0	11	0	18	37
Total province	12	0	22	0	25	59
Bayburt						
Total province	13	0	4	0	0	17
Total Coruh river catchment	26	1	73	2	26	128
% of province	78.8	100.0	79.3	100.0	78.8	82.6
Total province	33	1	92	2	33	155

Source: Village Inventory, Artvin, Erzurum, Bayburt, 1997, SIS

D.3.6.2 Village Cooperatives Assistance by Credit

(1) ORKOY credit for village cooperatives

ORKOY has the intention of providing credit preferentially to village cooperatives rather than to individuals. Establishments of new village cooperative requires more than half of the villagers to participate in the cooperative. Thus, confrontation of opinions and interests of forest villagers must be considered upon the establishment of new village cooperatives.

ORKOY assistance for farming households in the forestry villages is mainly comprised of credit activities. The aim is to improve the income of farming households by increasing agricultural production, to alleviate the negative pressure on natural resources, and to reduce the outflow of the rural population. Financial assistance is comprised of individual credit and cooperative credit. Credit provided by ORKOY is focused on cooperative credit, where the ripple effect is large.

The total amount of credit provided for forestry villages throughout the country for FY2002 was about US$7,880,000 (13 trillion TL). The total amount of credit provided in Artvin, Erzurum, and Bayburt provinces in the study area was about 4 percent of this total amount or US$2,360,000 (390 billion TL). A breakdown according to province is explained below.

unit: Billion TL

Province	Individual	Cooperative	Total
Arvin	-	170	170
Erzurum	-	50	50
Bayburt	25	170	195
Total	24	390	415

Source: ORKOY, MOF, 2002

(2) Credit Conditions

The annual interest for credit provided by ORKOY was 10 percent (actual credit for FY2002). The interest rate of T.C. Ziraat Bank, the national agricultural bank, fluctuates due to monthly inflation, and the annual interest rate for FY2002 alternated between 65 to 75 percent. Farmland and other collateral are required by agricultural and private banks loans, but individual credit extended by ORKOY does not require collateral. However, many farmers are forced to rely solely on credit from ORKOY since the majority of farmers do not have formal land ownership rights because a survey on land ownership rights (land registration) of forestry villages has never been conducted.

In the case of cooperative credit, loans of up to 90 percent of business costs are provided. Another characteristic of this credit is that goods and commodities are accepted as repayment for both individual and cooperative credit as well as cash.

Agricultural production activities that are eligible for ORKOY credit are beekeeping, livestock, fisheries, crop cultivation (vegetables, olives, mushrooms, etc.), the development of organic farming, small-scale irrigation, the construction of greenhouses, and others. A characteristic of these loans is that the annual interest rate for all of these activities is about 10 percent, but the repayment period varies (two to seven years).

Combined loans for both the development of small-scale irrigation facilities and the construction of greenhouses are common. There are loans for greenhouses that are 250m^2 and 500m^2 in size. Recently, applications by farm households in the forestry villages for combined loans to construct 500m^2 greenhouses and small-scale irrigation facilities have increased. The cost of constructing one 500m^2 greenhouse and irrigation facilities is about 2.5 billion TL.

D.4 Agriculture in the Selected Micro-Catchments

D.4.1 BT-04 MC : SAVSAT

D.4.1.1 Farming Pattern of Selected Villages

There are 15 villages distributed in MC. The number of total farmers of selected villages 5 villages (Cavdari, Ciftic, Hanli, Kirechi, Savas) is 730 among these, and the average per land holding area is 3.5ha. In Farming pattern, livestock is mainly composed, and each village is an agricultural income source with the maximum sales of the domestic animal (cow and sheep) and milk. The agricultural income source by which the domestic animal is followed is Potato and dry bean. The majority of crops are produced for home consumption. The fruit tree is traditionally grown in all villages. However, the superannuation of trees is low and amount is remarkably low. Many of harvest things are used as domestic animal's food. However, the superannuation of the fruit tree is advanced, therefore yield is low. Many of harvest things are used as domestic animal's feed. Moreover, the farmer of about 20% or more is doing bee keeping in Hanli and Kirecli and Savskoy.

In Kirechi, "Dairy products processing factory" was constructed with Agricultural development cooperative in 1969, and the production of cheeses was begun. Credit of ORKOY was received, and facilities were expanded in 1995. However, this dairy products factory decreases due to raw material shortage the operation rate, and has been closed since 2001. The renewal of the processing factory is planned in the same village. For this, the increase of the domestic animal fodder and the number of domestic animals is important conditions.

Table D.4.1.1 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average farm size(ha)	Cultivated area (ha)	Farming type
Cavdari	60	5.8	330	livestock + fodder + cereals + potato + dry bean
Ciftlic	70	1.8	126	livestock + fodder + cereals + vegetables
Hanli	100	3.7	370	livestock + fodder + fruits + potato + dry bean
Kirechi	300	2.8	720	livestock + fodder + potato + corn
Savas	200	3.4	540	livestock + cereals + dry bean + potato
Total	730	3.5	2,086	-

*Cereals mainly wheat and barley
Source: Prepared based on JICA Household Survey, 2003

D.4.1.2 Cultivation System and Production Cost

Use of fertilizer and agricultural chemicals is a little, because the crops cultivation is grown to mainly home consume. As for the fertilizer, manure of the domestic animal is generally used. As for the seed, there is a lot of farmer’s home collection. An agricultural machine is mainly used from the lack of the family manpower for plow the field. The rental rate of the tractor is reached

to 95% in 50% or more, especially in Cavdarli and (*S) reaches 75% with Hanli. For the farmer of selected villages, the rental rate of the tractor is 50% or more. Especially reaches 95% in Cavdarli and farmer's of Hanli reaches 75%.

The possession farmer of the tractor is about 4~6 in each village, and the demand for the tractor rush in April and May hit at the cultivation time of crops. The cost of the operator of the tractor is 20,000,000TL/dec. and the gasoline fee is added. Moreover, a lot of harvest damage of farm products by wild animals (mountain pig, rat, and bear) and the damage to honey by the bear occur in this MCs area in recent years, too.

Table D.4.1.2 Cultivated System of Major Crops

Crops	Cultivation season		Planting method	Seed (kg/dec.)	Fertilizer (kg/dec.)	Irrigation (type)	Yield (kg/dec)
	Seeding	Harvesting					
Wheat(autumn)	Sep.-Oct.	July-Aug.	Direct sown	30	Manure	Border	150-350
Wheat(spring)	Apr.-May	July-Sep	Direct sown	30	Manure	Border	150-300
Barley	Apr.-May	Jun.-July.	Direct sown	30	Manure	Border	Green forage
Maize	Apr.	Aug.	Drill	3 – 5	Manure	-	150
Potato	Apr.-May	Aug.-Sep.	Intercrop with maize	-	Manure	Border	1,000
Bean	Apr.-May	July-Sep.	Intercrop With maize	-	Manure	-	50-150
Apple	May-Jun.	Oct-Nov.	-	-	-	-	5,000(200tree)

Source: Prepared by field survey, June, 2003

D.4.1.3 Irrigation

(1) Existing irrigation facility

In Selected villages, the irrigation facilities constructed with GDRS or DSI already exist from the latter half of 1970's to 1980's. Therefore, the farmer has already had the experience of some irrigation agriculture. Main water resource is a river and uses two or more spring water and stream in MC. Each village presents a region the waterway construction site is not enough and an extremely steep geographical features situation. Therefore, the irrigation rainwater is pulled to the plain with the pipeline and the soil waterway. As for the irrigation facilities by GDRS, 20 years or more have already passed, and the water loss by the superannuation of the waterway is large.

(2) Irrigation crops

Irrigation land in Selected villages is about 20-30%. As the irrigation crops, wheat, alfalfa, potato, and dry bean are prior crops. Border irrigation system of the method of sprinkling water to crops is general. As for the irrigation method, it is very extensive, and the irrigation water loss in farm land is also large. However, the drip irrigation method is adopted in the vegetable cultivation in the greenhouse. The irrigation water is required to be able to be secured enough when credit of

the greenhouse of ORKOY is granted.

(3) Operation and maintenance

The farmer's water union or irrigation organization does not exist, and the waterway is maintained by joint work of the villagers. There will be traditionally no charge for the irrigation water, and the collection of the water supply expense etc. is not done. The head of a river and the waterway construction are due to the responsibility of GDRS.

D.4.1.4 Agricultural support

ORKOY credit is introduced to the crop cultivation from roof cover to granting of the domestic animal. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often not sustainable to help increase farmers' income.

Table D.4.1.3 ORKOY Credit by Villages (1976-2002)

Villages	Cavdarli		Ciftlic		Hanli		Kirecli		Savas	
Items	A	B	A	B	A	B	A	B	A	B
Roof cover (350-400kg)	117	117	175	171	169	161	317	259	251	229
Daily cattle (2 head)	25	1	80	3	30	3	80	17	50	4
Sheep (30+1 head)	10	6	30	3	20	7	30	9	20	4
Beef cattle (10 head)	-	-	-	-	-	6	50	11	-	-
Beekeeping (20 kovan)	20	3	40	5	80	17	-	7	60	17
Handy craft set (1 tezgah)	27	6	6	1	40	4	30	-	43	3
Poultry (500 Tavuk)	15	-	20	-	20	-	50	1	30	-

Note: A: Verilen Adet, B: Uygulanan Adet
Source: Prepared by field survey based on Artvin, ORKOY, data, June/2003

D.4.1.5 Rural Infrastructure

Rural electrification rate is 100% in all villages. Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to increased number of people who comes back from school and/or on vacation.

Children of Cavdarli and Hanli are the dormitory life in both elementary schools and junior high schools with Savsat city. There is a clinic in all villages, except Cavdarli. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children.

Wood is the most important heating energy in all villages since 1990s. Cow dung cake and branches of fruit trees and poplar trees are also used as a cooking and heating energy depending on season.

Table D.4.1.4 Basic Rural Infrastructure Condition by Villages

	Cavdarli	Ciftlic	Hanli	Kirecli	Savas
1.Drinking water	100% (2000)	100% (2000)	100% (2003)	100% (2002)	100% (2000)
2. Electricity	100% (1979)	100%(1980)	100% (1984)	100% (1984)	100% (1979)
3. Communication	100%(1980)	100%(1976)	100% (1980)	100%(1986)	100% (1980)
4.Education	Exist (1979)	Exist (1962)	Exist (1964)	Exist (1978)	Exist(1961)
Elementary school	Go to Savsat city	Students: 20	Go to Savsat city	Students: 45	Students: 11
Junior high school	(Students 10)	Students: 10		Students: 25	Go to other village
5. Medical treatment	No exist	Clinic (1970)	Clinic (1972)	Clinic (1975)	Clinic (1990)
6.Sewage treatment	No exist	No exist	No exist	No exist	No exist
7. Main Fuels	CDC + wood	Wood + poplar	Wood + poplar	Wood + Coal	Wood + poplar

Note: CDC (Cow dung cake)
Source: Prepared by field survey, June.2003

D.4.2 MC-03 MC Area: Yusfeli

D.4.2.1 Farming Pattern of Selected Villages

Four villages (Kilickaya, Alanbasi, Bakirtepe, Celtikduzu) are distributed in this MC. The number of total farmers is 1,008, and the average per one possession area is 3.1ha. In Farming pattern, livestock is mainly composed, and each village is an agricultural income source with the maximum sales of the domestic animal (cow and sheep) and milk. In this MC, the feature the point that other valleys and the production of the difference rice is cultivated.

Table D.4.2.1 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average farm size(ha)	Farming type
Alanbasi	180	3.0	livestock + fodder + wheat + rice + vegetables
Bakirtepe	45	4.5	livestock + fodder + wheat + vegetables
Celtikduzu	200	2.3	livestock + fodder + vegetables + rice + barley + fruits
Kilickaya	583	2.4	livestock + fodder + vegetables + rice + barley
Total	1,008	3.0	-

*Cereals mainly wheat and barley
Source: Prepared based on JICA Household Survey, 2003

D.4.2.2 Cultivation System and Production cost

For some farmers, a chemical fertilizer is used for wheat and alfalfa. However, manure is used as a fertilizer in farmers of large majority. Alfalfa is from year 2 to 3 time harvest.

Yield of main crops are some 20% lower than those produced in normal village. The reasons for the lower yield are attributed to the less dosage of seed and fertilizer and to cultivation technique.

Wheat, barley and alfalfa are cultivated for home consumption or feeding their raised animals. Only exception is greenhouse vegetables, which are produced for marketing. Therefore, it is a lease of a seed fee, a chemical fertilizer, and the tractor as the main production cost of grain and alfalfa. The price of the wheat seed is 6,000TL for every 30kg.

Moreover, a chemical fertilizer is 22,000TL for every 50kg, and the price rises by 30% or more compared with 2000. The farmer with a difficult cultivation of crops exists by the sudden rise of the production materials of a chemical fertilizer and the seed fee, etc. ,. The tractor is used from the labor shortage for plow of the field. The cost of the operator is 18,000 TL an hour, and the gasoline fee is added to this.

Table D.4.2.2 Cultivate System of Major Crops

Crops	Cultivation season		Planting	Seed	Fertilizer	Irrigation	Yield
	Planting,	Harvesting	Density(cm)	(kg/dec.)	(kg/dec.)	(type)	(kg/dec.)
Wheat(autumn)	Oct.-Nov.	July-Aug.	Direct sown	15-20	20-25	-	150-300
Wheat(spring)	Mar.-Apr.	July-Aug.	Direct sown	15-20	20-25	Border	150-300
Barley	Oct.-Nov.	Jul.-Aug.	Direct sown	10-12	N.D	Border	120-150
Rice	May-Jun.	Sep.-Oct.	Direct sown	8	DAP/ Manure	Border	250-300 (rice mill)
Maize	May	October	Drill	N.D	ND	Border	100-110
Alfalfa	Apr.-May	Jun.-Jul.	Direct sown	9-10	20	Border	250-300
Potato	Apr.-May	September	N.D	N.D	Manure	Border	2,500
Maize	May	September	N.D	N.D	Manure	-	120-150
Beans	May	September	N.D	N.D	Manure	Border	N.D
Apple	Apr.-May	Oct.-Nov.	N.D	N.D	Manure	-	N.D
Cherry	Apr.-May	July-Aug.	N.D	N.D	Manure	-	N.D
Walnut	May-Jun.	Oct.-Nov.	N.D	N.D	Manure	-	N.D

Source: Prepared by field survey, June, 2003

D.4.2.3 Irrigation

GDRS implemented small-scale irrigation projects in the MC during 1970s to 1980s, and those irrigation systems need to be rehabilitated and upgraded due to large water conveyance loss, especially the earthen canal portion. Water impounding may also be necessary to augment water supply capacity in summer season.

Irrigation land in Selected villages is about 30-50%. As the irrigation crops, wheat, alfalfa, potato, and dry bean are prior crops. Border irrigation system of the method of sprinkling water to crops is general. As for the irrigation method, it is very extensive, and the irrigation water loss in farm land is also large. However, the drip irrigation method is adopted in the vegetable cultivation in the greenhouse. The irrigation water is required to be able to be secured enough when credit of the greenhouse of ORKOY is granted.

The farmer's water union or irrigation organization does not exist, and the waterway is maintained by joint work of the villagers. There will be traditionally no charge for the irrigation water, and the collection of the water supply expense etc. is not done. The head of a river and the waterway construction are due to the responsibility of GDRS.

D.4.2.4 Agricultural support

ORKOY credit plays an important role to support agricultural production increase. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often not sustainable to help increase farmers' income.

Great success has been observed in greenhouse development in the Caglayan village where income level of the greenhouse farmers has raised tremendously.

Table D.4.2.3 ORKOY Credit by Villages

Villages	Kilickaya		Alanbasi		Bakirtepe		Celtikduzu	
Items & scale	A	B	A	B	A	B	A	B
Roof cover (350-400kg)	296	70	185	125	113	113	139	139
Daily cattle (2 head)	50	9	20	5	30	1	40	6
Sheep (30+1 head)	50	3	10	8	30	3	10	1
Beef cattle (10 head)	40	-	30	7	-	-	50	11
Beekeeping (20 kovan)	50	5	40	3	-	-	40	3
Handy craft set (1 tezgah)	50	12	40	-	20	0	40	-
Poultry (500 Tavuk)	50	3	25	1	-	-	20	2
Chain saw	1	-	-	-	-	-	1	1
Green House (500m^2)	-	-	-	-	-	-	14	5

Note: A: Plan, B: Implemented
Source: Prepared by field survey based on ORKOY data, Artvin, June/2003

D.4.2.5 Rural Infrastructure

Rural electrification rate is 100% in all villages. However, there is a case in the Cevizli village where the communication network has been disrupted for more than six months due to flood and landslides.

Elementary school is available in all villages. There is no junior high school in Altincanak and Sapaca, where students go to Kirazli and Uzundere, respectively by school bus. There is a clinic in all villages but Altincanak. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children.

Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to

increased number of people who comes back from school and/or on vacation.

Coal is the most important heating energy in all villages since 1990s. Cow dung cake and branches of fruit trees and poplar trees are also used as a cooking and heating energy depending on season. In the Sapaca village, sewage treatment system has been established by GDRS.

Table D.4.2.4 Basic Rural Infrastructure Condition by Villages

	Kilickaya	Alanbasi	Bakirtepe	Celtikduz
1.Drinking water	100% (1976)	100% (1978)	100% (1974)	100% (1995)
2. Electricity	100% (1980)	100% (1998)	100% (1976)	100% (1974)
3. Communication	100%(1980)	100% (1978)	100% (1995)	100%(1979)
4.Education	Exist(1948)	Exist	Exist: Closed	Rebuilding(2003)
Elementary school Junior high school	Total students: 7 To OLTU	Total students:190 (Alanbasi: 61)	Total students: 20 Dormitory in Kilickaya	Students: Students
5. Medical treatment	No exist	Clinic (1972)	Clinic (1977)	No exist
6.Sewage treatment	No exist	No exist	No existt	Exist (1996)
7. Fuels	Coal + poplar	Wood + Fruit trees + Coal	Wood	Fruit trees + CDC

Note: CDC; Cow dung cake
Source: Prepared by field survey, June.2003

D.4.3 OL-04 MC : OLTU

D.4.3.1 Farming Pattern of Selected Villages

There are 16 villages distributed in MC. The number of total farmers of Ballica which is Selected villages, Basakli, Orcuk, Ozdere, and Tutmac 5 village is 598, and the average landholding per household is 1.9ha. In farming pattern, livestock is mainly composed, and each village is an agricultural income source with the maximum sales of the domestic animal (cow and sheep) and milk.

Table D.4.3.1 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average farm size(ha)	Farming type
Ballica	48	1.1	livestock + wheat + barley + potatoes
Basakli	140	3.5	livestock + wheat + barley + fodder + vegetables
Orcuk	160	1.1	livestock + wheat + vegetables + barley
Ozdere	150	1.4	livestock + fodder + wheat + vegetables + barley
Tutmac	100	1.5	Livestock + fodder + wheat + vegetables + barley
Total	598	1.7	-

*Cereals mainly wheat and barley
Source: Prepared based on JICA Household Survey, 2003

D.4.3.2 Cultivation System

Average yield of the wheat is 3.4 ton/ha by irrigation, and the half in case of production by non-irrigation. For the farmer, the target of the amount of crops is generally assumed to be 5-8 times the amount of sowing.

The cost of a chemical fertilizer is 25,000,000-30,000,000TL for every 50kg. As for the majority of the seed, the one of a private collection is used. The tractor is used from the lack of manpower for plow of the field. The demand for the tractor concentrates at time with the work in April and May though the tractor depends on the leasing contract with the owner. Sold crops are wheat, potato, and it is very few. Farm gate price of both crops is wheat:350,000TL/kg, and potato: 500,000-550,000TL/kg.

Table D.4.3.2 Cultivate System of Major Crops

Crops	Cultivation season		Planting	Seed	Fertilizer	Irrigation	Yield
	Planting,	Harvesting	Density(cm)	(kg/dec.)	(kg/dec.)	(type)	(kg/dec.)
Wheat(autumn)	Oct.-Nov.	July-Aug.	Direct sown	15-20	20-25	-	180-200
Wheat(spring)	Apr.-May	July-Aug.	Direct sown	15-34	20-25	Border	150-300
Barley	Oct.-Nov.	Jul.-Aug.	Direct sown	10-12	Manure	Border	120-150
Maize	May	October	Drill	N.D	Manure	Border	100-110
Alfalfa	Apr.-May	Jun.-Jul.	Direct sown	9-10	20	Border	250-300
Potato	Apr.-May	September	N.D	N.D	Manure	Border	2,500
Beans	May	September	N.D	N.D	Manure	Border	N.D
Apple	Apr.-May	Oct.-Nov.	N.D	N.D	Manure	-	N.D
Cherry	Apr.-May	July-Aug.	N.D	N.D	Manure	-	N.D
Walnut	May-Jun.	Oct.-Nov.	N.D	N.D	Manure	-	N.D

Source: Prepared by field survey, June, 2003

D.4.3.3 Irrigation

GDRS implemented small-scale irrigation projects in the MC during 1970s to 1980s, and those irrigation systems need to be rehabilitated and upgraded due to large water conveyance loss, especially the earthen canal portion. Water impounding may also be necessary to augment water supply capacity in summer season.

Irrigation land in Selected villages is about 30-50%. As the irrigation crops, wheat, alfalfa, potato, and dry bean are prior crops. Border irrigation system of the method of sprinkling water to crops is general. As for the irrigation method, it is very extensive, and the irrigation water loss in farm land is also large. However, the drip irrigation method is adopted in the vegetable cultivation in the greenhouse. The irrigation water is required to be able to be secured enough when credit of the greenhouse of ORKOY is granted. The farmer's water union or irrigation organization does not exist, and the waterway is maintained by joint work of the villagers. There will be

traditionally no charge for the irrigation water, and the collection of the water supply expense etc. is not done. The head of a river and the waterway construction are due to the responsibility of GDRS.

D.4.3.4 Agricultural Support

ORKOY credit plays an important role to support agricultural production increase. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often not sustainable to help increase farmers' income.

Table D.4.3.3 ORKOY Credit by Villages

Year	Ballica	Basakli	Orucuk	Ozdere	Tutmac
1981	-	-	-	Cow: milk production 4 units	Cow: milk production 3 units
1982	Cow: milk production 4 units	Cow: milk production 4 units	-	Cow: milk production 4 units	-
1987	-	-	Sheep: milk production 6 units	-	-
1989	-	-	Sheep: milk production 3 units	-	-
1991	-	-	-	-	Sheep: milk production 4 units
1994	Beekeeping: 3 units	-	-	-	-

Source: Prepared by field survey based on ORKOY data, June/2003

D.4.3.5 Rural Infrastructure

Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to increased number of people who comes back from school and/or on vacation. Rural electrification rate is 100% in all villages. Elementary school is available in all villages. Often goes to school to another region such as OLTU when becoming a junior high school. Not only the school but also bridge in the village and drinking water and rural road are constructed with joint investment (imeje) of the village for Ozdere. Moreover, monthly sum 70US$ is collected from the villager, and (*S) allots (*O) to the maintenance management cost of facilities.

There are clinic in Basakli, Orcuk, and Tutmac villages. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children. As the fuel, it is a fuel source where cow dung is important though coal is becoming a subject.

Table D.4.3.4 Basic Rural Infrastructure Condition by Villages

	Ballica	Basakli	Orcuk	Ozdere	Tutmac
1.Drinking water	100% (1976)	100% (1960)	100% (2000)	100% (1995)	100% (2000)
2. Electricity	100% (1980)	100%(1975)	100% (1975)	100% (1974)	100% (1974)
3. Communication	100%(1980)	100%(1980)	100% (1982)	100%(1979)	100% (1989)
4.Education	Exist(1948)	Exist	Exist	Rebuilding(2003)	Exist (1948)
Elementary school Junior high school	Students: 7 To OLTU	To other village's school: 40 students	Students: 54 To Kucukorcuk	Students: Students	Total students: 100
5. Medical treatment	No exist	Clinic (1975)	Clinic (1986)	No exist	Clinic (1968)
6.Sewage treatment	No exist	Exist (1986)	Exist	Exist (1996)	Under construction
7. Fuels	Coal + poplar	Coal + CDC	Coal + poplar	Fruit trees + CDC	CDC + Coal

Note: CDC; Cow dung cake
Source: Prepared by field survey, June.2003

D.4.4 TR-06 MC Area: Uzundere

D.4.4.1 Agricultural Feature

Significant features of this MC is that while the farmers raise livestock as their main economic activities, they also develop agricultural diversity approaches such as producing fruits and vegetables. Insufficient forage for raising animals may be said as the problem for the livestock sector. Particularly the lack of forage during winter leads to decrease of milk production, body weight of beef cattle, and moreover, the number of livestock heads itself. Cottage type dairy processing is practiced in Kirazli, where livestock industry is most active. However, depending highly on outer sources for forage, the profit from dairy product is low. Increasing production and securing necessary amounts of forage is the most crucial task for the stock raising farmers.

In villages like Caglayan and Altincanak, where farmers secure their income through the practice of intensive agricultural production of vegetables with greenhouses, improvement of product quality and adjusting the period of shipping are important tasks. There are 157 greenhouses in the whole MC, 76% of which or 120 are in the two villages. The success of the greenhouse vegetable production is also attributed to the existence of a progressive farmer who played important role on extending technology to other farmers. On the other hand, village like Altincanak, where fruits is the main agricultural activity, old and low-productive fruits trees needs to be renewed (replanted) with new ones.

GDRS implemented irrigation projects in Altincanak, Caglayan and Kirazli during 1970s to 1980s, and those irrigation systems need to be rehabilitated and upgraded due to large water conveyance loss, especially the earthen canal portion. Water impounding may also be necessary to augment water supply capacity in summer season. Enlargement of irrigated areas through rehabilitation of existing irrigation facilities is essential for increasing production and securing necessary amounts of forage, and moreover, for producing high-profit crops. However, it must be noted that factors such as extension of irrigation techniques, application of proper fertilizers,

soil conservation and establishment of organizations for the operation and maintenance of irrigation facilities are the basic prerequisites for sustaining the effects of irrigation.

ORKOY credit plays an important role to support agricultural production increase. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often failed to help increase farmers' income. Great success has been observed in greenhouse development in the Caglayan village where income level of the greenhouse farmers has raised.

D.4.4.2 Cultivated area

MC Total crops cultivated area of the MC is estimated at 745 ha. In MC, pasture and meadow of about 4,900ha exist besides farmland. In MC, pasture and meadow of about 4,900ha exist besides farmland. Wheat is for food, and barley is produced for domestic animal's fodder. In the cultivation area of the fruit tree, fruits which are a lot of after filed crops, are the main are apple, walnuts, and sour cherry. Moreover, the main vegetable is a tomato, cucumber, and an eggplant.

Table D.4.4.1 Crop Cultivated Land Area unit: ha

	Farmland			Others	Total
	Rainfed	Irrigated	Fallow		
Altincanak	5	15	-	20	40
Caglayan	2,500	1,000	-	300	3,800
Cevizli	700	300	350	200	1,550
Kirazli	60	300	300	1,200	1,860
Sapaca	3,000	1,500	1,500	200	6,200
Total	6,255	3,115	2,150	1,920	13,440

Others: Poplar, and willow
Source: Prepared by Socio-economic Survey, June, 2003, JICA

D.4.4.3 Farm size and farming pattern

The number of total farmers of five MC villages is 930, and accounts for 70% by two villages (Cevizli and Kilazli) of these. The average per land holding area is 2.8ha.

Table D.4.4.2 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average Farm size (Maximum and Minimum)	Farming type
Altincanak	70	1.3ha	Fruits + Vegetable (GH)*+ Livestock
Cevizli	300	3.4ha	Livestock +Cereals + Alfalfa + Fruits
Caglayan	80	2.9ha	Vegetable(GH) + Livestock + Cereals
Kirazli	310	4.1ha	Livestock + Cereals + Alfalfa + Fruits
Sapaca	170	2.3ha	Livestock + Fruits + Cereals
Total	930	2.8 ha	

*GH: Greenhouse
Source: Prepared by field survey, June.2003.

D.4.4.4 Cultivation System

(1) Yield

Yield of main crops are some 20% lower than those produced in normal village. The reasons for the lower yield are attributed to the less dosage of seed and fertilizer and to cultivation technique. Alfalfa is from year 2 to 3 time harvest.

(2) Cost

A chemical fertilizer is used for wheat and alfalfa as some farmers. However, manure is used as a fertilizer in farmers of large majority. Wheat, barley, and alfalfa, etc. are mainly cultivated for home consumption or f**eeding their raised animals.** Only exception is greenhouse vegetables and which are produced for marketing**.** Therefore, it is a lease of a seed fee, a chemical fertilizer, and the tractor as the main production cost of grain and alfalfa.

(3) Greenhouse

In the greenhouse in Canglaya, the tomato and cucumber are grown to the subject. Two types (250m2 and 500m2) are widespread to the area of the greenhouse. The profitability of cucumber is higher than that of the tomato, and had sold with 450,000 40 per kg-TL last year. Moreover, the drip irrigation is widespread, and the fertilizer and agricultural chemicals have been turned on in greenhouse through irrigation.

Table D.4.4.3 Cultivate System of Major Crops

Crops	Cultivation season		Planting	Seed	Fertilizer	Irrigation	Yield
	Planting,	Harvesting	Density(cm)	(kg/dec.)	(kg/dec.)	(type)	(kg/dec.)
Wheat(autumn)	Sep.-Oct.,	Jun.-July.	Direct sown	18-20	N10, P 8	Border	130-150
Wheat(winter)	Mar.-Apr.,	Jul.-Aug.	Direct sown	15-18	N10, P 8	-	120-130
Barley	Oct.-Nov.,	Jul.-Aug.	Direct sown	15-18	N.D	Border	110-130
Maize	May-June,	Sep.-Oct.	Drill	18	N.D	Border	120-150
Alfalfa	Apr.-May,	Jun.-Jul.	Direct sown	9-10	20-40	Border	250-300
*Vegetables	May-June,	Jul.-Sep.	30 x 40 x 50	N.D	Manure	Furrow	N.D
Apple		Oct.-Nov.	N.D	N.D	Manure	-	N.D
Cherry		Jul-Aug.	N.D	N.D	Manure	-	N.D
Walnut		Oct.-Nov.	N.D	N.D	Manure	-	N.D

Note: * Tomato: Open field cultivation
Source: Prepared by field survey, June-July, 2003

D.4.4.5 Irrigation

GDRS implemented small-scale irrigation projects in the MC during 1970s, and those irrigation systems need to be rehabilitated and upgraded due to large water conveyance loss, especially the earthen canal portion. Water impounding may also be necessary to augment water supply capacity in summer season.

Irrigation land in Selected villages is about 30-50%. As the irrigation crops, wheat, alfalfa, potato, and dry bean are prior crops. Border irrigation system of the method of sprinkling water to crops is general. As for the irrigation method, it is very extensive, and the irrigation water loss in farm land is also large. However, the drip irrigation method is adopted in the vegetable cultivation in the greenhouse. The irrigation water is required to be able to be secured enough when credit of the greenhouse of ORKOY is granted.

The farmer's water union or irrigation organization does not exist, and the waterway is maintained by joint work of the villagers. There will be traditionally no charge for the irrigation water, and the collection of the water supply expense etc. is not done. The head of a river and the waterway construction are due to the responsibility of GDRS.

D.4.4.6 Agricultural support

ORKOY credit plays an important role to support agricultural production increase. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often not sustainable to help increase farmers' income. In Canglayan which activates the village with Greenhouse, credit is untried though the number of farmers who want ORKOY credit increases. The interest rate by an agricultural bank is in a difficult situation to receive an agricultural financing to reach 80% a

year now.

Table D.4.4.4 ORKOY Credit by Villages

Year	Altincanak	Cevizli	Caglayan	Kirazli	Sapaca
1991	Sheep: milk production 5 units	-	-	Sheep: milk Production: 3 units	Sheep: milk production 3 units
1992	Heating/cooking: 20units	Sheep: milk production 3 unit	Sheep: milk production 3 units	Heating/cooking: 60 units	Heating/cooking: 15 units
1993	-Cow: meat production 5 units -Sheep: milk production 3 units	-	-	-Roof cover: 100 units -Heating/cooking: 4 units	Roof cover: 100 units
1994	-	Sheep: milk production 3 units	Greenhouse: 10 units	-Beekeeping: 3 units -Greenhouse: 6 units	-
1996	-	-	-	-	Trout cultivation:7 units
1997	-	-	Greenhouse: 8 units	-	-

Source: Prepared by field survey based on ORKOY data, June/2003

D.4.4.7 Rural Infrastructure

Rural electrification rate is 100% in all villages. However, there is a case in the Cevizli village where the communication network has been disrupted for more than six months due to flood and landslides.

Elementary school is available in all villages. There is no junior high school in Altincanak and Sapaca, where students go to Kirazli and Uzundere, respectively by school bus. There is a clinic in all villages but Altincanak. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children.

Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to increased number of people who comes back from school and/or on vacation.

Coal is the most important heating energy in all villages since 1990s. Cow dung cake and branches of fruit trees and poplar trees are also used as a cooking and heating energy depending on season. In the Sapaca village, sewage treatment system has been established by GDRS.

Table D.4.4.5 Basic Rural Infrastructure Condition by Villages

	Altincanak	Cevizli	Caglayan	Kirazli	Sapaca
1.Drinking water	100% (1995)	100% (1999)	100% (1998)	100% (1997)	100% (1995)
2. Electricity	100% (1979)	100%(1976)	100% (1978)	100% (1978)	100% (1978)
3. Communication	100%	100%(1980)	100% (1982)	100%(1979)	100% (1989)
4.Education	Rebuilding(1979)	Rebuilding (2000)	Exist (1965,1985)	Exist (1954)	Exist (1961)
Elementary school Junior high school	Students: 24 Go to Kirazli village	Total Students: 120	Students: Students:	Total students:160	Students: 30 Go to Uzundere
5. Medical treatment	No exist	Clinic (1988)	Clinic (1972)	Clinic	No exist
6.Sewage treatment	No exist	No exist	No exist	No exist	Exist (2000)
7. Fuels	Coal + CDC	Coal + CDC	Coal + Fruits	Coal + CDC	Coal

Note: CDC; Cow dung cake
Source: Prepared by field survey, June.2003

D.4.5 UC-03 MC : BAYBRUT

D.4.5.1 Cultivated area

Total cultivated area of five villages (Maden,Heybetepe,Gezkoy,Yaylapinar,and Masat) which composes MC is 4,614ha. Farmland is distributed around smooth ground along the river, and the staple crop is wheat, barley, and fodder crops (alfalfa,sainfoin). Wheat is for food, and barley is produced for domestic animal's fodder. Agriculture activities in the MC put emphasis on feed crop production to support livestock. Vegetable and fruits mainly cultivated for home consumption or feeding their raised animals

Table D.4.5.1 Cultivated Land Area unit: ha

	Farmland			Others	Total
	Rainfed	Irrigated	Fallow		
Maden	250	70	15	6	341
Gezkoy	500	35	10	2	547
Masat	1,500	500	750	100	2,850
Yaylapinar	300	300	250	15	865
Heybetepe	300	30	20	2	352
Total	2,600	865	1,030	119	4,614

Others: Poplar, and willow
Source: Prepared by Socio-economic Survey, June, 2003, JICA

D.4.5.2 Farming pattern

The number of total farmers of five villages is 464, and accounts for 75% by two villages (Masat and Yaylapinar) of these. The average area of the farmer is 3.8ha. Agricultural land is used as

pasture ground, and sales of the domestic animal occupy all of an agricultural income mostly of the farmland.

Table D.4.5.2 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average Farm size (ha) (Maximum and Minimum)	Farming type
Maden	55	2.8	Livestock + Fodder + Cereals
Gezkoy	35	4.6	Livestock + Fodder + Cereals
Masat	240	3.1	Livestock + Cereals + Fodder
Yaylapinar	100	2.8	Livestock + Beekeeping
Heybetepe	34	5.9	Livestock + Fodder + Bean
Total	464	3.8	-

Source: 1)Number of farm household and average farm size based on Socio-economic survey, June,2003, JICA
2)Farming type is prepared by field survey, June.2003.

D.4.5.3 Cultivation System

There are especially comparatively a lot of farmers who use a chemical fertilizer in the cultivation of alfalfa of Fodder crops. However, the farmer more than half the number is to grow according to manure. Alfalfa is 4 from 3 times a year harvests. Other crops use all seeds by a private collection though a part of guarantee seed is used for Alfalfa. All are the hand work and, besides, exist though are used the tractor in plow of the field. Therefore, it is a lease of a seed fee, a chemical fertilizer, and the tractor as the main production cost of grain and alfalfa. The amount of Fodder crops of consumption for one is two ton-30 tons a year, and has the difference depending on the possession number of domestic animals. The amount of sales of Fodder crops is a range of two ton-12 tons according to the farmer though differs. The sales farmer is only a farmer of the MC about five % as a whole.

Table D.4.5.3 Cultivate System of Major Crops

Crops	Cultivation season		Planting Density(cm)	Seed (kg/dec.)	Fertilizer (kg/dec.)	Irrigation (type)	Yield (kg/dec.)
	Planting,	Harvesting					
Wheat(autumn)	Oct.-Nov.	July-Aug.	Direct sown	15-20	10-20	-	200-300
Wheat(spring)	Mar.-Apr.	July-Aug.	Direct sown	15-20	10-20	Border	200-300
Barley	Oct.-Nov.	Jul.-Aug.	Direct sown	10-12	N.D	Border	120-150
Maize	May	October	Drill	N.D	N.D	Border	100-110
Alfalfa	Apr.-May	Jun.-Jul.	Direct sown	5.5-10	20-25	Border	400-600
Potato	Apr.-May	September	N.D	N.D	Manure	Border	2,500
Maize	May	September	N.D	N.D	Manure	-	120-130
Beans	May	September	N.D	N.D	Manure	Border	N.D
Apple	Apr.-May	Oct.-Nov.	N.D	N.D	Manure	-	N.D
Cherry	Apr.-May	July-Aug.	N.D	N.D	Manure	-	N.D

Source: Prepared by field survey, June-July, 2003

D.4.5.4 Irrigation

GDRS implemented small-scale irrigation projects in the MC during 1970s to 1980s, and those irrigation systems need to be rehabilitated and upgraded due to large water conveyance loss, especially the earthen canal portion. Water impounding may also be necessary to augment water supply capacity in summer season.

Irrigation land in Selected villages is about 30%. As the irrigation crops, wheat, alfalfa, potato, and dry bean are prior crops. Border irrigation system of the method of sprinkling water to crops is general. As for the irrigation method, it is very extensive, and the irrigation water loss in farm land is also large. However, the drip irrigation method is adopted in the vegetable cultivation in the greenhouse.

The farmer's water union or irrigation organization does not exist, and the waterway is maintained by joint work of the villagers. There will be traditionally no charge for the irrigation water, and the collection of the water supply expense etc. is not done. The head of a river and the waterway construction are due to the responsibility of GDRS.

D.4.5.5 Agricultural support

ORKOY credit plays an important role to support agricultural production increase. However, as ORKOY credit does not provide technical support but financial support only, past credit supports including dairy sheep, dairy cattle, meat cattle and apiculture often not sustainable to help increase farmers' income.

Table D.4.5.4 ORKOY Credit by Villages

Year	Maden	Gezkoy	Masat	Yaylapinar	Heybetepe
1984	-	-	-	-	Roof cover: 30 unit
1990	-	-	Beekeeping: 10 unit	-	Beekeeping: 1 unit
1992	-	-	Roof cover: 15 unit	-	-
1995	Cattle beef: 5unit	-	-	-	-
1999	Sheep: 4 unit	-	-	-	-
2000	-	Sheep: 4 unit	-	-	

Source: Prepared by field survey based on ORKOY data, June/2003

D.4.5.6 Rural Infrastructure

Rural electrification rate is 100% in all villages. Elementary school is available in all villages. There is a clinic in all villages but Altincanak. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children.

Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to

increased number of people who comes back from school and/or on vacation.

Coal is the most important heating energy in all villages since 1990s. Cow dung cake and branches of fruit trees and poplar trees are also used as a cooking and heating energy depending on season.

Table D.4.5.5 Basic Rural Infrastructure Condition by Villages

	Maden	Gezkoy	Masat	Yaylapinar	Heybetepe
1.Drinking water	100% (1985)	100% (1996)	100% (1975)	100% (2000)	100% (1976)
2. Electricity	100% (1983)	100%(1982)	100% (1983)	100% (1983)	100% (1983)
3. Communication	100%(1980)	100%(1980)	100% (1981)	100%(1989)	100% (1980)
4.Education	Exist (1975)	Exist(1967):closed	Rebuilding2000	Exist (1952)	Exist
Elementary school	Students: 100	Go to Baybrut city	Students: 190	Students: 50	Students: 22
Junior high school	Students: 200	(Total students: 22)	Students: 90	Junior high: 15 Go to Maden	Junior high:18 Go to Baybrut
5.Medical treatment	Exist (1964)	No exist	Clinic (1975)	No exist	Clinic (1994)
6.Sewage treatment	No exist	No exist	Exist (1975)	No exist	No exist
7. Main Fuels	Coal+Wood+CDC	Wood + CDC	Wood + Coal	Wood+CDC+popular	Wood+CDC+Coal

Note: CDC; Cow dung cake
Source: Prepared by field survey, June.2003

D.4.6 UC-14 MC : ISPIR

D.4.6.1 Agricultural Features

Total crops cultivated area of the five villages of Durukoy(343 ha), Gockoy(82 ha), Kockoy(216 ha), Koprukoy(288 ha) and Numanpasa(290 ha) estimated at 1,219 ha. Cultivated area is divided field crops, vegetables and fruits. Field crops is composed by Cereals and Alfalfa. Cereals is divided into wheat and barley, and wheat is for food, and barley is produced for domestic animal's fodder. The main fruit tree is apple, walnuts, and sour cherry. Moreover, the main vegetable is a tomato, cucumber, and an eggplant. As for these crops, majorities are produced for the own consumption or self-support of the livestock, exclude the potato.

Total crops cultivated area of sample village's account for 36% of the farmland area in the MC. Basiacli accounts for 50% of the crop area of sample village. The key of the farmer management is livestock (cow and sheep's milk production). Livestock is a key of management in other villages in similar. Only in Ozredere, potato and wheat besides livestock is valuable cash crop.They are mainly cultivated for home consumption or feeding their raised animals. Only exception is greenhouse vegetables, which are produced for marketing.

D.4.6.2 Farming Pattern

The number of total farmers of five villages is 422, and (*S) accounts for 65% by two villages

(Durkoy and Koprukoy) of these. In the farming of each village, Livestock is a center of farm household management.

However, the farmland area is a little, and the vegetable cultivation and the fruit tree of farming are assumed to be a center in Anticanak and Caglayan. Agriculture with the feature corresponding to the land possession area, the geographical features condition, and the weather condition is seen in this valley. Moreover, the farmland where the owner does not exist by out-migration is loaned by the relative and the acquaintance and used as arable land.

Table D.4.6.1 Farm Size and Farming Pattern

Sample Villages	No. of farm household	Average Farm size	Farming type
Durukoy	104	3.3 ha	Livestock + Beekeeping
Kockoy	60	1.7 ha	Livestock
Koprukoy	160	3.6 ha	Livestock + Bean
Numanpasa	50	1.8 ha	Livestock + Alfalfa + Bean + Beekeeping
Gockoy	48	5.8 ha	Livestock + Fodder + Wheat + Vegetable
Total	422	3.2 ha	-

Source: 1)Number of farm household and average farm size based on MARA, District Office data, 2003
2)Farming type is prepared by field survey, June.2003.

D.4.6.3 Cultivation System

Yield of main crops are some 20% lower than those produced in normal village. The reasons for the lower yield are attributed to the less dosage of seed and fertilizer and to cultivation technique. Wheat, barley and alfalfa are mainly cultivated for home consumption or feeding their raised animals. Only exception is greenhouse vegetables, which are produced for marketing.

Therefore, it is a lease of a seed fee, a chemical fertilizer, and the tractor as the main production cost of grain and alfalfa. The price of the wheat seed is 6,000TL for every 30kg.

Moreover, a chemical fertilizer is 22,000TL for every 50kg, and the price rises by 30% or more compared with 2000. The tractor is used from the labor shortage for plow of the field.

The cost of the operator is 18,000 TL an hour, and the gasoline fee is added to this. Moreover, the skin addition is 2,000TL while the amount of sales without the skin is 12,000TL for each kg in the pignut of fruit trees. The worked all according to human strength in the age when manpower was abundant. However, the lack of the family manpower is caused by an increase in Out-migration. The lack of the family manpower is a result of producing a big influence on an agricultural output and an agricultural profitability.

Table D.4.6.2 Cultivate System of Major Crops

Crops	Cultivation season		Planting Density(cm)	Seed (kg/dec.)	Fertilizer (kg/dec.)	Irrigation (type)	Yield (kg/dec.)
	Planting,	Harvesting					
Wheat(autumn)	Oct.-Nov.	July-Aug.	Direct sown	15-20	20-25	-	150-300
Wheat(spring)	Mar.-Apr.	July-Aug.	Direct sown	15-20	20-25	Border	150-300
Barley	Oct.-Nov.	Jul.-Aug.	Direct sown	10-12	N.D	Border	120-150
Maize	May	October	Drill	N.D	N.D	Border	100-110
Alfalfa	Apr.-May	Jun.-Jul.	Direct sown	9-10	20	Border	250-300
Potato	Apr.-May	September	N.D	N.D	Manure	Border	2,500
Maize	May	September	N.D	N.D	Manure	-	120-150
Beans	May	September	N.D	N.D	Manure	Border	N.D
Apple	Apr.-May	Oct.-Nov.	N.D	N.D	Manure	-	N.D
Cherry	Apr.-May	July-Aug.	N.D	N.D	Manure	-	N.D
Walnut	May-Jun.	Oct.-Nov.	N.D	N.D	Manure	-	N.D

Source: Prepared by field survey, June-July, 2003

D.4.6.4 Irrigation

GDRS is implemented irrigation from 1970's to 1980's in the small scale all villages. The irrigation canal becomes superannuated, and the irrigation efficiency has decreased in the irrigation area. Because the irrigation waterway is a soil waterway, the irrigation loss is large. Moreover, majority of the irrigation canal constructed by earth therefore, the irrigation loss is large.

D.4.6.5 Rural Infrastructure

Rural electrification rate is 100% in all villages. However, there is a case in the Cevizli village where the communication network has been disrupted for more than six months due to flood and landslides. Elementary school is available in all villages. There is no junior high school in Altincanak and Sapaca, where students go to Kirazli and Uzundere, respectively by school bus. There is a clinic in all villages but Altincanak. But there is neither a doctor nor a nurse in any of clinics. They are used only at vaccination for children.

Drinking water supply system has been established and maintained in all villages. However, supply amount become short in summer season because of the increased demand due to increased number of people who comes back from school and/or on vacation.

Coal is the most important heating energy in all villages since 1990s. Cow dung cake and branches of fruit trees and poplar trees are also used as a cooking and heating energy depending on season. In the Sapaca village, sewage treatment system has been established by GDRS.

Table D.4.6.3 Basic Rural Infrastructure Condition by Villages

	Durukoy	Kockoy	Koprukoy	Numanpasa	Gckoy
1.Drinking water	100% (1996)	100%	100% (1998)	100% (2000)	100% (2000)
2. Electricity	100% (1985)	100%	100% (1982)	100% (1984)	100% (1974)
3. Communication	100%(1980)	100%	100% (1980)	100% (1979)	100% (1989)
4.Education	Exist (1962)	Exist (1967)	Exist	Exist (1994)	Exist (1948)
Elementary school	Students: 50	Students: 23	Students: 30	Dormitory in	Total students: 100
Junior high school	Dormitory in ISPIR city: 25	Dormitory in ISPIR city: 15	Students:30 Go to ISPIR	ISPIR city	
5. Medical treatment	Clinic (1990)	Clinic (1996)	Clinic (1993)	No exist	Clinic (1968)
6.Sewage treatment	No exist	No exist	Exist(1951)	Exist (1966)	Under construction
7. Fuels	CDC + poplar	CDC + Wood	Wood+ poplar	Popular+Coal+Wood	CDC + Coal

Note: CDC; Cow dung cake
Source: Prepared by field survey, June.2003

D.5 Agricultural Project for Livelihood Improvement Plan

D.5.1 Problems Causes and Proposed Solutions

In many of the selected villages pensions are the single most significant source of household income. However, increasing household incomes derived from agricultural activities is essential for sustainable improvement of incomes. In general, most parts of the Study Area have a comparative advantage in the livestock sector. Thus, increasing agricultural incomes through improvement of the livestock sector (milk, cheese, meat) is likely to be an effective method of improving household incomes. Livestock production is dependent on the provision of summer feed from grazing pastures and winter feed from preserved hay and fodder crops grown in summer, together with better breeds and veterinary care. The former can be largely achieved by improving upland and lowland pastures and by better systems of controlled grazing of rangelands, which will also rehabilitate eroded areas and minimize further soil erosion. The latter can be achieved by improving hay-making systems (minor mechanization) and through improved crop cultivation systems that link to the livestock sector.

In addition, increased production of crops (vegetables, fruits) for household consumption and sale of surpluses through intensification of production systems will improve household livelihoods. Another option for improving household livelihoods is diversification into other activities (apiculture, high value crops such as strawberries – provided economic markets are developed), capitalizing on the available natural resources. The problem for the livelihood improvement in the selected MCs is divided into the following aspects; i) Low productivity of livestock and crop production, ii) Difficulty in intensifying agriculture, iii) Irrigation, iv) Marketing, v) Agricultural research, extension of agricultural technology and general improvement of the agricultural support system. In the following, proposes measures against these problems.

(1) Low productivity of livestock and crop production

Causes/Trends

The best potential for increasing agricultural incomes lies in the livestock sector. The main constraints are lack of winter feed, which restricts liveweight gain and milk production, and the conventional breeds of cattle, which restrict the potential productivity. Crop production is the second major source of agricultural income after livestock. It is constrained by many factors, including small scattered fields which are not suitable for mechanized cultivation, poor soils, inadequate irrigation coverage, harsh dry climatic conditions, genetically poor seeds, insufficient fertilizing and poor availability of advice on agricultural problems. The general trend in agricultural productivity is probably downwards, because of continued degradation of soils, or at best neutral.

Measures for Solution

Farmers continually complain of inadequate agricultural extension services, insufficient irrigation coverage of cropping fields and inadequate, unreliable irrigation water. Increased production of summer crops through intensified production, new varieties of high-productivity crops and minor mechanization, and better systems for storage and feeding of fodder crops for winter feed for stall-feeding, are important solutions**.** The maintenance and improvement of soil fertility is being neglected in many Forest Villages.

Increasing the quantity and quality of milk and meat depends on better feeding, better breeds of cattle and improved veterinary services. Better systems for marketing agricultural products to achieve acceptable prices, including cool storage of fruits and milk, are important solutions. However, expensive facilities such as dairy factories and cool stores require assurance of reliable regular supplies of products of good quality.

Techniques/Agencies

The techniques include: extension of irrigation coverage and improvement of water delivery systems and management; improved extension advice through written, electronic and verbal means; better crop seeds; improved orchards; greenhouses for fruit and vegetable production; improved apiculture; better fertilizer and manure management to improve soils; minor mechanization; better systems for preservation, storage and feeding of winter feeds; better conditions (ventilation, cleanliness) in the barns during the long winter; better breeds of livestock; better veterinary services; and greatly improved marketing systems for meat, milk and other agricultural products. Active support from MARA is essential for improving the productivity of livestock and crops, and the storage and marketing of agricultural products. Easier access to affordable credit for agricultural intensification is essential. ORKOY may be able to offer limited assistance.

(2) Difficulty in intensifying agriculture

Causes/Trends

In order to develop intensive agriculture, seeds, fertilizer, chemicals, especially through greenhouses, minor mechanization and better irrigation, easier access to affordable credit is necessary. Farmers have great difficulty in obtaining investment capital under current agricultural credit conditions, where the interest rates can be 65-70% (Agricultural Bank of Turkey: TCZB) and 30 to 35% of Agricultural Credit Cooperative (TKK). In case of ORKOY interest rate is 10%(FY2003).

Measures for Solutions

A low-interest agricultural credit system is necessary for promoting intensive agriculture. Better cultivation techniques using minor mechanization, improved use of fertilizers and manures, greenhouses and reliable irrigation water are helpful. Better extension services,

improved management of farm finances and better marketing will assist in taking full advantage of the potential improvements in agricultural production

Techniques/Agencies

Though the Agricultural Bank and Agricultural Credit Cooperative (TKK) have nationwide networks, acquisition and repayment of credit is difficult for farmers in Forest Villages, mainly due to the high interest rates. Therefore, ORKOY should become more active in assisting these farmers in every possible way

(3) Irrigation

Causes/Trends

Improvement of the irrigation infrastructure and the efficient supply and management of reliable irrigation water are the most important factors in improving agricultural production in Forest Villages. During the period from the 1980s to mid-1990s GDRS constructed irrigation facilities such as intake structures and main canals, but these have generally not been properly maintained and are now becoming less functional. Concrete canals may be damaged, and earth canals lose large amounts of water through seepage. Insufficient and unreliable irrigation water seriously decreases the effective irrigated areas and thus crop production, and limits efficient usage of the limited areas of cultivable land. Rehabilitation and maintenance of irrigation facilities are expensive so farmers tend to neglect these activities. The productivity of existing irrigated areas declines and new irrigated land is not created. The general trend in most Forest Villages is probably downwards.

Measures for Solutions

Most of the existing irrigation system consists of earth canals, which lose water through seepage. They should be concrete-lined to improve efficiency. Rehabilitation of irrigation facilities should be based on existing canals. Construction of new canals in the Study Area is undesirable, not only because of the difficulty of finding suitable land in areas with complex topography, but also because of its possible negative impacts to the environment. New canal systems are expensive, and also the total supply of water may not be sufficient for both the existing system and the extended system. Rehabilitation of existing irrigation facilities will enlarge irrigated areas, support the livestock sector through increased forage production and will enable the introduction of highly profitable crops. However, considering the limited water supplies in most villages and the scarce rainfall, much better water management is necessary.

Techniques/Agencies

Though the farmers have experience in irrigation, water management techniques for given crops must be improved. GDRS is the responsible agency for development of small-scale irrigation facilities smaller than 500L/s. After construction is completed by GDRS, the irrigation facilities are transferred to the Muhtars and the villagers become responsible for operation and maintenance. However, GDRS does not provide any technical extension services, including

advice on operations and maintenance for irrigated agriculture, and MARA does not have any responsibility for construction of irrigation facilities. Therefore, there are no agencies responsible for the extension of irrigation techniques. Under these circumstances, ORKOY must arrange technical training on irrigation techniques, water management and operation and maintenance of irrigation facilities, with the cooperation of the villagers

(4) Marketing

Causes/Trends

In the Study Area, there are very limited amounts of products (crops, dairy products) surplus to home consumption and which are available for sale in the markets. Standardization of product quality and securing stability of the quantities available for sale are the basic issues for improving marketing. Farmers lack reliable market information, and are generally unable to adjust their dispatch of agricultural products to avoid periods of over-supply (which produce low prices) and to take advantage of periods of shortage (to receive better prices). They need cool storage facilities to smooth the dispatch of products to markets, especially if production of perishable products such as fruit is increased through project interventions.

Measures for Solutions

Increase of crop and fruit production, in terms of both quantity and quality, through improved productivity is the basic solution for marketing problems.

Introduction of improved breeds of cattle, increased production of fodder crops and intensive agriculture supported by increased irrigated areas and more efficient irrigation systems are necessary to achieve this. Establishment of village or local facilities for cool storage and scheduled dispatch of agricultural products to markets are effective measures for taking advantage of market price trends.

Techniques/Agencies

Farmers with greenhouses and improved fruit orchards in Uzundere have made direct contracts with private supermarkets and have established stable methods for sale and dispatch at acceptable prices. They have systems for acquisition of market information, and are able to adjust dispatch times and product qualities. The responsibility for these improvements must therefore be largely accepted by the farmers, but they should be assisted where possible by MARA.

(5) Agricultural research, extension of agricultural technology and general improvement of the agricultural support system

Causes/Trends

There is potential for improving livelihoods through diversifying agricultural production into activities such as apiculture and production of highly profitable fruits and crops, in addition to improving incomes from livestock and current crops. Basic support in farmer-directed applied

research and agricultural extension is needed. Pests and diseases of livestock, fruits and crops are serious problems.

Measures for Solutions

Both MARA and GDRS need to reinforce their research institutes especially at its Provincial levels. Re-training and increasing the numbers of technical extension officers are essential. Research should be farmer-directed and new techniques proven on-farm. On the job training at village demonstration farms can be very effective for training farmers in better solutions for their problems.

Techniques/Agencies

The agencies responsible for agricultural research are under MARA and GDRS. Technical extension courses and dispatch of extension officers by ORKOY, in cooperation with MARA and University research institutes, are necessary. The use of private agricultural consultants can be effective when extension services by government agencies are not being delivered.

D.5.2 Proposed Livelihood Improvement Programs/Projects

The measures for solution mentioned above need to be interpreted into practical projects. The following programs/projects are formulated as a means to execute the measures for solution in each MCs.

(1) Development of agricultural productivity program

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

(2) Development of stall feeding and livestock productivity program

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

(3) Development of other income generating activities program

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

(4) Strengthening of support systems program

Agricultural, livestock and other income generation programs and activities will be supported selectively by provision of adequate agricultural extension services and technical assistance; provision of livestock extension services, technical assistance and veterinary services; provision of credit support with suitable terms and under acceptable cost-sharing conditions, strengthened monitoring of appropriate utilization of credit assistance; and promotion of a

small scale mechanization development-assistance.

The content, the effect, and the cost etc. of proposed programs are summarized as following profile and presented.

(1) Program/Project: Irrigation Improvement

1. Project Title : Irrigation Improvement				
2. Target Beneficiaries Forest villagers (irrigation farmer)		3. Project Duration 5 years		
4. Implementing Agency / Body Ministry of Environment and Forestry (MEF) GDRS				
5. Summary of Objective - Enlargement of irrigation areas through repair and rehabilitation of existing irrigation facilities - Improvement of agricultural production and utilization rates of farm land through enlargement of irrigation areas				
6. Justification Having the highest comparative advantage in terms of economic activities, livestock sector is the largest source of agricultural income in the catchment. Though increased production of fodder crop is necessary for increasing and stabilizing agricultural income, the sever lack of water during the summer, which is the growing season for crops, limits the production of fodder crop as well as numerous other crops. Rehabilitation of irrigation facilities will enlarge irrigated areas and will enable the improvement of utilization rates of farmland. Consequently, this will contribute to the increased production of fodder crops as well as other crops such as cereal, vegetables and fruits.				
7. Expected Benefits/Outputs - Improved utilization rates of farmland - Improved yield of crops such as fodder crops, cereals ar vegetables. - Increased production of crops - Increased number of livestock	8. Verifiable Indicator - Changes in cultivated area (increase/decrease) - Changes in yield per unit area (decar) - Changes in production of respective crops for both farm household and whole village - Changes in number of livestock that are raised/sold for both farm household and whole village			
9. Important Assumptions / Conditions for the project - Irrigation facilities equipped by the GDRS or Villagers already exists - Cooperation by GRDS and MARA should be able to be received - Needs for enlargement of irrigation areas through repair and rehabilitation of existing irrigation facilities are present				
10. Project Linkage / Other Sector Linkage - Coherence with program such as "Rangeland management program" and "Greenhouse development project"	11. Relevant Agencies to be Coordinate - Irrigation plan prepared by GDRS - Agricultural development plan prepared by MARA			
12. Major / Key Activities	13. Major Inputs			14. Estimated Unit Cost (1,000 TL)
	Personnel	Materials	Construction	
1) Water supply facility New canal ：Concrete lining			X	1 m : 23,018
Rehabilitation canal：Concrete lining			X	1 m : 11,509
Pipeline			X	D=50cm: 20,160
Farm Pond			X	$1m^3$ = 34,400
2) Irrigation agricultural extension assistance	X			
3) Improvement of operation & maintenance system	X			
16. Necessary External Inputs / Assistance / Arrangement				
Finance cooperation		X	X	
Technical cooperation for irrigation agriculture	X			
Technical cooperation for O/M system	X			

(2) Program/Project: Greenhouse promotion

1. Project Title : Greenhouse promotion				
2. Target Beneficiaries Forest villagers (irrigation farmer)			3. Project Duration 5 years	
4. Implementing Agency / Body Ministry of Environment and Forestry (MEF): ORKOY				
5. Summary of Objective - Increase of greenhouse - Promotion of intensive agriculture - Improvement of agricultural income				
6. Justification Cultivated period is short in the Study Area, and small the arable land area, too the spread of greenhouse is indispensable to improve an intensive agricultural. Greenhouse is effective to introduce crops with a high profitability. There are already an experience and results about cultivation which uses greenhouse. Therefore, it is judged that the spread of greenhouse is easy.				
7. Expected Benefits/Outputs - Improved utilization rates of farmland - Improved yield of crops such as high profitable vegetables (cucumber, tomato, eggplant, etc.,). - Increased of employment opportunities - Increase of agricultural income	8. Verifiable Indicator - Change in yield of crops - Changes in production of respective crops for both farm household and whole village - Changes of agricultural income			
9. Important Assumptions / Conditions for the project - Irrigation facilities equipped by the GDRS or Villagers already exists - Cooperation by MARA technical extension should be able to be received - ORKOY credit should be able to received				
10. Project Linkage / Other Sector Linkage - Irrigation improvement project	11. Relevant Agencies to be Coordinate - Irrigation plan prepared by GDRS - Agricultural development plan prepared by MARA			
12. Major / Key Activities	13. Major Inputs			14. Estimated Unit Cost (1,000 TL)
	Personnel	Materials	Construction	
1) Greenhouse 1 set	X	X	X	1 set: 500m^2 295,925,000
2) Agricultural extension assistance	X			
3) Improvement of operation & maintenance system	X			
16. Necessary External Inputs / Assistance / Arrangement				
Finance cooperation		X	X	
Technical cooperation for irrigation agriculture	X			
Technical cooperation for O/M system	X			

(3) Program/Project: Marketing Improvement

1. Project Title : Marketing improvement				
2. Target Beneficiaries Forest villagers (irrigation farmer)			3. Project Duration 3 years	
4. Implementing Agency / Body Ministry of Environment and Forestry (MEF): ORKOY				
5. Summary of Objective - Improvement of collect and shipment agriculture products - Improvement of marketing system				
6. Justification The harvest loss occurs by agricultural products because there are no collection and shipment of facilities. The collect and shipment are necessary to reduce the harvest loss, and to increase the amount of sales of agricultural crops. The construction of the collection of cargo and the shipment facilities is indispensable to improve circulation of farm products. The improvement of the collection and shipment facilities comes to be able to fixed amount of crops are surely shipped. And trust in the market distributor will be established. The construction of the collection and the shipment facilities is expected not only the circulation improvement of farm products but also to be used multipurpose , saying that farmer's meeting facilities.				
7. Expected Benefits/Outputs - Increased of agricultural products for market - Improved of agricultural income through the increased of sales products - Improvement of products quality	8. Verifiable Indicator - Change of shipment volume of products - Change of agricultural income			
9. Important Assumptions / Conditions for the project - Cooperation in a joint shipment of villagers should be able to be received - Crops cultivation period and cultivation method must be defended. - Cooperation by MARA technical extension should be able to be received - ORKOY credit should be able to received				
10. Project Linkage / Other Sector Linkage - Irrigation improvement project	11. Relevant Agencies to be Coordinate - Adjustment with ORKOY credit plan - Agricultural development plan prepared by MARA			
12. Major / Key Activities	13. Major Inputs			14. Estimated Unit Cost (1,000 TL)
	Personnel	Materials	Construction	
1) Collection and shipment facility	X	X	X	1 set: : 2,000m^2 60,000,000
2) Agricultural extension assistance	X			
3) Improvement of operation & maintenance system	X			
16. Necessary External Inputs / Assistance / Arrangement				
Finance cooperation		X	X	
Technical cooperation for irrigation agriculture	X			
Technical cooperation for O/M system	X			

(4) Program/Project: Fruits Orchard Rehabilitation

1. Project Title : Fruits Orchard Rehabilitation				
2. Target Beneficiaries Forest villagers (irrigation farmer)		3. Project Duration 3 years		
4. Implementing Agency / Body Ministry of Environment and Forestry (MEF): ORKOY				
5. Summary of Objective - Replanting of old frits trees - Improvement of productivity				
6. Justification In STUDY area, various fruits are produced. Many of fruits tree is becoming superannuated, and however, amount decreases, and production decreases. Moreover, the quality decreases because the tree is old, too and the shipment to the market is difficult. Therefore, the majority is for private consumption. The improvement of amount and the shipment to the market become possible by the replanting of the old trees, and the improvement of an agricultural income can be expected.				
7. Expected Benefits/Outputs - Increased of fruits yield per tree - Improved of agricultural income through the increased sales of fruits - Improvement of products quality	8. Verifiable Indicator - Change of shipment volume of products - Change of agricultural income			
9. Important Assumptions / Conditions for the project - Cooperation by MARA technical extension should be able to be received - ORKOY credit should be able to received				
10. Project Linkage / Other Sector Linkage - Irrigation improvement project	11. Relevant Agencies to be Coordinate - Adjustment with ORKOY credit plan - Agricultural development plan prepared by MARA			
12. Major / Key Activities	13. Major Inputs			14. Estimated Unit Cost (1,000 TL)
	Personnel	Materials	Construction	
1) Fruit orchard rehabilitation	X	X	X	1 ha= 385,500
2) Agricultural extension assistance	X			
3) Improvement of operation & maintenance system	X			
16. Necessary External Inputs / Assistance / Arrangement				
Finance cooperation		X	X	
Technical cooperation for irrigation agriculture	X			
Technical cooperation for O/M system	X			

(5) Program/Project: Small scale mechanization development

1. Project Title : Small scale mechanization development assistance				
2. Target Beneficiaries Forest villagers (irrigation farmer)		3. Project Duration 1 years		
4. Implementing Agency / Body Ministry of Environment and Forestry (MEF): ORKOY				
5. Summary of Objective - Improvement of tractor and mower - Improvement of operator				
6. Justification In Study Area, the labor shortage is serious as the population decreases. Lack of manpower has brought the decrease in productivity. Moreover, the decrease of the cultivated land leads to the deterioration of a natural environment.				
7. Expected Benefits/Outputs - Increased of land and labor productivity - Improved the agricultural production - Improvement of agricultural incme	8. Verifiable Indicator - Change of cultivated land use ratio - Change of yield			
9. Important Assumptions / Conditions for the project - Cooperation by MARA technical extension should be able to be received - ORKOY credit should be able to received				
10. Project Linkage / Other Sector Linkage	11. Relevant Agencies to be Coordinate - Adjustment with ORKOY credit plan - Agricultural development plan prepared by MARA			
12. Major / Key Activities	13. Major Inputs			14. Estimated Unit Cost (1,000 TL)
	Personnel	Materials	Construction	
1) Tractor and mower	X	X	X	1 set: 30,000,000
2) Agricultural extension assistance	X			
3) Improvement of operation & maintenance system	X			
16. Necessary External Inputs / Assistance / Arrangement				
Finance cooperation		X	X	
Technical cooperation for irrigation agriculture	X			
Technical cooperation for O/M system	X			

D.5.3 Agricultural Production Plan

A basic policy of the activities plan in MCs was described with 5.1 and 5.2 each section. Moreover, the content and the implementation schedule of the plan of concrete MCs were described to Annex J. Micro Catchment Plan. Here, the benefit and cost propose the introduction crops for Irrigation.

D.5.3.1 Proposed Production Cost

As for MCs, the condition of agricultural production is greatly different between the weather condition and the geographical features condition. Therefore, it is natural that the production cost is also different in each MCs. Moreover, the production cost is different in MCs. Each crops were settled on based on the production cost in MARA Regional Office of Artvin where MCs was located, Erzurum, and Baybrut when the production cost was settled on because various like this production costs existed.

Table D.5.3.1 Production Cost

unit: 1,000 TL/da

Wheat	Brley	Maize	Rice	Alfalfa	Cayil	Dry beans	Cucumber	Tomato	Potato	Strawberry
158,343	103,977	266,630	311,934	107,169	71,974	346,354	1,047,461	746,573	583,479	2,964,500
Walnut	Peach	Olive	Dut	Apple	Pear	Queens	Sourche.	Cherry	Hazelnut	
405,575	291,451	434,819	188,825	327,596	368,926	245,902	246,783	135,065	175,643	

Source: Prepared by Field Survey Based on Arvin, Erzrum MARA Regional Office Data, 2003

D.5.3.2 Proposed Yield, Farmers Gate Price, Gross Income and Net Income

It is cropping pattern which centers on crops such as wheat and barley in the farmland of the no irrigation condition in Choruh river. The cultivation of fodder crops, the vegetable, and the fruit tree is difficult without irrigation. However, high yield and profits can be expected with irrigates. Proposes yield, farmers gate price, and gross income and net Income by the execution of irrigation as follows.

Table D.5.3-2 Proposed Yield, Farmers Gate Price, Gross Income and Net Income

Crops	Yield (kg/da)	Farmers gate price (1,000TL/kg)	Gross income (da) (1,000TL/kg)	Net income (da) (1,000TL/kg)
1. Cereals				
Wheat	200	240	48,000	-110,340
Barley	-	240	54,000	-49,977
Maize	275	400	110,000	-156,630
Rice	200	1,160	232,000	-79,934
2. Fodder				
Alfalfa	563	200	112,500	5,331
Sainfoin	-	200	105,000	-
Cayil	338	225	75,938	3964
3. Vegetables				
Fresh beans	350	300	105,000	-
Cucumber	3,500	333	1,163,750	116,289
Tomato	3,200	300	960,000	213,427
Eggplant	500	480	240,000	-
Pepper	450	400	180,000	-
Potato	1,500	396	594,000	10,521
Strawberry	3,500	950	3,325,000	360,500
Dry beans	200	2,000	400,000	53,646
4.Fruits				
Grape	850	480	408,000	-
Walnut	550	1,600	880,000	474,425
Peach	1,125	640	720,000	428,549
Olive	360	1,700	612,000	177,181
Anzu	900	800	720,000	-
Apple	1,100	360	396,000	68,404
Pear	900	400	360,000	-8,926
Queens	800	1,000	800,000	114,099
Dut (kuwa)	750	400	300,000	111,175
Sour Cherry	900	400	360,000	113,217
Nar (zakuro)	1,000	800	800,000	-
Cherry	975	400	390,000	254,935
Hazelnut	-	1,200	132,000	-43,643
5.Apiculture	30	4,000	120,000	-

*1.Gross income: average yield x farmers gate price
*2.Net income: gross income – production cost
Source: Prepared by Artvin, Erzurum Regional Office Data, 2002

D.5.3.3 Cropping Pattern by MCs

It is assumed expansion of cropping area plan based on irrigation in the plan. Crops give priority and introduce high profitable crops. There is a high comparative advantage in livestock in MCs. Therefore, to support stock raising, fodder crops is introduced as top priority crops. Moreover, the introduction of a suitable vegetable and fruits intensive agriculture is aimed at. However, because wheat is staple food, introduces regardless of the profitability. Following shows the proposed cropping pattern by MCs.

Table D.5.3.3 Proposed Cropping Pattern by MCs

	Savsat BT-04	Yusufeli MC-03	Uzundere TR-06	Ispir UC-14	Bayburt UC-03	Oltu OL-04
Cultivated area	1,301	2,602	2,895	1,219	1,687	1,072
Irrigation area	911	1,821	1,948	853	1,181	750
1. Cereals						
Wheat	104	192	354	138	102	143
Rice		55				
2. Fodder						
Alfalfa	353	678	731	311	551	266
Cayil	164	323	343	136	220	115
3. Vegetables						
Cucumber	7	12	20	8		11
Tomato	9	16	27	12	12	11
Potato	15	28	28	17	28	23
Strawberry	8	15	20	11	11	11
Dry beans	13	24	9	15	17	5
4.Fruits						
Walnut	43	41	60	34		33
Peach	21		41	21	12	9
Olive	7	14				
Anzu	14	24	22	5	22	4
Apple	42	84	83	39	54	29
Pear	23	47			42	
Sour Cherry	42	85	85	40	52	33
Cherry	47	95	100	44	55	36

E. Livestock and Rangeland Management

CONTENTS

E.1 EXISTING CONDITIONS IN CORUH BASIN

E.1.1 Background

This report analysis the development conditions of livestock, pastures and forage production in the Coruh Basin. The coverage includes the present conditions, constraints to development, key issues that need to be addressed to utilize the development potential in a sustainable and environmentally desirable manner. Recognizing that the main cause of degradation is rural poverty, the report emphasizes the potential role of livestock and pasture improvement to reduce rural poverty and thereby the pressure on the forest environment.

The second part of this report presents a livestock development program for six selected micro catchments. Development projects for both livestock and pasture improvement are presented. A discussion of costs of the proposed programs, their impact, and financial viability is included.

There are two interfaces between livestock raising practices of farmers and the forest environment. One is the grazing pressure on the forest areas and the pressure that this creates for forest regeneration. Overgrazing also removes the vegetative cover of pastures and is a main cause of soil erosion. This aspect of the interaction is the main focus of this paper.

The other interface is the role of pastures and livestock as an alternative income source. Illegal logging by the poor farmers is recognized as a main contributor to deforestation. Providing alternative sources of income will reduce the pressure on forests as a source of livelihood. Management of the pastures in the most rational manner will reduce soil erosion, and will contribute to the national economy and accelerate regional economic development. This role that pastures and livestock can play in regional development can be very significant. The area under pastures is as large as the forest areas. The increasing role of pastures as a feed source can reduce production costs of livestock products. This will benefit the consumers and will contribute to the improvement of international competitiveness of the Turkish livestock sector.

Improvements in livestock productivity can make substantial contributions to incomes from livestock and reduce the poverty driven pressure on forest areas. Livestock is reported to provide 60% of income in the forest villages. Livestock is also the main source of income in nearly half of the villages (Table 1). Further development of the livestock can thus reduce poverty in forest villages and reduce the pressure on the forests.

Bee keeping is not covered by this report, though it presents large opportunities for income generation. Other components of livestock such as poultry and fresh water fisheries also present environmentally friendly and sustainable sources of production.

E.1.2 Herd size, composition, and production

E.1.2.1 Livestock herd size

The size of livestock population in Coruh Basin in 2001 is given in Table 2. This is the equivalent of 216,273 Livestock Units of cattle, sheep, and goats. Only 11% of this was in sheep and goats and all of the rest was cattle (Table 3).

There is a broad correspondence between the number of livestock in each district and the availability of pastures. This correlation is particularly strong in the case of sheep: districts with large pasture areas (Ardanuc and Savsat in Artvin; Narman, Oltu and Tortum in Erzurum; and Merkez in Bayburt) tend to have a relatively large livestock population (Table 2).

The number of animals has declined in the Coruh Basin for all types of livestock (Table 3). The herd size has declined from 321,043 Livestock Units (LU) in 1991 to 216,273 LU in 2001.

Cattle has always been the dominant livestock type and this dominance has increased in recent years. The sheep/ goat herd in the Region is small, in terms of livestock units, and its size has declined steadily over the last decade. The share of sheep and goats in livestock is smallest in Artvin, intermediate in Bayburt and relatively more significant in Erzurum.

The size of sheep/ goat herd in 2001 is less than half of what it was in 1991 as shown below. The decline is similar in all three provinces in the Coruh Basin.

		Artvin	Bayburt	Erzurum	Total
1991	Sheep/Goats	193,490	256,333	347,164	796,987
	Cattle	104,823	87,970	186,439	379,232
2001	Sheep/Goats	81,625	102,913	108,811	293,348
	Cattle	64,778	62,990	163,729	291,503

Refer to table 3 for detail

The decline in sheep/goat herd size is a response to a number of factors. The change in demand favors beef over mutton and cow milk over sheep/goat milk. A large part of mutton output was traditionally exported to Middle Eastern countries and these markets have declined with the problems on the Iraqi border on the south. This has caused a decline in the mutton price and the farmers have reduced the size of their sheep herds.

The security problems in East and Southeast Anatolia during the last decade led to closure of some areas of pastures for security reasons. The farmers reduced the sheep herd dramatically when their access to pastures was curtailed. In cattle, cut hay and forage production substituted for this loss of pastures but such a shift is not possible for sheep/goats.

E.1.2.2 Changes in herd composition

Significant changes have occurred in the composition of cattle herd. Low productivity native cattle are being gradually replaced by cross-breeds and pure breed cattle (Table 4). This change is accompanied by a shift from pasture based feeding to a new system more dependent on cultivated forages and concentrate feed.

Available data on the breed composition of cattle herds show a large decline in the number of native cattle. The available data for Bayburt in 2001 shows that there are nearly no native cattle left. The situation is similar in Artvin and to some degree also in Erzurum. Cross breeding programs using both natural and artificial insemination of native cows have resulted in conversion of the native cattle herds into cross breeds at various crossing levels.

The change in the number of pure-bred cattle is quite interesting. During the years when there were large subsidized government programs for imports and distribution of purebred (1995-1997), the number of pure breed cattle increased. Many farms, which could not achieve the required productivity levels, lost money and sent the pure bred breeding stock for slaughter. That is the reason why the number of exotic cattle fluctuates during the last 10 years in all three provinces.

E.1.2.3 Herd size and production

The government does not consider the decline in the cattle herd size particularly problematic. In fact, the decline is consistent with the government livestock development strategy. This strategy is based on achieving higher production from a smaller herd size. It is possible to achieve substantial growth rates in livestock products while the size of livestock herd is reduced.

Cattle is the dominant source of both milk and meat production. In 1998, cattle produced 88.6% of all milk and 61.5% red meat production in Turkey[1] and these shares are increasing steadily. Cattle production systems may be considered to vary from a wide span covering low productivity, extensive pasture based systems to intensive in-stall production systems. The productivity differences between these systems are very large.

The differences in productivity between the extensive pasture based systems and intensive practices is a result of large differences in productivity parameters. Productivity in livestock is a result of a number of interrelated parameters. These include the proportion of productive cattle in the herd and production per head in the productive categories. The proportion of productive cattle,

[1] The Report of Specialized Committee of Eight 5-Year Development Plan. pp.49-50.

in turn, is affected by the livestock practices, breed types, and feeding systems. All of these are very different between the extensive and intensive livestock practices.

The milk yield from the local cows under the traditional pasture based systems is estimated to be 816 liters per year. The milk yield of pure breed cows is estimated to be 4080 kg under intensive management. Average milk production at present in Turkey is 2002 liters per cow[2].

The productivity of cattle herds in the Region is extremely low. The research done by Eastern Anatolia Research Institute reports average milk yields to be 697, 1218 and 2067 kg/annum for the local, cross-bred, and pure bred cattle. The milk yield of pure breed cattle in the region seems to be similar to the national average of all types. Dairy farms can not cover their costs with this low level of yields.

Similarly, the proportion of milking cows in the herd varies between intensive and pasture based systems. This results from intermediate parameters on: age at first pregnancy; length of period the cow remains dry; and other production related parameters. Considering the yield per cow and the other related parameters, the differences in milk production per head of the cattle herd may be as high as eight times.

There are large differences in meat production between the different systems, though the difference on this parameter is not as large as that of milk yields. The first measure of productivity in meat production is the amount of meat produced per head of cattle. Average carcass weight of cattle slaughtered was 158 kg in Turkey in 1998. The carcass weight in native cattle is estimated to be around 110 kg and over 250 kg in purebred cattle. Development of cattle under extensive systems is very slow due to poor breed, insufficient feeding, and lack of veterinary service. Cattle reach slaughter weight in three years of age in traditional systems. In contrast, cattle reach mature weight at around 20 months in the intensive systems. These differences in herd parameters lead to different off-take rates: a much higher proportion of cattle can be slaughtered each year under the efficient systems with a constant herd size. This higher off-take rates and the higher average carcasses lead to large differences in herd productivity for meat production.

The other measure of productivity in meat and milk production is the feed conversion efficiency. Extensive systems are more dependent on pastures for the feed intake, which is basically free to the farmers. These systems, however, are inefficient in converting the feed base into meat and milk. The differences in feed conversion efficiency can have a very large impact on total feed demand. Furthermore, the type of forage demanded is also different between the different systems. The only source of feed under the extensive systems during summer is pastures.

[2] SPO, Livestock Sector Report, Ankara 2001

Animals are put out to pastures as soon as snow melts and are kept there until it snows again. Intensive systems, in contrast, are totally dependent on cut hay and concentrates. Further information on the variants of these systems and their feed demand is given below.

In sheep, all farm types rely on pastures. It is not possible to raise sheep without grazing. Although the sheep raising systems are basically similar between all enterprise types, the quality of pastures, feeding practices during the winter, veterinary care, and supplemental feeding during grazing period leads to some difference in productivity. However, the room for productivity improvements in sheep is more limited. Given the more intensive use of pastures in sheep production, the static or declining herd size in sheep/goats will reduce the pressure on pastures.

The livestock research in the Region reports fairly high levels of efficiency in sheep farming. The lambing rates are reported to be around 95%. The lamb death rate for the first month, however, is reported to be high at over 10% of live births. Data on the herd composition indicates reasonable age at slaughter for lambs (around six months) and relatively high average carcass weight. Sheep farming in the region thus seems to be much more effective than dairy farming. Dairy and sheep farming, however, are not alternatives as they produce different products.

E.1.2.4 Constraints to improved productivity

The main cause of low livestock productivity in the Region is insufficient feeding. In cattle, breed is also a factor. The feed rations do not contain sufficient green fodder and concentrates during the winter and summer grazing totally depends on pastures. As a result of excessive pressure on the pastures, the existing herd can not receive sufficient good quality pasture grass during the grazing period. Forage production is not sufficient to meet the winter roughage requirements.

The second main constraint to improvement in livestock productivity is poor veterinary care. Contagious diseases are common in the Region. Difficult accessibility conditions and lack of sufficient veterinary capacity limits the coverage of vaccination and other veterinary services.

Only local breeds perform at the level of their genetic potential under insufficient feeding and veterinary health conditions. Breed improvement efforts have not been effective in productivity improvements without the other required changes. The yields in dairy farms, based on pure breeds and stall feeding, established in the region are less than half of target levels as a result of these conditions.

Improper barn conditions and lack of proper husbandry practices are other major constraints to improved productivity. Proper ventilation, insufficient space, and access to clean water at all times are reported to be some of these other problems.

Few specialized farms that have established in the Region and attain reasonable levels of productivity face marketing problems. There are no milk processing enterprises in the Coruh Basin. Organized collection systems do not develop when there is not a sufficient size of year around milk production to justify regular milk collection for transport to the milk processing plants. Without such a marketing outlet, milk is processed into local products with low value added generating low incomes for the dairy farmers.

At The same time, the small processing plants in the region and those in Erzurum have been closing down in recent years. Milk is available for processing during the flush season from May to July. Milk production declines to a fraction of flush season production during the remainder of the year. Processing plants can not secure sufficient supplies for processing during the year.

The regional consumption patterns have also changes. Traditionally, families procured and stored their cheese for subsequent consumption at the end of the flush season. This suited the seasonal processors well, because they could market their output at the end of the flush season. The shift to cold storage with the availability of electricity and refrigerators has encouraged the families to buy their requirements on a daily/ weekly basis. This pattern of year around steady demand is not consistent with the seasonal supply of the traditional production systems. Over half of the dairy requirements in Erzurum is imported from the developed western regions of Turkey during the autumn and winter months.

E.1.3 Productivity of pastures and pasture hay production

E.1.3.1 Grazing conditions

Livestock production practices, forage production, and use of pastures are closely interrelated. There is very little forage production for the market: all forage production in the Coruh Basin is used for own consumption. Almost all forages marketed are shipped from Erzurum and Bayburt to the Black Sea Coast.

Despite the substantial decline in the size of herds, overstocking and overgrazing is reported for all parts of the Basin. The pastures and meadows are reported to provide only 60 to 80% of the feed requirements of the existing herd for the grazing period actually practiced.

This situation of degraded pastures due to overgrazing does not seem to be the case in all parts of the basin. Some villages in the basin have excess grazing resources. These are rented to nomadic herdsmen who migrate from adjacent regions for the grazing season. There are also some pastures in areas that have not been grazed for extended periods due to distance from the village.

If it is true that there is overstocking as is generally claimed, the balance between the carrying capacity of the pastures and the livestock population can be established in one of the following two ways or through a combination of these. The first is to improve the pasture productivity and change land use to produce more forage crops. Another approach is to reduce the livestock numbers to restore the balance between the carrying capacity of the pastures and the livestock numbers. This reduction in livestock herd size can be accompanied by increases in production if sufficient productivity improvements are achieved.

Substantial room exists for increasing productivity on all types of pastures. The present production from heavily degraded pastures is estimated to be 300 kg. dry-matter per ha. This can be increased to around 1.5 tons/ha with appropriate management. These include rotational grazing, shortening the grazing period, and selective improvements in grazing related practices such as availability of water troughs and access roads to high pasture grounds (yayla).

Unlike pastures, which are communally owned and grazed, meadows are privately owned. Meadows are reportedly grazed in early spring and closed to grazing for cutting hay once a year. They are grazed again after the cut hay is removed. The dry matter yield is reported to be around 3 tons/ha. This can be increased to up to 6 tons/ha with improved management. The main recommended change is to stop grazing the meadows and try two hay cuts instead of once as is generally practiced.

E.1.3.2 Pasture and meadow hay production

There are two sources of statistical information on the area of pastures and meadows in the region. These are the 1997 Village Inventory and the Current Statistics. The two sources report similar figures for the area (Tables 5 and 6), though there is some difference in the area reported for Artvin and Bayburt. The calculations in this report are based on the Current statistics due to availability of information on cultivated forage production, which is not available from the Village Inventory data.

The data given below covers all of Bayburt, but only parts of Erzurum and Artvin that are included in the Coruh Basin[3].

Pasture and Meadow areas (2001)

Unit: ha

	Pasture	Meadows
Artvin	98,860	25,729
Bayburt	216,362	31,338
Erzurum	400,753	9,070
Total	715,974	66,137

Refer to table 6 for detail

The amount of hay produced from the given area depends on pasture quality. Unlike area, it is relatively easier to produce statistical data on yields. Field work have produced fairly accurate results on hay production in different pastures. In contrast, there is no statistical information on the area covered by each type of pasture. This information is essential for calculating the total hay production from the pastures. The specialists who have long years of experience in the region provided some tentative estimates.

Three levels are identified for the existing conditions of the pastures. One group consists of heavily overgrazed pastures where the grass cover of the land is less than 30% and the crop composition lacks desirable varieties. The dry matter yield in such pastures is estimated to be around 300 kg/ha. The region is reported to have good pastures as well. These are close to climax conditions. Production from these pastures is reported to be over 2.0 tons/ha. The yields in intermediate pastures are reported to be around 1.2 tons/ha.[4] The average pasture yield in the region for the following parameters is 970 kg/ha.

Quality class	Share of pastures	Dry matter yield (ton/ha)
Good/ very good	10%	2.5
Average	50%	1.2
Poor	40%	0.3

Based on the area given above and estimated productivity, the pasture hay production in the Basin is around 690,000 tons/annum. This is the total estimated dry matter yield. Only parts of these grasses are palatable and would be actually consumed by the grazing animals. This share varies depending on the pasture quality. The share of this part increases with the quality of pastures and may be assumed at between 50 to 70%.

[3] The data for Erzurum covers the eight districts in the Coruh Basin. It covers all of Bayburt, and six of the eight districts of the Artvin province, which are included in the Coruh Basin. For all three provinces, the data is collected from the provincial directorate of Ministry of Agriculture.

[4] Pilot Projects to Develop Pastures and Meadows in eastern Anatolia, Eastern Anatolia research institute, Pub. No 12

Meadow hay obtained from a single cut is reported to vary from 3.5 to 5 tons/ha. Assuming an average of 4 tons, cut hay from meadows is 264,000 tons. In addition to the cut hay, there is some hay production from early spring and late autumn grazing. This is disregarded at this stage.

E.1.3.3 Herd types and forage demand

The forage demand depends on the length of the grazing period, quality of pastures, and the type of livestock. These three parameters also determine distribution of forage demand between pastures and cultivated forages.

a) Composition of livestock herds

Size of the livestock herds has declined throughout the study area over the last 10 years. The decline in the herd size is prominent for sheep and goats but has also happened in cattle herds as well.

Livestock herd size in the Coruh Basin

	1991	1995	2001
Sheep	728,794	438,148	255,492
Goat	68,193	48,095	37,856
Cattle	379,232	363,847	291,503

Refer to table 3 for detail

Two structural changes have significant impacts on the demand for pasture grazing. First, the size of cattle herds has increased relative to that of sheep/goats. Second, there has been a substantial decline in the number of native cattle with a corresponding increase in the number of cross breed and exotic cattle. Both of these changes reduce the demand for pasture grazing and will increase the demand for cultivated forages.

The main source of forage for some livestock practice is mainly pasture hay. Other practices such as in-stall (zero grazing) dairy, do not use pastures directly. Changing the herd management practices can reduce the pressure on pastures by substituting pastures with cultivated forages as a source of feed. Dependence on pastures can be reduced within each type of practice by introducing supplemental feeding. In addition, the share of different practices in the existing herds can be changed in favor of practices that are grazing-intensive.

In all cases, forage production will play an important role. Forage cultivation is a prerequisite for intensive livestock. The availability of cut hay is also essential for adoption of some of the recommended livestock practices such as delayed grazing. Better feeding based on cultivated

forages also encourages adoption of livestock practices that are less dependent on grazing. Intensive cattle farms based on exotic breeds do not graze the dairy herd.

b) Changes in livestock production systems

The move from the present extensive livestock to less pasture dependent intensive practices depends on simultaneous changes in three aspects of livestock production. These are breeds, environmental factors (including feeding, veterinary care, condition of sheds, and training of farmers on appropriate care), and marketing. The experience in the Coruh Basin with the transition to high productivity practices is similar to the national experience: the transition from one farming system to the more intensive one has failed in achieving the required levels of productivity.

The path of change from a low productivity plateau to higher productivity needs to be evaluated from two perspectives: one is the farm level profitability of the recommended changes, and the other is the impact on the regional and national production levels. The farmers will not adopt the recommended changes unless these are profitable at the farm level. Similarly, increasing the number of the intensive production units is not necessarily the most effective strategy for increasing total production: small improvements in the yields of many traditional farms may have a bigger production impact than establishing few modern farms.

The change from the low cost extensive systems to more intensive ones increases operating costs for feed, more expensive stock, and veterinary care. The farmer will loose money with this change if his productivity does not increase in parallel with the more intensive input use. Experience in Turkey shows that productivity under the more intensive systems fails to reach target levels. The main reason is that a critical component will be lacking as the production system is intensified: farmers may acquire the more productive pure breeds and feed them properly but neglect veterinary care, or improvement of the environmental conditions. The productivity may fall below that of the traditional systems if all components of the package are not in place.

c) Marketing of livestock products

Marketing is another main constraint facing the transformation of production. Sheep and goat are milked for two- to three months during the spring. This is also the flush milk season for the traditional cattle. Mobile milk processors (Mandira) locate in the Region during that season to buy milk and process it into cheese. There is no local marketing outlet for fresh milk during the rest of the year.

The Mandira process milk into one of the two popular cheese types (white Fetta type cheese or the more concentrated Kaskaval type). Both are sold to packing houses that have national brands. Cheese produced during the spring are kept in specialized cold stores and are sold year around. Some direct marketing also occurs by the farmers.

Farmers who have excess milk during the rest of the year process this into cheese at home. This produce is sold in the local weekly markets or to the stores in the local towns.

Scale of local production has a critical effect on marketing. Milk collection and processing by Mandira will not be economical if there is not sufficient milk. Without this volume milk plants will not start regular milk collection. Even Mandira may not locate in the village if the volume is not sufficient. Home processing of milk into cheese is the only marketing outlet in these cases.

Processing milk into cheese solves the marketing problem, but the unit revenue for fresh milk equivalent is less than when products are marketed fresh. The highest unit revenues occur when milk is sold as fresh milk or Yoghurt. There is only one plant that produces pasteurized milk in the region and is operated by the University in Erzurum. The bulk of fresh milk is sold as raw milk by the producers. Farmers with relatively high production volumes buy small vans and undertake raw milk distribution themselves to regular customers in the cities and towns. It is quite rare that these farmers would expand their marketing activity and start marketing milk purchased from the other farmers as well.

Sheep and goats are milked during the spring. This is the period when the temporary Mandira locate near the village herds and buy the milk. Farmers may not milk sheep and goats in less accessible villages where mandira do not locate.

The year-around marketing outlet is essential for processing milk into high value fresh milk and milk products (yogurt). That is one of the reasons why intensive dairy farms develop near large population centers where fresh dairy products may be marketed. Similarly, concentration of dairy farms in an area eases milk collection.

Unlike milk, live animal output poses less marketing problems. Many dairy farms raise their own male bulls and lambs to the marketing weight. These are sold to the local butchers or traders who then transport them to the large cities for eventual marketing. An alternative marketing outlet for lambs and young cattle is sales to specialized fattening operators.

The market for live animals seems to work well. The preliminary analysis of price data shows that the unit prices in the region are similar to the national averages. The national market for live animals is well integrated and works well.

d) Livestock hay requirements

The livestock hay requirements vary with farm practices. Five distinct types of farm practices may be identified considering the type of livestock and use of pastures. These prototypes vary to a large extent in their dependence on pastures. Possible improvements in pasture quality will have a significant impact on the profitability of different farm types.

These farm types are represented in the following diagram. Specialized branches of livestock such as poultry and beekeeping are disregarded, as they do not involve direct use of pastures, though bee keeping directly benefits from the plant diversity in pastures.

		Pasture dependent	Partially uses pastures	Can be independent Of pastures (zero grazing)
Sheep/Goat		For summer grazing (1)	No	No
Cattle	Local cattle	For summer grazing (2)	No	No
	Cross breed	Summer grazing (3)	Supplemental concentrate during grazing period (4)	In-house feeding
	Pure breeds		Very Limited	In-house feeding (5)

All sheep and goat farms are dependent on grazing for summer feeding. Sheep and goat raising is not economical without free pasture-based grazing and is never practiced without access to pastures. Some supplemental feeding may be provided to the young lambs during the early growth period to accelerate weight gain and achieve marketable weight within a single grazing season.

Some of the recommended pasture management practices have different impacts on farm types. Reduced grazing period has a very severe impact on type (1). The impact is less on types (2) to (3) and has no impact on type (5). There will be varying adverse economic impact of the reduced grazing on all livestock that uses pastures. These need to be considered when recommending specific pasture improvement measures.

For cattle, two types of enterprises are totally pasture dependent. Local breeds depend on pastures for summer grazing. Subsistence rations are given during the winter. The weight loss during the winter is compensated during the summer grazing period. Herd productivity parameters vary significantly depending on the quality of pastures and whether farmers provide supplemental concentrate feeding.

Detailed information on livestock farm types is not available at this time. Instead, an estimate of the hay requirement is made on the basis of average national parameters on feed demand and the existing herd size in the Basin. These parameters and the estimates are given below:

		Number of animals (000Head)	Daily Fodder Requirement (kg./animal)	Fodder requirement (ton dry matter/yr)
Dairy Herd	Pure breed	11996	8	35028.32
	Cross breed	79862	7	204047.41
	Native	94065	3	103001
Cattle fattening	Pure breed	6459	1	2357.535
	Cross breed	43000	1	15695
	Native	56115	1	20481.025
Sheep/goat	Sheep	257086	1.5	140754
	Goat	37758	1	13782
Total requirement- ton dry matter				535148

The parameters given above include all feed demand throughout the year. The annual feed demand is estimated by multiplying the daily demand with 365. Some of the feed sources used during the winter are not taken into account in the estimates of feed availability given below.

The estimate below includes hay production from pastures, meadows, and cultivated forages. Some feed derives from the use of residues- particularly wheat straw which may be the main source of fodder during winter. This is true of sheep and goats, and most traditional cattle. The amount of feed from this source is disregarded at this time.

e) Hay production

The main source of hay production in the Coruh Basin is pastures. Meadows and cultivated forages are the other source of fodder. The pasture and meadow hay production is estimated to be 694,000 and 264,000 tons respectively. The other source of hay production is cultivated forages. The main cultivated forages in the basin are Vetch, sainfoin and alfalfa. The data on the area under these crops and the estimated dry matter production is given in Table 6.

The total supply of hay is 901,528 tons of dry matter per/annum if we assume that only half of the pasture hay is consumed by the animals. This far exceeds the total estimated requirement of 535,000 tons on the basis of present herd size and the feeding practices.

This is quite a surprising result and contradicts most views regarding feed availability in the Region and the extent of overgrazing. The annual feed demand need to be further broken down by the requirements during the grazing season and in-door feeding before judgments on the extent of overgrazing can be made. The population pressure on the pastures does not seem to be as severe as is generally claimed. This is the case for the present herd size, which is around 70% of what it was in 1991 in terms of livestock units.

The production is based on area and existing yields. The present yields are reported to be less than half of the potential yields. Hay production from the present pastures can thus be substantially increased with some pasture improvement measures to increase yields.

This regional data is not consistent with the detailed village level data presented in the second part of this report. According to the data in Table 6, only one-third of the forage consumption originates from pastures (taking into account half of pasture hay yield that is actually consumed by livestock). Pastures supply the summer feed, which is approximately half of the annual feed requirement. The village level data suggests higher production from pastures than cultivated forages, which is more in line with the general observations in the field.

E.1.3.4 Livestock-forestry interface

Pastures and forest are the two largest land use categories in the Coruh basin. Plant cover is a direct function of grazing intensity and the main determinant of soil erosion. There are two objectives regarding the plant cover of pastures. One is to increase the plant cover to reduce soil erosion. In addition, it is desirable to maintain a favorable plant composition to increase the nutrient value of a given quantity of dry matter supplied by the pastures.

The status of pastures impacts the forests in two ways. First, grazing has a major impact on forests. Keeping the livestock out of forest areas and reducing the grazing pressure may be a prerequisite to allow regeneration. Second, livestock is the major source of agricultural income in rural areas of Coruh Basin. Improved livestock practices will contribute to rural incomes and reduce poverty.

It is unlikely that the pressure on forest areas and their excessive exploitation can be stopped until the forest areas are clearly delineated. The Government appears to deliberately prolong the ambiguity in the borders between the forest and pasture areas. There are too many laws governing the identification and mapping of forest areas. Some of these create huge legal problems when efforts are made to enforce the laws. The Government chooses the easy course of ignoring the problem. In many cases, this requires that rules are not explicit and enforcement is avoided.

E.1.4 Pasture management and improvement

E.1.4.1 Pasture yields

Eastern Anatolia has a large part of the national area of pastures. The condition of pastures in the region is much better than the national averages. Even at that, the yields are very low. The grass yield in degraded pastures is reported to be one/sixth of the potential (climax) yield. The yield in

moderately degraded pastures is half or less of the potential yield. These two groups make up more than half of all pastures in the Coruh Basin. The dry matter yield can be increased substantially in these types of pastures with appropriate management practices.

E.1.4.2 Causes of overgrazing

The overriding cause of the degraded pastures is their status as a free good. In Turkey all pastures are owned by the 'State' but are allocated for the communal use of villagers. All villagers have unlimited rights to graze the pastures. There is no charge and no restrictions on the grazing herds of individual farmers. Similarly, there are no rules on when and for how long animals may be grazed. Everybody has an interest to exploit the pastures to the maximum extent possible.

Under these conditions, the farmers will increase their exploitation of pastures to the point where the marginal benefit of exploiting the ever deteriorating pastures will equal the cost of this exploitation. This cost is the energy expended by the livestock in reaching the pasture and in grazing. For a given type of livestock this cost would be fixed. This is largely true of sheep. Different type of cattle would have varying costs of using the pasture. This cost would shift up or down depending on the changes in cattle breeds. These costs are fixed for the medium term. The farmers are likely to increase the stocking rates on the pastures if the grass yields of pastures are improved. They will practice overgrazing and reduce the pasture yield to the point where such benefits are equal to the marginal cost of grazing.

This perception predicts that any improvement in pasture yields will be short lived and the farmers will have an on-going incentive to overgraze as long as pastures remain improved. This incentive for overgrazing will be larger if the improvement in pasture quality is higher. That is part of the reason why pasture improvement projects in Turkey were not sustainable. The pastures reverted to their original position as soon as external project inputs were discontinued.

E.1.4.3 Pasture management

One quarter of the land area of Turkey is in pastures and the poor state of pastures has been an important national concern for decades. Overgrazing has also been long recognized as the main cause of degradation.

After decades of debate, a pasture law was enacted in 1998. The law gives sweeping powers to the Ministry of Agriculture to delineate and manage the pastures in a sustainable manner. This authority is given to the Ministry of Forestry for pastures in the forest villages. The application of the law requires three steps: these are identification; delineation; and recording of the pasture area. Delineation is to be done on 1/5000 scale maps. Less than 5% of the pasture area has been

delineated as required by the law between 1998-2002. It will take decades for the registration to be completed at the present pace.

There are two critical steps following the registration. These are determination of the carrying capacity of the pastures and allocation of this capacity to individual farmers. Carrying capacity is not a static concept and it will vary with annual climatic changes as well as in response to better management practices. The law has no provisions for periodic review. The Ministry of Agriculture is asked to take the necessary steps for the effective implementation of the law.

Once the carrying capacity is determined, this needs to be allocated to individual farmers. Under the Law, all allocations carry a charge even if the farmer who receives the grazing rights has no animals. These revenues are kept in a special account that may be used only for pasture improvement. The grazing fees will be determined by the local officials in the light of local conditions.

The delineation and mapping required by the law is also very slow. Pastures are delineated in very few villages in the Coruh Basin. It may take decades to complete the required mapping in the Basin. The new law has had no impact even in cases where the required technical works are completed, because the procedure for calculation of carrying capacity, its allocation to individual farmers, and the enforcement mechanisms are not clear.

E.1.4.4 Pasture Improvement

The recommended pasture management practices depend on the present status of pastures. For severely degraded pastures, it is recommended to reseed and apply fertilizers. Seeding will reintroduce desirable types of plants preferred by animals, which had disappeared from the flora due to persistent overgrazing. This generally requires breaking the ground surface, seeding and fertilizer application.

It is necessary to keep the livestock out of pastures that have been reseeded for a number of years to allow new plants to develop adequate roots. The experience in the Region with this type of improvement has been disappointing. During research trials, three quarters of plants introduced into the pastures have disappeared during the subsequent year and almost all of the rest during the following year. The main constraint is the limited precipitation, which does not allow adequate root development. Another major cause of the disappointing experience with re-introducing new plant varieties is the unsuitability of varieties. Cultured feed grains and legumes do not adjust well to the local conditions and can not survive in competition with endemic varieties. The new emphasis is on identification and multiplication of endemic grass varieties.

Such pasture improvement activity can be undertaken only when the topography and soil conditions are suitable. It will be very dangerous to undertake any tampering with the unstable soils on very steep slopes. In such pastures, the recommended practice is to close it to grazing and allow soil cover to develop and prevent erosion. Plants that are generally considered weeds may be beneficially utilized for this purpose.

In pastures with moderate overgrazing, the recommended practice is rotational (controlled) grazing. Left by themselves, it may take 5 to 10 years for the pastures to recover to their natural state. The recommended improvement for these types of pastures is to divide the grazing area into two or three parts depending on the degree of overgrazing. One part is grazed while the rest is allowed to rest to recover the plant cover and to encourage root development. Fertilizer applications combined with these practices may double the dry matter yield. Seeding after light cultivation is also recommended for these pastures. The usual recommendation is one unit of cereal grasses for each unit of leguminous grasses to prevent bloating in the animals.

The experience with this type of management has been more successful. Close dialogue with the villagers and their full cooperation is required for rotational grazing. Most demonstration projects have also provided subsidies to convince farmers to accept the recommended practices during the initial years.

In all trials, the grazing period was also reduced. The deferred grazing in the early spring is a critical component of the improvement projects. Availability of additional forage to meet the livestock demand during this period is a constraint. This can be overcome by increasing forage production. This improvement in pasture grazing therefore requires a parallel program of forage production.

The recommended practice for relatively well-maintained pastures is reduction of the grazing period. The animals should be kept out of pastures during early spring to allow plants to reach full growth before they are grazed. In Erzurum, this requires that animals should not be let out on the pastures until mid-May. Snow melts in mid-April and animals are let out to pastures at the same time. This should be delayed by one month to allow grass growth of 10 cm. before the start of grazing.

Early withdrawal in autumn is also required to allow root development and resumption of early growth during the following year. Delaying the start of grazing and early withdrawal will reduce the grazing period to around 120 days compared with the present practice that may extend up to 10 months in warm micro-catchments.

There is little experience in the Region with this type of pasture improvement. It can be introduced in villages where consensus may be achieved by all herders.

Trials have been conducted on grass yield response to a package of recommended practices under different pasture conditions by the Eastern Anatolia Research Institute. The actual dry matter yield and the yield after the implementation of appropriate measures were as follows:

Pasture Condition	Present yield-ton/ha	Yield after improvement
Poor	0.43	1.77
Average	1.09	2.74
Good	2.44	4.1

E.1.4.5 Forage production and winter feeding

Winter feeding is based on a mixture of pasture/ meadow hay and cereal residue. Little concentrate or grains may also be used. Hay is cut from privately owned plots of pastures/meadows. These plots may or may not have high ground water levels, but they generally have good soil conditions. There is little discussion of ways to improve yields on these plots. There is consensus on three steps regarding improvements in meadows and cut grass hay.

The first step is fertilizer application. With sufficient moisture, there is good response to fertilizer applications in meadows. The second recommended change is time of cutting the hay. At present, farmers wait too long before they cut the hay. This increases the grass quantity but reduces the quality when the grass is past flouring. The third change is to discontinue early-spring grazing of meadows. Instead multiple cuts should be targeted.

One interesting question concerning the balance between grazing and winter feeding is what determines the size of livestock herds. The farmers increase the livestock herd size until they face technical and financial limitations. There are two separate views on the actual limiting factor. According to some, the size of herd is limited by the availability of winter feed. If this is true, forage production for winter feed will lead to increases in herd size. This will increase the pressure on pastures and will further degrade the pastures.

Another view of the limiting factor is the requirement of the family for own consumption for the great majority of the livestock farmers. The function of the livestock as a store of value is another common explanation. Both of these would indicate a constant herd size.

The dominance of production for own consumption limits the size of family herds. Specialized livestock enterprises, with larger herd size, are more responsive to the market conditions. In particular, seasonality of demand and production are key factors.

E.1.5 Key policy issues and support measures

The most important factor affecting the vegetation cover in the area is the reduction of pressures on pastures and forest areas. This has occurred as a result of the depopulation of the area due to migration. Steep slopes that were cultivated have been abandoned for over 20 years and they have reverted to natural pastures. These plots that were cultivated for own consumption have extremely low productivity and it is not profitable to cultivate these plots under the existing market conditions. It may become profitable to cultivate some of these plots again as a result of recent government direct income support measures that provide a subsidy per unit area cultivated.

The reduction in livestock size and the shift from small ruminants to cattle has also reduced the pressure on pastures. The grass cover has improved and large areas are reverting to forest cover after 20 years of little or no grazing- particularly absence of goats. The most critical policy issue is to accelerate this natural trend.

E.1.5.1 Mapping and registration

The government relies on the new pasture law to improve the pasture conditions. Improved pasture management practices under the new law will be implemented after the technical requirements are in place. This means delineation of the borders of pastures, their mapping at 1/5000 scale, and allocation of a specified grazing capacity to the farmers. These works were started under a special fund after the enactment of the new law in 1998.

The law established an extra-budgetary fund to finance mapping activities. This fund, together with all other extra-budgetary funds, was canceled under the standby agreement with The International Monetary Fund. It is likely that the future work will take even longer without this special funding facility. It is unlikely that the state of pastures will change in the near future even after the full implementation of the new law.

As in pastures, the borders of most forest areas are also not delineated. Both legal and functional definitions are used to delineate the forest areas. There are three separate levels of definition for the borders. The most complete and legally binding is the full cadastre conducted by the general Directorate of Cadastre and Title Deeds. This is available for all of Bayburt but not the other parts of the Basin. For the country as a whole, such areas are only 4 million ha of the 21 million ha of forest land.

The courts accept Forest Cadastre as valid when the general cadastre is not available. Forest Cadastres are available for parts of the Basin. Nationally, such work is reportedly completed for seven million ha in addition to the four million ha for which full cadastre has been completed.

In cases when both of these cadastres are not available, the only border is that indicated on forest management plans. These management plans cover all forest areas in Turkey. These plans represent a unilateral determination by the Ministry of Forestry. Yet, courts are reported to accept these as legal documents. There are legal conflicts with the villagers in areas where these are the only basis for designating boundaries.

Functional definitions are very problematic. This definition of forest areas includes some privately cultivated plots and parts of pastures. The forestry administration can not enforce control over areas thus defined. It also cannot undertake development projects in such areas. The ambiguity in borders and the rights to use the forest resources has created major problems. Fully one-third of millions of all court cases deal with forest related disputes. The forestry administration tries to avoid enacting and enforcing strict rules due to the ambiguities in the relationship with forest villages.

Two steps need to be taken to open the way for rational management of forest areas and pastures. The first is delineation of the boundaries of both. The second key issue is to clarify the rights of forest villagers in forest areas.

The borders of forest areas must be defined in such a way as to protect the rights of villagers over the land that they have privately operated. This includes agricultural lands, orchards, and village communal pastures. Ideally, these lands should be kept out of the designated borders of forest areas even if the law defines them otherwise. Once this is done the forestry administration can fence the designated areas and keep strict control on all factors impacting the forests.

A new relationship can be defined with the villagers, such as social forestry, only after these preliminary steps are taken. One new avenue that must be fully exploited is community forestry. Here the main thrust must be on allowing farmers to plant trees in forest areas while respecting the requirement that the present land use designation should not be changed. A second main avenue that should be exploited is the possible use of suitable forest areas for cultivated forages during the transition period of reforestation projects. Clearly, this can be done when the land is particularly suitable for both tree growth and cultivation.

One extremely harmful effect of the new pasture law is the shift in control of grazing land from village communities to the central government (MARA). Villages that have excess grazing

resources have been leasing these to nomadic herdsmen for centuries. They exercised control over the nomads to prevent overgrazing.

The right to lease the pastures have been transferred to MARA under the new pasture law. MARA keeps 75% of the leasing revenues and gives 25% to villagers. The MARA officers in towns can not control the nomads as effectively as the villagers used to do. This may lead to serious degradation of pastures in villages with heavy concentration of nomadic herdsmen.

E.1.5.2 Government policy and support measures

Government support for the agricultural sector in Turkey is constrained by the commitments made under international trade agreements and the on-going austerity program. Severe budgetary limitations are likely to continue to limit government support for the agricultural sector.

The main government support program for the agricultural sector is the ongoing direct income support for the farmers. The program was started in 2001 and will continue for five years with the financial support from the World Bank. The farmers are currently receiving 135 million TL per ha of land that they operate as an income supplement. An additional amount is paid as a rebate for the tax on fuel used by the farmers. The subsidy is paid for land operated by the farmer, up to a limit of 50 ha, regardless of the ownership status: payment is made to tenant operators, and those who claim to have operated a piece of land continuously even if they do not have title deeds.

This system of payment has two main impacts on land use and erosion. First, marginal plots of farm land, which were abandoned when the young male population migrated to the cities, are now operated again to receive the subsidy. This will contribute to increased soil erosion.

The second unintended consequence of the new support payment is conversion of pastures into cultivated land. Farmers who plow up the pastures produce witnesses who state the land to have been continuously farmed. The government commissions, which were set up to verify such claims, are not able or willing to counter such claims.

There are four other programs that support livestock and forage production. The support provided through these programs is detailed below as of Mid-2003.

1- Support for forage crop production.

The government provides a subsidy equivalent to 20% of the production cost for annual forage crops. The costs include all production inputs and the cost of machinery services. The subsidy increases to 30% in the case of perennial fodder crops. A similar level of support may

also be provided for the purchase of agricultural machinery when the land area devoted to forage crops is large enough.

Farmers in the Coruh Basin produce substantial amounts of forage crops. Yet, no farmer that has been interviewed has benefited from the forage subsidy. The bureaucratic requirements of utilizing the subsidy, and the controls imposed on the farmers as to the source of seed procurement discourage farmers from applying to the programs.

2- Subsidy for artificial insemination

The subsidy is paid to enterprises with pedigree registration. The subsidy covers half of costs of AI in first priority provinces and 25% in other provinces. The program will continue for a period of 5 years with a target level of 10 million cows to be inseminated. Qualified veterinarians who wish to acquire the necessary equipment to start private practice also receive subsidies.

As in forage subsidy, this element of support is not utilized in the Basin at all. Farmers use natural insemination. Government bull stations were not reported by any of the villagers visited.

3- Subsidy for breeding stock

This subsidy is paid for pregnant heifers purchased from state farms or from licensed establishments. The subsidy is 30% of the procurement price for pedigree cattle, and 15% for purebred cattle.

4- Milk subsidy

A subsidy of TL 10- 20,000 is paid to the farmers per liter of milk delivered to licensed milk processing plants. The amount of subsidy varies with the technical characteristics of the processor. Deliveries to fully equipped modern processors receive more subsidy per liter of milk. Deliveries to small informal processors, and cottage industries are not qualified.

As in other components of the programs, government support for breeding stock and milk subsidy had no impact in the Region. There were no pedigree cattle in villages studied in detail, and milk is not delivered to registered enterprises. All milk is processed at home.

E.2 CONDITIONS IN THE SELECTED MICRO CATCHMENTS

The overall conditions described for the three provinces are true of the selected micro catchments as well. Statistical information is not available for analysis of trends in livestock size for the selected areas. Field visits and discussions with the farmers confirm that the macro trends have also occurred in the selected catchments: there has been a substantial decline in livestock herd size; grazing pressures on pastures and forest areas were reduced; and villagers have become less dependent on agriculture for their livelihood.

Detailed information is collected for the pasture conditions and the livestock size in the selected micro catchments. This included information on the structure of livestock enterprises as well as a detailed investigation of the condition of pastures.

E.2.1 Feeding conditions

Feeding requirements are specified separately for winter and the summer. Summer feeding is based exclusively on pasture grasses. The exception would be in-stall feeding based intensive enterprises. There were no such enterprises in the three villages for which detailed analysis of livestock practices were undertqaken. Pastures are the exclusive source of feed.

The recommended source of winter feed is forages. In reality, farmers also utilize cereal residues as winter feed. These have no nutritional value but they provide bloat material to fill up the stomach.

The existing feeding conditions are analyzed in three stages. The first is to convert the existing livestock population into livestock units of standard 500 kg weight. Standard conversion tables are used for this purpose. A local cow is 0.5 Livestock units; a cross breed cow is .75 units; and a sheep is 0.1 units. The existing livestock herd size in each village is expressed in terms of LU.

The pasture hay production is also expressed in terms of LU that may be supported by the available amount. This is a function of pasture area, production per unit area, and the length of the grazing period. Production is grass actually consumed by the animals, which is estimated to be half of the grass yield of pastures.

It is assumed that the total pasture area is available for grazing every year. This can be done only by continuing the practice of spending the summer months on high pasture grounds (yayla) in some villages. The total area of pastures used by each village is given in Figures 1 to 3.

The area enclosed by the bold dark lines is the actual area grazed. The land use designation in forest management plan is also indicated on these maps. The area actually grazed and the designation in the management plans is not always consistent. The difference is particularly big in Cankurtaran (Figure 3). The reported pasture area is 1164 ha in Camlica, 885 ha in Basakli, and 491 ha in Cankurtaran. The total pasture hay production is calculated from this area and the yields estimated for the pasture classes by the MARA Research institute under contract with the JICA Study team.

A similar calculation is made for the winter feed base. Forage production from meadow hay, alfalfa and sainfoin is estimated for each village. The three villages, studied in detail, did not have significant amounts of vetch (Vetch production in Basakli is taken into account). The total forage requirement depends on amount per LU per day and the length of grazing or feeding period. The grazing and winter-feeding periods vary with the climatic conditions. They also vary with the type of livestock (sheep are generally grazed for a longer period than cattle). The actual practice in the three villages is around 180 days each of grazing and in-stall winter-feeding.

The forage and grass requirement per LU is generally considered to be 2.5% of the live weight per day. This implies 12.5 kg dry matter per LU/day. A slightly more conservative figure of 10 kg per LU per day was assumed in this study. The following herd size, winter feed, and pasture hay availability are calculated for the three villages. Detailed data for each village is presented in Tables 7 to 9.

Village	Existing LU	LU capacity of existing pasture hay	LU capacity of winter feed
Cankurtaran	125	109	47
Basakli	467	234	135
Camlica	136	647	54

There is a shortage of feed year around in two of three villages, and during the winter in the other village as well. The overall picture confirms the impression that there is severe malnutrition in winter and livestock loses weight. Some of the weight loss is gained back during the grazing season. In all cases, there is not sufficient feed for the livestock to achieve reasonable productivity levels.

Each village has developed mechanisms to reduce the deficit of winter feed. Cankurtaran villagers purchase large quantities of wheat straw from outside the village. Bran and some cereals are also used to supplement the straw based rations.

Camlica villagers purchase cut hay from other villagers during some years. When conditions are not favorable, cut hay may not be available from other villagers. In this case, the livestock farmers hire labor to cut hay, though the cost of this is higher than the market price.

Two of three villages are deficient in the amount of pasture hay for the existing herd size. Camlica has excess grazing resources. Field observations revealed large tracks of unused pastures. This, however needs to be qualified. The pastures in Camlica are used jointly by this village and two other villages (Duzenli and Kirecli). Historically, these two villages were part of the same village as Camlica (Figure 1), but they continued to use the pastures jointly after the villages were established as separate administrative units. The extent of excess available grazing resources may be less if the analysis were to be repeated for the three villages as a unit. Even then, however, there seemed to be sufficient grazing resources in this village which is adjacent to the large grazing areas of Ardahan (Figure 1).

Given the existing livestock herd size and pasture area, the pasture hay productivity in Cankurtaran needs to be increased by a factor of 1.14 (125/109), and in Basakli by a factor of 2.0 times to meet the grazing requirements. These are possible with appropriate management in average (actual existing condition in Basakli) and degraded pastures (actual existing conditions in cankurtaran).

The deficit of winter feed is more severe. There are two avenues to be explored. The first is to increase forage productivity. This can be combined with an expansion in area under forage crops. The villagers believe there are limits to expansion in forage crop area, because area suitable for forage production is already used for that purpose. There are possibilities for substantial expansion of productivity in forage crops.

Preliminary estimates for Basakli show that it will be difficult to close the feed gap even with expansions in area in forage crops and increased yields (Table 7). Doubling the area under forage crops and reasonable yields in forage production will increase the winter feed capacity to 271 LU in that village compared with the existing herd size of 467 LU. Production of sufficient winter-feed will require major changes in cropping patterns.

Research into new seed varieties is also critical and present opportunities. The average alfalfa yields in the three villages are around 7.5 tons/ha. Trials with new seed varieties have produced 17 tons/ha in Erzurum. The trial results for new sainfoin varieties have produced an average of 6 tons/ha of dry matter compared with the actual average of 3.5 tons/ha in the project area.

The required increase in pasture productivity can be achieved by better management alone. There are two critical components of the better management. These are shortening the grazing period

and rotational grazing. The latter has two objectives. One is to improve the long term productivity by following 10 day grazing periods with 20 days rest periods. The other is to assist with natural seeding through light grazing at appropriate times.

Better grazing management involves no cost. All that is required is to have extensive discussions with the villagers, draw up a management plan, and strictly apply this plan. Villagers that participate in the plan will be given support with the forage production. Providing good quality seed of the improved varieties is the first obvious step. This can be supplemented with selective support in mechanized hay cutting.

Simple machinery for hay cutting is available in the region but is not used by the farmers in the three villages. The project should procure few such machines and make them available to the farmers. An alternative is to extend credits to interested farmers to buy these and lease them to other farmers.

The work of TEMA in Bayburt for forage production has focused on mechanized seeding. This reduces the seed requirement per unit area and improves productivity. The same may be implemented in project area where the topography permits this. Field observations indicate little prospect of such mechanization but it should be considered in appropriate locations.

E.2.2 Structure of production units

Detailed data was collected on livestock ownership and forage production by each family in the three villages. The actual condition of cattle and sheep was also observed.

There are no pure bred cattle in the three villages. The dominant breed is a cross of Swiss Brown with the local DAK (East Anatolia Red). There were no intensive production units. All livestock use pastures for part of the year. Basic productivity parameters were found to be very reasonable for cattle and sheep with the exception of milk per lactation. Live births were around 80 to 90% per cow put to bull and were around 100% per sheep. Death rates are reasonably low and incidence of disease is low due to the relative isolation of the villages, which limits contacts with herds from outside.

Without pure breed based intensive production units, the maximum milk yields per lactation were less than two tons in all farms interviewed. All of milk production occurs in four months from June to September when the grazing conditions are relatively more favorable. The incidence of milking sheep was rare.

There is no regular milk marketing. Milk is processed locally into a fat-free cheese (Civil). The conversion of milk into such cheese was not very attractive commercially but was a result of failure to market fresh milk. The discussions with processors indicate that 10 liters of milk are needed to produce a kg. of Civil which was marketed for 2 to 2.5 million TL per kg. The equivalent milk price (200 to 250,000 TL per liter) is considerably less than the fresh raw milk price of 300,000 to 325,000 generally quoted by the farmers.

The cheese are collected in plastic barrels for occasional sales in the local towns. In Camlica, annual delivery trucks are hired to transport the cheese to Istanbul and Bursa for distribution to the village families who have migrated to these cities.

The main cash income is from sale of lambs and male calves. The number of cattle owned by each family is quite substantial, though production of milk is mainly for self consumption. In Basakli, the average number of cattle in cattle owning families is 6.7 head. This is 14 heads in Cankurtaran. Detailed data by family shows the following number of cattle owned by each family.

		Basakli	Cankurtaran
Resident village family with no cattle		6	2
Families with	1 - 6 head of cattle	57	1
	7 - 10 head of cattle	37	2
	11 -20 head of cattle	7	5
	more than 20 head of cattle	1	2

Statistical data collected for the Basin (Table 10) and interviews with the farmers indicate that less than half of the cattle is milking cows. This proportion varies from 40 to 50% in the three villages, though the local terms do not always follow standard definition of livestock categories (dry cows are sometimes counted as heifers because they are part of the same grazing herd).

In Carkurtaran and Camlica, cattle is the only livestock. In Basakli, 21 families owned a total of 196 sheep as well. The family with the largest sheep herd had 20 heads and the smallest had 4 heads. There were 257 head of goats in Basakli. One family had 200 goats while all others had less than 10 head of goats each.

Cankurtaran is most dependent on livestock as a source of income. Basakli has diverse sources of income including crop production and seasonal labor. Camlica is an extreme example of villagers not relying on agriculture. There are 55 registered households in that village. Of these 15 live elsewhere permanently but spend a few months a year in the village. Of the 40 permanent residents, 30 had retirement salaries. Only 10 of the 55 registered households relied on agriculture or labor income for their subsistence. In only 3 of these 10 households, the head of the household was younger than 60 years of age.

Labor is a constraint in all villages. Young males were not available to be hired as shepherds. In two villages, villagers were shepherding the animals in turn, based on the number of animals each owned, because hired labor was not available.

E.2.3 Development Trends

Livestock is a critical component or rural activity. It is also the main source of pressure on the forests. Extensive livestock practices in the Region rely on pastures. This needs to be transformed both to increase farm incomes and to reduce the pressure on forest areas.

Improvement of summer feeding conditions by pasture management is the most cost effective mechanism. At the same time, intensive livestock systems need to be developed. The most appropriate mechanism appears to be intensive dairying.

Farmers have given up goat keeping on their own due to its damage on the forests. This should be stressed in the information campaigns. Sheep is less than 10% of the livestock herd in the region and is a minor source of income. Sheep grazes more intensively, and cattle are less damaging to the grazing environment. Priority for livestock development should be given to cattle-specifically in-stall intensive dairy farming.

This farm model is also supported by both MARA and MEF. A key requirement to develop this model, however, is winter feed. Winter feed shortage is more severe than pasture based summer feed. It will be difficult to develop intensive farms without substantial expansion in winter feed.

E.3 PROPOSED PROJECTS

E.3.1 Livestock production systems

Different models are developed and proposed for livestock development in different micro catchments in the Coruh basin in the light of the foregoing discussion and the analysis of local conditions. The proposed models take into account the household characteristics as well as the environment in each MC. The characteristics of the main ones and the likely support requirements are presented below.

The most common production system in the Coruh Basin is extensive production with low input use and low productivity. These can be either cattle, or sheep/goat farms. These farms are dependent on pastures for summer grazing. Cut hay and forage production will be supported to

improve winter feeding conditions. Supplemental feeding using both forages and concentrates during the grazing season will have a significant impact on productivity.

Pasture improvement will be an important component of livestock production. Communities in which MARA has completed border delineation under the new pasture law will be given priority. The willingness of farmers to introduce and abide by rational grazing management will be a criterion in selecting villages for project implementation.

All sheep raising in the region is under the extensive system. Some elements of intensive production systems are introduced in cattle farming, though productivity remains similar to those of the extensive systems. The improved systems for cattle farming are brought about by transforming the extensive systems. This transformation occurs by improving breeds, feeding, and quality of husbandry. Such farms can be developed in areas with particularly favorable pasture conditions. Cross-bred, dual purpose cattle can use a mixture of in-stall feeding and grazing on private forage areas or improved pastures. The development of these farm types can be targeted in communities dependent on dairy farming. It is important to note that the existing dairy programs of the government ministries do not allow this process as they require farmers to keep pedigree cattle.

There are very few intensive dairy production units in the region, and none in the three villages studied in detail. These were created by special development projects implemented by ORKOY and MARA. These projects require farmers to keep pure bred cattle and practice no grazing. This system relies on availability of cultivated high quality forages.

Availability of land for forage production will be a requirement for farmers who wish to establish such production units. Part of these forage areas will be used for cut hay and parts may be grazed when they are easily accessible. These farm types will have a marketing advantage in areas close to the major population centers. Areas with limited pastures will be candidate sites for relatively easy transformation from semi-pasture based systems to intensive livestock.

E.3.2 Existing Programs

MEF is currently implementing programs for both livestock production and pasture improvement. The proposed programs in these two areas can thus be implemented by this ministry, though close involvement of the Ministry of Agriculture and Rural Affairs will be required for implementing some of the key components of the livestock improvement projects.

The existing programs of MEF in livestock sector cover breeding and fattening programs for sheep and cattle. The livestock credits are individual programs that support individual farmers.

Large scale credit is also provided for the farmer's cooperatives for processing. These cover dairy in the livestock sector.

Sheep breeding programs provide credit for the farmers to acquire 30 breeding ewes and one ram. Sheep fattening program provides credit for procurement of 50 male lambs for fattening. The ceiling for the ORKOY credit for both activities in 2003 is 12 billion TL per farmer.

Under the cattle breeding program, ORKOY provides up to 10 billion TL to allow farmers to procure two pure bred dairy cows. Cattle fattening program provides 10 billion TL credit to fatten 10 male cattle (steers).

The breeding programs have a repayment period of 6 years and the fattening program 5 years. In both, there is a grace period of one year. The interest rates are fixed at the time of lending and are based on a ratio of the current Agricultural Bank credits at the time of lending.

One of the main drawbacks of the existing programs is their small size. The project size implemented by MEF is much smaller than that recommended by the Ministry of Agriculture and Rural Affairs.

The MEF credits are heavily subsidized and are designed to help poor farmers. The small size is desirable on equity grounds, but these enterprises are not specialized and do not attain the required level of technical efficiency to lead to sustained long term development. Livestock farming remains a supplementary partial source of income for the farmers instead of creating specialized livestock farms.

Traditionally, there has been strong demand for ORKOY credit due to its low interest rates and generous credit/ equity structure. The interest rate is generally set at one-seventh of that charged by the Agricultural Bank of Turkey. The Agricultural Bank credits themselves have a large element of subsidy, indicating a very large level of subsidy in the ORKOY credits. This is the main reason for the strong loan demand for the credit program.

This project proposes a mixture of the main programs being implemented- including breeding, fattening and milk processing. The program content is believed to be reasonable in the light of the production and natural resources in the area. The actual demand from the forest villagers will determine what programs will be implemented. It is not clear how the credit demand will evolve if the credit conditions are tightened to reduce the element of subsidy and introduce commercial principles in the operation of ORKOY credits.

The existing level of subsidy also creates problems if the scale of operation is increased to commercially viable sizes. The size of existing projects per farmer is small and this limits the amount of subsidy per farmer. The subsidy will be difficult to justify on social grounds if the loan size is increased with a corresponding increase in the amount of subsidy per beneficiary farmer.

E.3.3 Proposed livestock development programs

E.3.3.1 Cattle breeding program

There are serious economic and technical problems of dairy production in Turkey, especially in the project area. Milk yields per cow are reported to be 2067 liters/annum in the intensive production systems with pure bred cattle and zero grazing. Milk is the main component of farm incomes in dairying and modern dairy farming cannot be viable at this level of productivity.

Average lactation period is reported to be over a year due to very low success rate in artificial insemination. Calving rate in the intensive farms is estimated to be 75% by the Provincial Directorates of Agriculture. Calf mortality is estimated to be 7%. All these parameters indicate very low levels of productive efficiency.

Low productivity is a result of a number of interrelated factors. Feeding, veterinary care, environmental conditions and the quality of husbandry all contribute. Most of these are associated with small scale subsistence farming. Productivity is much higher in specialized farms. This project proposes to support a livestock unit size, which is commercially viable and technically efficient.

There are two variants of the breeding program. One is intensive production based on pure bred cattle. This is the model that is presently imposed on the farmers by ORKOY. Farmers who wish to receive the ORKOY credit have to buy pure-bred cattle. This model uses no grazing. The average milk yield in these farms is reported to be 2000 kg per annum.

A variant of improved cattle breeding program is also presented in this report. Fairly high levels of production efficiency are possible under this model. The breeding stock may either be pure bred cattle or advanced crosses (G1 or G2). The pure bred cattle will not be grazed while the intermediate level model may partially use grazing either on improved pastures or cultivated forages. The basic feeding levels and husbandry practices under this model are similar to those of intensive production system. The present milk yield per cross bred cow milked is estimated at 1250 kg. This can be increased to two tons. In this case, the net revenue from improved farming systems will approach those of very efficient intensive units (Table 11).

The cattle breeds will also vary under the two types. In intensive dairy model, the breed is likely to be milk breeds (Holstein). The improved model may utilize meat breeds or dual purpose cattle such as Swiss Brown. This will be compatible with the levels of milk yield assumed under the projections, and will produce better stock sale revenue than indicated in Table 11.

a) Intensive dairy model

Although ORKOY supplies credit for 2 head of cattle, it is expected that the farm will eventually grow in size or the farmer may already have some cattle. The building construction planned under the ORKOY program is for 5 heads, though the stock credit is supplied for two heads only. The actual farm size may thus be larger under the ORKOY program.

The size limit under the present program is largely a result of limited financial resources available and the desire to maximize the number of beneficiary farmers rather than provide larger size credit to a small number of farmers. This is an understandable concern from a social and equity point of view. This farm size however is too small and may not be financially viable. One common mechanism the farmers actually use to avoid this unreasonable size constraint imposed by the government agencies is to have many relatives register separately. The cattle registered by many farmers will actually be owned and managed by a single farmer.

The pure bred cattle the farmers are required to acquire need a very high level of husbandry practices. The farmer should produce green fodder for the required feeding. Cattle hygiene and veterinary practices also need to be very strict. It is unlikely that a farmer with only two milking cows can achieve that.

The projected levels of yields are possible only in specialized dairy farms. Dairy will be the main source of farm income. The minimum required size under the existing Turkish conditions would be 10 head if the average farm incomes are to be attained from dairy farming alone. Recognizing this, the Ministry of Agriculture, Provincial Directorate of Erzurum recommends 15 milking cows per farmer.

Such a unit is qualitatively different from most existing farms with few head and low productivity. The proposed model relies on regular milk marketing and targets high level of yields. It is an intensive input using business. Achievement of a high level of technical efficiency is a prerequisite for commercial success. Normally these would not be mixed crop/ livestock farms but will be specialized dairy farms with most of the farm income deriving from dairying.

Such farms can only be established where marketing opportunities exist. These normally are available near the major population centers. Location near a population center is also advantages

for access to veterinary service-including artificial insemination. It will be difficult to develop an efficient milk collection system unless many farmers produce milk in the same area. Therefore, dairy production units should be concentrated in selected villages.

Intensive dairy farms can be established only in combination with forage production. There will be zero grazing and sufficient quantity of high quality roughage is a requirement for successful husbandry. The calculations presented in this report are based on the market value of fodder, though this will be produced in the farm. This convention avoids the complications of estimating the cost of on-farm fodder production. More importantly, it values the input of dairy enterprise at market prices and presents a more reliable picture of the financial viability of the proposed project.

Regardless of the number of cows given to a farmer, the dairy projects are implemented for a village. Villagers are required to form cooperatives. All members are given credits at the same time and cows are all procured at once. There are two variants of this model. MARA supplies four cows each to at least 50 member cooperatives with a total of 200 head in a village. MEF has the same policy but two cows are provided for each farmer resulting in 100 head per village. The data given in Table 11 is for a unit of 100 head of milking cows.

This policy of supplying many members in one village at the same time has many advantages and it should be continued. Production and breeding support is more efficient in such concentrated production areas and marketing arrangements are easier to make for fresh milk.

b) Improved dairy model

Most farms in the Coruh Basin have few cows producing around 1500 liters of milk per lactation. This milk is mainly consumed by the family. Some milk may be sold for cash income to seasonal processors during the spring season. Some milk is also marketed after processing into local cheese.

Interested farmers who wish to continue mixed farming but want to improve the yields in their livestock activity should be supported through this project, though no such programs are implemented at present. The project will support breed improvement by artificial or natural insemination, supply veterinary service, and provide credit to procure additional cattle.

These cattle will utilize improved pastures of high quality. Supplemental feeding will be practiced during the summer. Winter-feeding will include high quality roughage and will supply sufficient concentrates.

Beef breeds may be emphasized in these programs to reduce the milk marketing pressure, though some milk marketing will still be necessary for the financial viability of these farms. Arrangements for marketing in the local markets and sale of home processed products may also be possible.

The analysis of financial viability of different farm types are based on the conditions for a stationary herd size (Table 11). The income and expenditures are different when a new herd is acquired as, for example, under the ORKOY credits. A farmer who has no other stock but buys pregnant heifers or ewes has a different pattern (Table 12) of stock and milk sales compared with a farmer who owns a stationary herd (a herd where the size is not changing).

The conditions for building a dairy herd are shown for initial years in Table 12. The operating income does not cover the costs during the first year. Milk yields will be lower during the first lactation and there will be little stock sales depending on the time of the year when the pregnant heifers are bought. The investment requirements of such a herd are larger than a farmer with a stationary herd. This is taken into account in the economic benefits of breeding program in Table 20. The permanent working capital requirements given in Table 19 include financing during the built-up stage.

The feed input of the dairy farm is specified separately for concentrates and forage. Concentrate consumption is calculated for milk production and maintenance rations for each type of livestock. The requirements for milk production are estimated based on a ratio of 3 liter milk per kg of concentrate. Forage requirements of dry matter are 2.5% of the live weight per day.

E.3.3.2 Cattle fattening program

Male cattle in the study area are presently slaughtered at over 30 months. This normally involves keeping the steers on the pastures for two grazing seasons to achieve sufficient weight for the cattle to be sold to finishing operations. The finishing period is generally around 6 months, though it may be longer when younger stock is fattened.

In better managed farms, based on pure breeds, the age at slaughter may be reduced to 18 months while achieving the same or even improved carcass weight. This improves the herd composition in favor of milking cows and calf yield. This large difference between the existing practice and what is technically possible in the improved enterprises is shown in Table 11. The number of “followers” declines from over 74 to 29 with the change in production system.

The total herd size declines from 160 Livestock Units, under the present system, for a herd with 100 head of milking cow to 141 LU in the intensive system (Table 11). The male steers in

traditional farms are kept for two years before they are sold for finishing. In the intensive production system half are sold during the year they are born and the remainder early next year.

Both the traditional and the improved farms do not finish the male steers in their own enterprises but sell it to specialist fattening units. ORKOY provides credits to these units for up to 10 head of steers at any one time (with two cycles a year such units will fatten 20 steers per annum). This is small compared with the recommended size of 50 head per farmer by the Ministry of Agriculture. This 50 head unit is the basis of calculations presented in Table 19.

The fattener will procure the male steers at 12 months. These will be grazed for a period of 6 months and will be finished after a further six months. This is the recommended practice in the region at the moment. It will change after the cattle population is transformed from grazing based to intensive production systems.

During the grazing period, the main costs are labor and insurance, which is taken as 6.8% of the procurement value. This will be paid for six months. The farmer will pay pasture fees of 10 million per head for good quality pastures. The cost of veterinary care and vaccinations is assumed to be the same as that of pasture fee.

The concentrate consumption during the finishing period is calculated from a conversion ratio of 7 kg concentrate to 1 kg live weight. In addition, the cattle will be fed 2 kg of straw per day.

The cattle will be bought at 150 kg. It will leave the pasture at 260 kg and the weight after finishing will be 404 kg. The dressing ratio will be 60%. The costs and operating revenues of such a fattening unit are given in Table 13.

E.3.3.3 Sheep breeding program

Interested farmers who want to breed sheep are given credit to acquire a breeding herd of 30 sheep. The ceiling on the ORKOY credit that may be provided is 12 billion TL. This project recommends a unit size of 100 head of sheep, which is the same size as recommended by the Ministry of Agriculture.

Unlike cattle, breed is not a problem in sheep. There are good local breeds, which are well adopted to the local conditions. Sheep raising practices are also fairly efficient with most farmers achieving reasonable levels of productivity.

Feeding practices are quite similar. Animals graze the pastures for up to 8 months and are stall fed during three to four months. It is uncommon to supply supplemental feed during the grazing

season. This is reflected in the feed consumption given in Table 14. Cut hay and concentrates are fed for 90 days during the winter. The remaining feed is totally pasture based.

The present lambing rate is estimated at 80%. Some farmers actually achieve better rates with increased twinning. This will be increased to 100% under the improved system. Milk produced per sheep is estimated to increase from 50 to 60 kg net of amount fed to the lamb, tough it is quite common for farmers not to milk sheep at all in the Region. Wool yield will increase from 1.4 kg to 1.7 kg per sheep under the improved system.

There are two main differences between the sheep and cattle breeding. For sheep, the main source of income is meat. Income from milk is insignificant and milking is confined to three months during the spring. This milk may be consumed by the family or sold to seasonal mobile processors. Some farmers do not milk the sheep and goats at all.

The second major difference is in forage intensity. Cattle breeding heavily depends on availability of good quality cultivated forages. Sheep in contrast depends on grazing. Cultivated forage is not as significant for sheep breeding. The sheep breeding program is recommended for MC s with good pasture conditions. There is however one major reservation for supporting sheep breeding.

Sheep grazes the pastures much more severely than the cattle. In areas with steep slopes and susceptible soil conditions, sheep grazing will contribute to soil erosion. Sheep breeding programs should not be supported in such areas. Among the three villages that were studied, conditions seem to be particularly unfavorable in Camlica (Table 22) for sheep breeding.

E.3.3.4 Sheep fattening program

ORKOY supplies credit for fattening 50 head of sheep per cycle. Normally the feeder stock are young lambs varying in age from 4 to 8 months. The present practice is to sell lambs to fattening units at around 16 kg live weight. This is reduced to 10 kg (early sale) under the improved practice. The live weight at the end of fattening period is assumed to be 50 kg. This will be achieved in a fattening period of 100 days. Initially, the fattening will combine supplemental feeding with some grazing. Grazing will be discontinued when the lambs reach 30 kg live weight.

The concentrate feed requirements are calculated by assuming a feed conversion ratio of 7 kg feed per kg of live weight gain. The forage consumption during fattening is negligible and this is disregarded (Table 13).

The present project size of 50 head of sheep is too small a size for gainfully employing one person. It is recommended that this should be increased to 100 head per cycle. The size recommended by the Ministry of Agriculture for Erzurum is 200 per cycle.

The main criteria for location of such activities is availability of feeder stock. Lack of alternative employment opportunities is the main factor that promotes interest in this type of activity.

E.3.3.5 Dairy Processing

All intensive livestock development programs depend on availability of a marketing outlet for milk. Milk marketing is less critical for sheep than cattle farming. Extensive cattle farms based on pasture grazing are also less dependent on milk marketing than intensive system. Milk provides less than half of the farm income under the extensive systems (the rest comes from stock sales while keeping the herd size constant). This share goes up to 60 % under the more intensive systems (Table 11).

There are two alternative marketing arrangements that may be pursued for milk marketing. The more rational one is to support the cool chain for milk collection so that it may be processed in central plants producing the full range of dairy products. This approach may not be possible in the region due to lack of large plants. There only are a few large processing plants in Erzurum. These may process up to 100 tons milk/ day. The first priority should be to ship the fresh milk to these plants.

The existing plants cannot process all of the expected increase in milk production if the proposed livestock projects are implemented. It is therefore proposed that a processing unit should also be established. It will process milk into the full range of fresh products and cheese. The MEF provides financial support for this purpose through its program of cooperative development.

The total investment costs of this plant are estimated at 1746 billion TL (Table 15). The plant will employ 15 people and will process 15 tons of milk per day, operating 360 days a year.

The main products are ayran in 230 gr. cups and yoghurt in 1.5 kg containers. It will also produce white cheese, and pasteurized milk (Table 16). The first two will be the main source of revenue. The processing plants in the region also utilize a unique and low cost system of selling bulk pasteurized milk without packaging. The same may be adopted by the new plant.

The data provided by the Cooperatives Department of MEF indicate operating margins of nearly 50% for the dairy processing enterprise. Yet, many of the dairy plants in Erzurum have closed down in recent years, including the largest one privatized by the government milk board. The

surviving ones report losses due to extremely low capacity utilization. The main problem is lack of raw milk for year around processing.

The data presented in Table 16 is provided by MEF. It was, however extensively modified to reflect the conditions in the region. Milk and product prices are adjusted to actual prices in the Region in June 2003. The proposed plant can operate profitably only if two critical problems of raw milk and marketing are solved. The government policy of only supporting cooperatives is another equally serious problem.

The investment model pursued by the ministry is one based on village cooperatives. The village development cooperatives will become eligible for credits only if more than half of all the households in the village are members of these cooperatives. As in livestock credits, these processing credits are also very attractive due to heavy subsidies.

The main problem is management. The farmers are not capable of managing large processing enterprises. They are also reluctant to pay professional managers high salaries compared with their own difficult survival conditions. As a result, these cooperative enterprises tend to be very poorly managed and require repeated credits by the Ministry to remain solvent.

The Ministry should consider the eligibility criteria for credits. Private operators who wish to invest in dairy processing should be supported. The objective should not be to make dairy farmers owners of industrial enterprises, but to develop reliable markets for the output of dairy farms. Any move along these lines to broaden the scope of ORKOY credits will raise important questions concerning the appropriate implementing agency for this component of the program. There are specialized lending institutions with nationwide loan programs. These should be encouraged to expand their lending in the Region for agro-processing.

One mechanism to ensure that raw milk is available for the processing plant is to integrate the processing plant with the dairy farmers. One way is to channel some of the support intended for the dairy farmers through the processors. The government agencies should bear the cost of extension services and forage subsidies that may be provided to the farmers by the processors. Such integrated programs insure that raw milk and processing facilities are developed in parallel.

E.3.4 Pasture Improvement Projects

E.3.4.1 Grazing Arrangements

All villages in the Coruh Basin practice some sort of pasture management. In some villages, this is done by the type of herd. In others, rotational grazing is practiced for combined herds.

Villages with large cattle herds hire shepherds for three types of cattle. These are milking herds, calves, and other cattle. The last category includes steers, and draft animals if any. Sheep herds are generally divided into milking ewes and lambs. Each herd is assigned a different section of the pasture area.

In addition to the grazing by the type of herd, rotational grazing is also practiced by season. Areas where grass growth occurs earlier (generally slopes overlooking south) are grazed earlier. Sections of pastures may also be closed to grazing and preserved for early spring grazing during the next year.

Some villages close part of pastures during a year and cut hay from this area. That part is opened to grazing next year and the other part is preserved. Although pastures are communally grazed, specific plots are allocated to individual families for cutting hay. This implies that some sort of individual ownership of grazing land has evolved, though this is not officially recognized.

These grazing practices meet the general recommendation for managed grazing. The only missing key ingredient is reduction of the grazing period. In general, animals are put on the pastures as soon as snow melts in contrast to the recommended practice of allowing one month for grass to reach maturity before grazing. This deferred grazing also eliminates the damage caused by animals trampling on wet soils.

E.3.4.2 Existing pasture improvement programs

MEF has been implementing pasture improvement projects since 1970's. The initial emphasis was on development of watering holes to facilitate even utilization of the forest pastures. Itching poles and salt stands were also provided. Selective terracing to prevent soil erosion in pastures, de-stoning, and weed control were other actions taken.

There has been early recognition of the importance of proper pasture grazing conditions. The Ministry has encouraged livestock owners to stop early grazing and promote early withdrawal in autumn. Rotational grazing programs are drawn up for different grazing parcels and village guards are hired to enforce the grazing regime.

The typical pasture improvement project presented here incorporates the results of projects implemented by the Ministry in the Basin. These include projects in Bayburt, Savsat (Artvin), and Oltu (Erzurum).

E.3.4.3 Pasture Improvement Strategies

A complicated and a fairly comprehensive set of pasture improvement interventions have been developed in Turkey. Some of these are expensive to implement and the results are not proven to be beneficial or sustainable. A description of all possible interventions is presented below, but only a very limited set of these is recommended for implementation in the Coruh Basin.

Improvement of the grazing and forage resources

The key steps for this purpose are soil and moisture conservation. Soil conservation will be achieved when the grass cover is improved. Moisture conservation requires additional measures for water retention such as terracing.

Forage production reduces the demand for grazing in two separate ways. First, it is a prerequisite for shortening the grazing period, which is a key requirement of the improved management. Second, ample supply of low cost forage will encourage the development of intensive, in-stall livestock production systems, which do not use pastures at all.

Increasing the hay yield

Increasing the hay yield of pastures and improving the composition of this yield requires that three steps should be taken. The first step is to reduce the grazing pressure on the pastures. This can be done by reducing the number of animals grazing the pastures or reducing the grazing period for a given herd size. The grazing pressure is also reduced when the hay yield of pastures is increased. There are different mechanisms that may be used to achieve this.

An important component of this strategy is to change the management system of pastures. One critical step in this is to shorten the grazing period- by deferred grazing and early withdrawal from pastures. Rotational grazing of different parts of the pastures will reduce localized pressure. These will increase the grass yield of pastures.

Additional measures may be implemented in villages where consensus has been achieved for pasture improvement. These include fertilizer applications, re-seeding, and closing parts of pastures to grazing for extended periods.

Homogenous distribution of grazing pressure

Distributing the grazing pressure equally among different parts of the pasture area will eliminate localized pressure and the resulting degradation. Generally, pastures around the settlements tend

to be overgrazed while summer grazing grounds (yayla) tend not to be grazed as much. Parts of pastures may also be overgrazed due to water availability. Provision of water troughs in areas presently lacking facilities; and assistance with building accommodations for livestock on the yayla will contribute to even grazing.

Reducing the grazing demand

The combined improvement in pasture and forage production is expected to assist the transformation from extensive pasture based systems to intensive production. This comes about by changes in the type of livestock and production conditions, which increase the yield response to feed input. In-stall feeding under the intensive systems eliminates part of the grazing demand.

E.3.4.4 Existing conditions and recommended improvements

The specific pasture management and improvement projects to be implemented depend on the existing conditions. There is a general consensus on the type of measures that should be taken for each type of pasture. These improvement measures must be accompanied by appropriate management practices.

The main measure to be taken for the pastures in good conditions is fertilizer application. There are different views on the level and composition of fertilizer applications. The present view is to apply phosphate fertilizers at a rate of around 5 kg/da. This will improve the grass composition in favor of legumes, which will fix the required nitrogen.

The recommended practice for moderately degraded pastures is re-seeding. This can be done mechanically when topography is suitable. In other areas it will have to be done manually.

The topsoil is likely to have largely eroded away in heavily degraded pastures. There is little that can be done in these areas. One safe step is planting of fodder shrub. Research is being conducted in the Region on suitable varieties that may be used for this purpose.

The pasture improvement measures will not have a sustainable impact if these are not accompanied by appropriate management practices. All livestock owners must agree on a simple management system that will be applied at the village level. Selective improvement of specific plots have proved not to be sustainable. There are two critical components of the village level management system.

The first component is shortening the grazing period. In Coruh valley, animals should not be allowed onto the pasture until the dominant grass species reach a plant growth of around 10 cm.

This would mean delayed grazing by about one month compared with the present practice. The grazing must also be terminated early to allow strong growth during the next season.

The second element of village level grazing management is a simple rotation system. Parts of pasture area should be rested for part of the season and lightly grazed during selected periods to allow seed development. The general recommendation is division into three parts with a part rested every three years.

Shortening the grazing period will eventually increase grass yield. Initially, however farmers must be assisted to keep the animals indoor for the extended period- around a month in Coruh Valley. Increasing forage production in parallel can do this. The common practice in Turkey is assistance by providing forage seeds and equipment for planting and harvesting the forage crops.

E.3.4.5 Pasture improvement programs

The data on the full range of likely pasture improvements programs for Basakali village is presented in Table 17. It is ,however, not recommended that the full range of these measures are implemented. The top priority should be given to management. This does not require any physical investments.

A key factor limiting the likely interventions in pasture improvement is the relatively poor resource base in the pasture area (Table 22). The pasture area has steep slopes, most land is in Land capability Class VII, and the soil types are not very fertile.

As an incentive for the farmers, it is recommended that the management program should be accompanied with a forage production program. The machinery listed in table 17 will support this program. In addition, forage seed subsidy is proposed for 50 ha each year in each village. This coverage may be expanded where the demand exists. The other pasture improvement measures are included for information purposes and it is not recommended to implement them.

E.3.5 Proposed development programs in each MC

A package of development programs have been proposed for each MC by taking into account the existing resource base and development potential. The salient features of the MC’s that affect the selection, the number for proposed programs in each MC and the total investment costs of these programs are given in Table 18. They include the costs of providing efficient services as well as fixed capital investments.

For sheep breeding, new breeding programs are proposed in MC's where the carrying capacity already exceeds the existing herd size. Breeding projects may also be implemented if the carrying capacity is projected to exceed the existing size after pasture improvement.

Cattle breeding programs are proposed in areas with sufficient forage production. A prerequisite is availability of irrigated land. Access to markets is an important factor. As discussed above, these programs should be concentrated in few interested villages for reasons of efficiency in service delivery, and milk marketing arrangements.

The number of livestock fattening units that may be developed in each MC depend on the existing conditions and the capacity of each MC. Fattening programs derive from the size of available feeder stock. Stock can also be imported from other regions for fattening in case of strong local interest in the program.

E.4 THE COST AND IMPACT OF PROPOSED PROJECTS

The unit investment costs of the proposed income generating projects are given in Table 19. Unlike the implementation units, of 200 head dairy unit for example, these are given for actual farm costs as these will be implemented by individual farmers. The investment costs include fixed capital investments and the permanent working capital requirements.

The total cost of pasture and livestock projects over a five-year period is estimated to be $11.5 million. This excludes dairy processing units. Two dairy processing units to be established in Erzurum and Bayburt city centers should also be included. The investment cost of each dairy is $1. 16 million (Table 15). Including these two units, the total investment costs of the Basin Development project for livestock and pasture improvement is $13.83 million. (11.5 Trillion Turkish Lira in June 2003 prices, and using an exchange rate of 1$=1.5 million).

E.4.1 Pasture Improvement

Pasture improvement projects will achieve two interrelated objectives. They will increase the grass yield and support livestock development. At the same time, they will increase the grass cover on the soil and will reduce soil erosion.

The pasture improvement projects contain a complicated set of likely interventions. These include pasture management; soil improvement; structures that facilitate even grazing; productivity enhancing measures; and production of cultivated forages. There are lists of possible

actions that may be taken under each category. The specific actions to be undertaken vary with the condition of pastures.

Three sets of improvement activities are recommended for the pastures. The first priority is reduction of the grazing period. At present, grazing starts in April 15 and continues until the end of October. This needs to be changed. The recommended grazing period starts on May 15 and continues until September 15. Thus, the grazing period will be reduced to four months from the present practice of 6.5 months.

The feeding requirements of the livestock have to be met for the additional 1.5 months that the animals will be kept indoors. A parallel program of forage production can do this.

Substantial increases are expected in pasture hay as a result of deferred grazing. In case this increase falls short of summer grazing requirements, additional production is possible, in areas with adequate grass cover, by fertilizer applications. There is no agreement on the level and composition of fertilizers to be applied. There are contrasting views on this point. Given the soil conditions and the composition of vegetation, it is recommended to apply 50 to 40 kg./ha of nutrient N and P. This is not recommended due to the environmental impact of fertilizer use and the unsustainable nature of this practice after the project implementing agency terminates its involvement.

The second set of activities involve land improvement measures in pasture areas. These include harrowing, raking and other soil improvement measures. Selective de-stoning may also be undertaken.

Third, facilities that regulate grazing may be constructed. These include watering troughs, itching poles, and accommodations. The last includes sheds to house shepherds, barns for animals and shade during the day.

Production enhancement measures include reseeding and weed control. This will be done manually. In selected cases, cutting weeds or intensive grazing may be sufficient. In other cases hoeing will be necessary.

The implementation of these measures on all of the village pastures is expected to increase the grass yield from one ton per ha to three tons in average pastures; and from half a ton to one ton in degraded pastures.

It is recommended that only three of the long list of these interventions (presented in Table 17) should be implemented. These are provision of forage seed, extension and procurement of

machinery for forage planting and harvesting. The cost of these interventions in Basakli over a five-year period is TL 189 billion or $126,000.

The present and projected grass production from the pasture area of Basakli is presented in Table 7. The expectation is that the grass yield will increase from 500 kg/ ha dry matter to 1000 kg. The increase will occur gradually and reach its full potential at the beginning of year-4. The benefits of the proposed project is the increased grass production and the reduction in sheet erosion.

The price of dry hay is around 100,000-125,000 TL/kg. In the case of pasture hay, the project will increase the standing hay. This needs to be cut and transported for comparisons with cut hay. The value of standing hay may be regarded as half of the market value or TL 60,000/kg. The value of the increased production from all of the village pasture and the associated costs are given in Table 20. The economic IRR calculated from that table is 12%.

The breakdown of the costs is instructive. We have assumed a full time extension agent working in one village for pasture improvement alone at a cost of two billion TL per month. Similarly, a seeder, silage machine, and hay cutting machine is considered an outright cost with no associated income (labor saving) and no salvage value. On the benefit side, reduced soil erosion is disregarded. Still, the estimated IRR is relatively high.

Two possible risks faced by this project is failure to utilize the increased pasture hay and the failure to actually achieve the projected increase in hay production. The first is simulated by setting the value of increased production at 40,000 TL/kg instead of 60,000. This reduces the IRR to 6%. The failure to increase grass yield has more serious impacts and it reduces the IRR to 2% if the increase in the hay yield is 250 kg instead of the projected 500 kg dry matter.

It should be noted that the robust IRR is mainly due to the inclusion of all village pastures in the program. The project will not be viable for improving small patches of pastures.

Pasture improvement projects will need to be implemented in a very flexible manner. They can be implemented only in villages where all farmers agree to abide by the rules that are collectively agreed upon. Traditionally, this agreement is reached by all farmers rather than a representative body. This makes decision making extremely complicated and the tendency by some farmers to break the rules is very strong.

Consequently, this component of the program can be most easily implemented in villages with homogenous ownership patterns. It is difficult in villages where there are factions within the village.

The implementation of pasture program also requires strong contacts between the villagers and the implementing agency. There is a need for continuous dialogue. The representative of the implementing agency will work as a facilitator to reach and maintain agreement among the farmers. He will need to respond to problems as they occur in a very flexible manner if the program is to succeed. This is an unusual mode of operation for a central government agency. It is more in line with the operating style of NGO's with experience in community development.

E.4.2 Dairy Development

After pasture improvement, the priority should be on promotion of intensive dairy farms. The conditions for a village herd of 100 head of exotic cattle are given in table 11. The table presents a breakdown of costs and sources of income for three types of dairy development. The benefits stated for intensive dairy are summarized in Table 20. The indicated benefits will occur when the herd is in a stationary position, which will be achieved only after a number of years. The herd dynamics and the time it will take to achieve this stationary state for the intensive production unit are given in table 12. The costs and benefits of a herd that is developed to a stationary state (the herd size remains constant) are given in Table 20.

The village herd of 100 head cows requires an initial investment of 410 billion TL as detailed in Table 19. It will generate net revenues of 64 billion at full development (Table 11). Milking equipment of the dairy unit needs to be replaced and this is shown as new investment in Table 20.

The model is presented for the dairy unit only. It buys the forage from the crop part of the farm even if these are under the same ownership. Market prices are paid for the forages.

The dairy unit is reasonably profitable with the relative prices existing in June 2003 (Table 21). The estimated Economic IRR is 10% in the base case. The Financial IRR is higher because of the interest rate subsidy.

The main determinant of the farm level profitability of proposed investments are the projected changes in the levels of productivity. There are not significant differences in the levels of inputs used between a dairy farm producing 2 or 5 tons per cow per lactation. The low productivity system looses money while the technically efficient one can be very profitable.

Traditionally the livestock development projects have encouraged farmers to adopt the input intensive systems. The same policy is implemented by the Ministry of Environment and Forestry. The change in yields falls far short of the targets despite the intensification in input use.

The main constraint to low productivity is structural. Livestock farms are too small to be professionally managed. Support services in veterinary care and farmer education are also largely lacking. The attainment of the projected productivity depends on simultaneous adoption of a package of practices. These include relatively large size to facilitate specialization, farmer extension services to be provided both by government staff as well as private technical experts, finance, and support for marketing.

Implementation of these measures in a coherent way will attain the targeted productivity. Improved productivity changes the herd size in a very favorable manner as well. The total number of LU declines after the project is implemented while the output is nearly tripled. This supports the government objective of keeping the livestock herd size constant while increasing production.

E.4.3 Dairy processing

Milk production and dairy processing are intimately linked. One can not be undertaken without the other. There is demand for fresh milk in all urban centers in the study area. Yet, none of the villagers in three villages studied in detail marketed any fresh milk. In any case marketing of fresh milk without processing is not recommended as it may create health problem. The existing dairy processors in Erzurum and Bayburt can not operate due to shortage of raw milk.

Still, it would be advisable to establish a new dairy processing plant in each city. These plants should be linked to the dairy producers in a mutually supportive way. The investment costs and the operating conditions of such a plant are given in Tables 15 and 16.

The plant will have reasonable processing margins on which to make a profit if it can be managed properly. This investment will have a very high return under normal operation conditions: the IRR is 25% for the base case (Table 20). It is, however, unlikely that the present model, which relies on cooperatives, will succeed. Support should be given to experienced private processors.

E.4.4 Sheep breeding

There is a strong interest from the farmers for sheep breeding. The analysis conducted by the team indicate that sheep raising is not profitable under the existing conditions. It may become marginally profitable with improved husbandry practices. The return to the investment is very low even under the improved practices (Table 20). The strong interest in sheep raising despite the apparent little profitability is due to very profitable conditions enjoyed during the previous two years, though these have largely disappeared.

Sheep breeding may be recommended in MC's that have excess grazing resources, and where the winter feeding season is relatively short. The costs can be reduced by shifting the feed requirements to the pastures from forages and concentrates.

E.4.5 Fattening

Fattening of male lambs and bulls has not developed as a specialized activity in the Region. Breeding farms tend to fatten their stock to marketing weight. Fattening should be developed as specialized operations parallel to the intensification of production in the breeding units.

Preliminary analysis of the costs and the revenues of these enterprises show that they can be undertaken profitably (Table 13). These enterprises are not as market dependent as dairy and can be developed where labor is available. These enterprises purchase the excess male stock of the breeding enterprises and they will develop where the fattening stock is available.

Separate estimates of financial viability of the fattening units are not included in this report. This is due to the enormous variations in the type of practice. In some cases, it is recommended not to build new facilities- open air fattening. The length of the fattening period may also vary with up to four cycles per year. Thus, estimates based on an average practice will be misleading for the fattening units and they are not included in this report.

Table E.1 - The Number of Villages by the Main Income Source in the Coruh River Basin

Province	No. of villages	Nos. of forest village	Rank as source of income	Income source: Crops	Fruits	Vegetable	Livestock	Forest products	Others	Total
Artvin	251	250	1	82	46	8	83	23	9	251
			2	56	51	28	78	9	8	230
			3	35	42	22	42	16	6	165
Erzurum	403	228	1	187	45	9	145	5	12	403
			2	153	73	21	122	6	1	376
			3	28	45	62	27	7	9	182
Bayburt	175	36	1	77	1	3	88	0	6	175
			2	88	1	3	75	0	1	168
			3	3	1	8	6	0	0	18
Coruh	829	514	1	346	92	20	316	28	27	829
Basin			2	297	125	52	275	15	10	774
			3	66	88	92	75	23	15	365

Source: 1997 Village Inventory, Artvin, Erzurum, Bayburt; SIS

Table E.2 Livestock population by district: 2001

		Cattle: Pure breed	Cross-bred	local	Total	Sheep	Goat	Horse/donkey
Artvin	Merkez	1,119	2,738	2,789	6,646	3,220	1,800	205
	Ardanuc	4,718	2,770	1,734	9,222	36,184	882	275
	Borckca	2	3,452	7,321	10,775	2,957	496	114
	Murgul	215	730	1,020	1,965	1,000	1,200	15
	Savsat	71	11,143	12,092	23,306	18,104	31	406
	Yusufeli	305	1,181	11,378	12,864	9,500	6,251	747
	Sub-total	6,430	22,014	36,334	64,778	70,965	10,660	1,762
Erzurum	Ispir	310	4,000	20,736	25,046	11,917	5,109	954
	Narman	748	22,327	8,871	31,946	2,413	95	214
	Oltu	470	10,800	16,500	27,770	23,500	4,300	2,025
	Olur	300	3,500	12,325	16,125	6,400	4,900	1,120
	Pazaryolu	204	849	4,612	5,665	4,318	136	447
	Senkaya	4	9,262	18,109	27,375	11,964	5,776	2,659
	Tortum	310	10,180	15,010	25,500	15,950	2,170	718
	Uzundere	8	509	3,785	4,302	7,633	2,230	670
	Sub-total	2,354	61,427	99,948	163,729	84,095	24,716	8,807
Bayburt	Merkez	6,600	29,440	2,061	38,101	74,303	1,520	549
	Aydintepe	1,700	4,770	1,329	7,799	11,275	350	124
	Demirozu	1,490	12,990	2,610	17,090	14,852	610	447
	Sub-total	9,790	47,200	6,000	62,990	100,430	2,480	1,120
Basin Total		18,574	130,641	142,282	291,497	255,490	37,856	11,689

Source: Unpublished time-series data, 2001, SIS

Table E.3 Changes in the size of livestock herd in the Coruh Basin

	Artvin	Bayburt	Erzurum[1]	Total Basin
		1991		
Sheep	165,780	248,753	314,261	728,794
Goat	27,710	7,580	32,903	68,193
Cattle	104,823	87,970	186,439	379,232
L.Unit[2]				321,043
		1995		
Sheep	102,128	122,565	213,455	438,148
Goat	15,041	2,818	30,236	48,095
Cattle	89,946	62,951	210,950	363,847
L.Unit				280,524
		2001		
Sheep	70,965	100,432	84,095	255,492
Goat	10,660	2,481	24,716	37,857
Cattle	64,778	62,990	163,729	291,497
L.Unit				216,273

1 The value for Erzurum refers to 1992 for the first group of entries

2 The herd size converted to Livestock Units on the basis of the following coefficients: 1 sheep= 0.1 Livestock Unit 1 Goat= 0.08 L.U 1 Pure breed cattle = 1 L.U 1 Cross breed cattle= 0.75 L. U. 1 Local cattle= 0.5 L.U.

Source: Provincial Director of Agriculture

Table E.4 Livestock herd size in Artvin and Erzurum

Artvin

Year	Cattle				Sheep	Goat
	Pure breed	Cross-breed cattle	Native cattle	Total		
1992	10,643	20,019	63,607	94,269	131,925	18,006
1993	8,105	21,180	66,970	96,255	140,325	15,150
1994	9,210	16,867	64,763	90,840	106,369	15,822
1995	7,444	19,923	62,579	89,946	102,128	15,041
1996	7,444	19,923	62,579	89,946	103,128	15,041
1997	6,710	13,868	57,938	78,516	94,410	13,056
1998	5,994	18,078	43,937	68,009	80,227	11,460
1999	5,792	19,557	41,022	66,371	79,577	12,016
2000	6,652	30,506	38,913	76,071	74,206	12,132
2001	6,429	25,698	36,985	69,112	72,562	13,559

Erzurum

Year	Cattle				Sheep	Goat
	Pure breed	Cross-breed cattle	Native cattle	Total		
1992	2,053	28,372	156,014	186,439	314,261	32,903
1993	2,448	30,572	148,821	181,841	300,025	31,699
1994	2,809	31,368	153,120	187,297	246,681	28,683
1995	5,538	43,265	162,147	210,950	213,455	30,236
1996	5,266	45,879	168,764	219,909	199,661	33,190
1997	1,543	42,602	133,883	178,028	119,677	26,600
1998	2,082	54,517	155,527	212,126	187,512	36,715
1999	2,316	59,897	149,494	211,707	186,299	35,798
2000	2,383	56,613	135,193	194,189	176,126	29,839
2001	2,354	61,427	99,948	163,729	84,092	24,616

Source: Provincial Director of Agriculture

Table E.5 Land use in the project area

	Total Land Area (ha)	Area Sown (ha)	Fallow Land (ha)	Permanent pasture and meadows (ha)
		Artvin		
Merkez	80,092.0	562.4	8.4	26,332.0
Ardanuc	90,923.0	1,283.5	52.0	34,421.0
Borcka	65,223.0	2,247.6	20.2	10,763.0
Murgul	33,685.0	309.2	1.7	6,101.0
Savsat	112,750.0	491.5	0.0	31,046.0
Yusufeli	185,743.0	2,285.6	45.7	36,081.0
Sub-total	568,416.0	7,179.8	128.0	144,744.0
		Erzurum		
Ispir	207,406.0	3,233.0	103.0	74,396.0
Narman	81,828.0	6,132.5	3,168.0	60,517.0
Oltu	132,176.0	5,754.1	466.0	74,784.0
Olur	76,711.0	1,687.1	242.0	54,360.0
Pazaryolu	52,978.0	1,432.7	125.0	37,087.0
Senkaya	137,056.0	7,215.1	1,271.0	58,789.0
Tortum	133,799.0	3,915.3	492.0	84,206.0
Uzundere	41,475.0	495.3	81.0	15,579.0
Sub-total	863,429.0	29,865.1	5,948.0	459,718.0
		Bayburt		
Merkez	145,653.0	19,347.7	3,675.0	65,672.0
Aydintepe	43,495.0	1,847.8	0.8	34,997.0
Demirozu	49,110.0	7,928.0	1,117.0	15,831.0
Sub-total	238,258.0	29,123.5	4,792.8	116,500.0

Source: Village Inventory, SIS, 1997

Table 6 - Land use and forage production in the Coruh Catchment

			Land use (ha)		
	Total Agr Area	Area Sown	Fodder Crops	Pastures	Forests
Artvin	32,874.00	15,990.00	2,373.00	98,859.80	309,471.00
Bayburt	95,703.00	51,227.00	13,880.00	216,362.00	14,631.00
Erzurum	275,018.00	204,396.00	6,979.00	400,753.00	223,583.00
Total				715,974.80	

		Forage production (ha)		
	Artvin	Bayburt	Erzurum	Total
Meadow hay	25,729.00	31,338.00	9,070.00	66,137.00
Cow Vetches	830.00	5,788.00	1,238.00	7,856.00
Alfalfa	10,012.00	44,708.00	3,769.00	58,489.00
Sainfoin	2,574.00	11,213.00	1,872.00	15,659.00

		Forage production (ton)		
	Artvin	Bayburt	Erzurum	Total
Pasture hay	95,894.01	209,871.14	388,730.41	694,495.56
Meadow hay	102,916.00	125,352.00	36,280.00	264,548.00
Vetches	2,750.00	19,170.00	4,100.00	26,020.00
Alfalfa	39,434.00	176,000.00	14,845.00	230,279.00
Sainfoin	5,496.00	23,940.00	3,997.00	33,433.00
Total	246,490.01	554,333.14	447,952.41	1,248,775.56

Source: SIS, Agricultural Structure and Production, 2001

Table E.7 Present and projected pasture hay and fodder production in Basakli Village

Present production of pasture hay			Projected Production	
Area-da	Yield-kg/da	Production	Yield-kg/da	Production
7,290	50	364,500	100	729,000
158	30	4,740	60	9,480
1,318	40	52,720	80	105,440
		421,960		843,920

Existing livestock pop. 467.36 LU

	Production of forage crops and meadow hay			Projected production of fodder crops		
F. crops	Area-da.	Yield- kg/da	Production	Area-da.	Yield- kg/da	Production
Alfaalfa	151	400	60,400	300	500	150,000
Sanfoin	100	150	15,000	200	200	40,000
Vetch	50	250	12,500	200	250	50,000
Subtotal			87,900			240,000
Meadow hay	621	250	155,250	621	400	248,400
Total fodder			243,150			488,400

Herd size- LU	467.4	
Carrying capacity of pastures: LU	234.4	468.8
Fodder capacity: LU	135.1	271.3

Source: JICA Study Team

Table E.8 Summer and winter feed requirements in Camlica village

Livestock herd size	Cow	heifers	calves	Total cattle	Sheep
	n.a.	n.a	n.a	173	320
Existing Livestock- LU					135.8

Pasture hay production	Area- ha	Prod. Ton
	1164	1,164

Winter feed production		Area- da	Prod- kg
	Sainfoin	60	18,000
	Cut hay	400	80,000
			98,000

Existing herd size in LU	135.8
Pasture availability. LU	646.7
Winter feed availability- LU	54.4

Source: JICA Study Team

Table E.9 Summer and winter feed requirements in Cankurtaran village

Livestock size		Cow	steer	Calf	Bulls
		100	25	50	27
Livestock units		124.95			
Pasture		Area	Pasture hay-kg		
		491 ha	196,400		
Winter feed		Area	Production- kg		
	Alfaalfa	64.4 da	48,300		
	Sainfoin	78.2 da	31,280		
	Cut hay	50 da	5,000		
	Sub- total		84,580		
Existing herd size				124.95	
Grazing Capacity- LU				109.1	
Winter feed Cap. LU				47.0	

Table 10- Herd composition in the Coruh catchment

	Total cattle	Calves	Calf Ratio	Pure breed	Calves	Calf Ratio	Local Cattle	Calves	Calf Ratio
Savsat	23,306	5,276	0.29	71	26	0.58	12,092	3,272	0.37
Yusufeli	12,864	3,880	0.43	305	100	0.49	11,378	3,230	0.40
Bayburt- M	38,101	13,691	0.56	6,600	2,375	0.56	2,061	756	0.58
Uzundere	4,302	1,200	0.39	8	0	0.00	3,785	1,050	0.38
Ispir	25,046	7,055	0.39	310	136	0.78	20,736	6,736	0.48
Oltu	16,125	5,770	0.56	300	115	0.62	12,325	4,075	0.49
Total	119,744	36,872	0.44	7,594	2,752	0.57	62,377	19,119	0.44

	Sheep	Lambs	Ratio	Goat	Kid	Ratio
Savsat	18,104	6,261	0.53	31	7	0.29
Yusufeli	9,500	2,000	0.27	6,251	1,801	0.40
Bayburt- M	74,303	29,198	0.65	1,520	574	0.61
Uzundere	7,633	2,618	0.52	2,230	800	0.56
Ispir	11,917	3,967	0.50	6,100	3,000	0.97
Oltu	6,400	2,200	0.52	4,800	2,100	0.78
Total	127,857	46,244	0.57	20,932	8,282	0.65

Source: SIS data for 2001

Table E.11 Herd composition and productivity of a 100 head dairy herd: present conditions and after project implementation

(Prices in Thousand TL in June 2003 prices)

	Present herd Feed Requirement			Improved herd Feed Requirement			Intensive Production Feed Requirement		
Dairy herd	Head	Forage	Concentrate	Head	Forage	Concentrate	Head	Forage	Concentrate
Milking cows	100	90000	9125	100	108000	10950	100	292000	16425
Cows milked	75		20000	80		53333.33333	85		141666.6667
Replacement heifers	21	13230	5748.75	25	18000	6843.75	26	47906.25	7185.9375
Calves	22	7920	4015	26	14040	4745	28	40150	5018.75
Followers	74	59940	40515	54	48600	39420	29	52468.75	10493.75
Bulls	2	2190	1460	2	2190	1460			
Total	209	171090	79403.75	202	190830	116752.0833	182	432525	180790.1042
Production costs									
Feed			41,237,188			53,041,770.83			99,263,151.04
Labor			8,400,000			8,400,000			19,200,000.00
Building maintenance			5,000,000			5,000,000.00			5,000,000.00
Vet. costs			2,200,000			2,200,000.00			22,000,000.00
Other costs									
Total costs			56,837,188			68,641,770.83			145,463,151.04
Revenue		Unit	Value (Th. TL)		Unit	Value		Unit	Value
Milk production-lt		60000	18,000,000		160000	48,000,000.00		425000	127,500,000.00
Stock sale- head									
Steers/heifers		50	30,210,000		54	43,200,000.00		57.5	46,000,000.00
Cull cows		19	15,200,000		24	24,000,000.00		24	36,000,000.00
Revenue			63,410,000			115,200,000.00			209,500,000.00
Net Revenue			6,572,813			46,558,229.17			64,036,848.96
Total LU equivalent	160.44			154.4			141.2		

Source: JICA Study Team

Table E.12 Herd dynamics

	First Year			Second year			Stationary herd		
		Forage	Concentrate						
Dairy herd	Head	Cons.-kg	Cons-kg	Head	Forage	Concentrate	Head	Forage	Concentrate
Milking cows	100	292,000	16,425	100	292,000	16,425	100	292,000	16,425
Cows milked	85		106,250	85		141,667	85		141,667
Replacement heifers		0	0	26	47,906	7,186	26	47,906	7,186
Calves	85	124,100	15,513	28	40,150	5,019	28	40,150	5,019
Followers		0	0	29	47,222	10,494		0	0
Bulls									
Total	185	416,100	138,188	182	427,278	180,790	153	380,056	170,296
Production costs									
Feed			86,559,375.00			106,842,281.25			90,081,119.79
Labor			19,200,000.00			19,200,000.00			19,200,000.00
Building maintenance			5,000,000			5,000,000			5,000,000
Vet. costs			22,000,000.00			22,000,000.00			22,000,000.00
Other costs									
Total costs			132,759,375.00			153,042,281.25			136,281,119.79
Revenue								Unit	Value
Milk production-lt		318,750	95,625,000		425,000	127,500,000		425,000	127,500,000.00
Stock sale- head									
Steers/heifers					57.5	46,000,000.00		57.5	46,000,000.00
Cull cows						0.00		24.00	36,000,000.00
Revenue			95,625,000.00		425,057.50	173,500,000.00			209,500,000.00
Net Revenue			-37,134,375.00			20,457,718.75			73,218,880.21

Table E.13 Costs and revenues of livestock fattening

	Sheep fattening:100 head (Th. TL)	Cattle fattening: 50 head (Th. TL)
Procurement of stock	12,500,000	30,000,000
Concentrate	2,400,000	21,000,000
Hay/straw	8,750	2,400,000
Labor	800,000	2,400,000
Other costs	400,000	120,000
Total costs	16,108,750	55,920,000
Revenue	18,000,000	64,000,000
Net revenue	1,891,250	8,080,000

Table E.14 Herd composition and productivity of a 100 head sheep herd: present conditions and after project implementation

	Present practice			Improved practice		
	Head	Feed consumption		Head	Feed consumption	
		Forage	Concentrate		Forage	Concentrate
Mature ewes	100	10,800	9,000	100	13,500	12,000
Ewe hoggs	28	2,800	1,680	26	3,120	1,560
replacement lambs	32		800	28		700
Followers	70		3,150	74		3,330
Sub total		13,600	14,630		16,620	17,590
Feed costs		5,357,500			6,475,000	
Labor		4,800,000			4,800,000	
Building minatenance		2,067			2,067	
Other costs		1,000			1,100	
Total costs		10,160,567			11,278,167	
Revenue						
Milk	1,500,000			1,800,000		
Stock sale						
Cull ewes	3,000,000			3,000,000		
Lambs	5,400,000			7,400,000		
Wool Sales	384,000			435,200		
Total revenue	9,900,000			12,200,000		
Net Revenue	-260,567			921,833		

Table E.15 Investment requirements of a dairy processing unit

		Unit: Million TL
Project preparation		26,000
Land purchase		120,000
Vehicles		27,000
Construction		540,000
Cooling plant		103,000
Machinery and equipment		347,000
Electricity		111,000
Boilers		38,100
Central facilities		78,450
Transport vehicles		32,775
Furniture and fixtures		55,500
Other expenses and contigencies		60,300
Total Fixed investments		1,539,125
Permenant working capital	Milk procurement	180,000
	Other costs	27,000
Total Investment		1,746,125

Table E.16 Costs and revenues of a dairy processing unit: 15 tons/day raw milk capacity

Annual production	Quantity	Price- Mil TL	Revenue- Mil.TL
Pastorized milk- lt	900,000	0.5	450,000
Yoghurt- kg	1,620,000	1.08	1,749,600
Ayran- lt	540,000	0.59	318,600
White cheese(fetta)-kg	122,400	2.4	293,760
Cream- kg	36,000	2.8	100,800
Lor cheese- kg	18,000	1.05	18,900
Total revenue			2,931,660
Annual procurement and costs			Annual Cost
Raw milk- 5000 tons/year at 325000TL/kg			1,625,000
Staff/ labor			70,200
Maintenance			80,000
Electricity			18,000
Materials			13,500
Packaging materials(1)			337,500
Fuel and water			119,340
Milk Transport charges			125,000
Other costs			12,000
Total costs			2,400,540
Net Revenue			531,120

(1) The main items are ayran cups at 75000 tl per cup, 2.34 million cups per annum and yoghurt cup at 150 000 TL each, 1.08 million cups a year. The white cheese marketed in 18 kg cans costing 2.3 million each.

Source: Ministry of Forestry and environment and JICA Study Team

Table E.17 Pasture Improvement Project for average pastures (Basakli Village)

	Year 1		Year 2		Year 3		Year 4		Year 5	
	Quantitiy	Cost- mil TL	Quantity	Cost- mil TL	Quantitiy	Cost- mil TL	Quantitiy	Cost- mil TL	Quantitiy	Cost- mil TL
Soil Improvement measures										
Terracing	3000 ha	2,400	3500 ha	2,800	3500 ha	2,800	1,500	1,200		
Furrowing		1,800		2,000		2,000		900		
Facilitating structures										
Watering trough		2,000				2,000		2,000		
Salt troughs		600		600		600		600		
Rubbing post		600		600		600		600		
Productivity enhancement										
Weed control										
Fertilizer application (1)	1000 ha	9,500	1,000	9,500	1,000	9,500				
Seeding										
Forage production										
Seed(2)	25 ha	5,625	50	11,250	50	11,250	50	11,250	25	5,625
Fertilizer		500		1,000		1,000		1,000		500
Equipment (3)		6,000		6,000		6,000		6,000		
Extension services		24,000		24,000		24,000		24,000		24,000
Total costs		53,025		33,750		35,750		47,550		30,125

(1)Nutrient N application of 5 kg per da and nutrient P application of 4.3 kg per da.

		(2) Seed		Requirement
Total pasture area	876.6 ha	prices	Mil TL/kg	kg/ha
Irrigated area	400 da	Alfalfa	7.5	30
Rainfed agr	522 da	Sanfoin	1.25	120
		Vetch	0.8	120
		Silage corn	5	30

(3) Equipment and prices

Equipment	Quantity	Price in Mil TL
Silage machine	1	4,000
Seeder	1	8,000
Hay cutter	2	12,000

Table E.18 Important features of each MC,number of proposed programs and investment costs in each MC

Micro catchment	Area- Ha	Pasture-%	Pasture area	Village pop.	Number of villages	Cattle herd	Sheep herd
Savsat- BT 04	18,589	0.3	5,576.7	3,239	14	2,684	5,209
Uzundere- TR 06	30,708	0.37	11,362.0	3,252	5	1,364	1,525
Yusufeli- MC 03	21,568	0.21	4,529.3	3,853	3	1,247	1,385
Ispir- UC 14	31,180	0.44	13,719.2	3,242	24	1,958	107
Bayburt- UC 03	21,879	0.74	16,190.5	3,204	6	2,183	1,940
Erzurum- OL 04	38,524	0.48	18,491.5	4,312	17	4,219	3,819

Number of proposed programs in each MC

Micro catchment	Pasture improvement (Villages)	Dairy farming (200head)	Sheep breeding (100 head)	Cattle fattening (50 head)	Sheep fattening (100 head)
Number of proposed programs					
Savsat- BT 04	2	-	10	4	10
Uzundere- TR 06	1	-		2	
Yusufeli- MC 03	1	-		2	
Ispir- UC 14	4	1		1	
Bayburt- UC 03	1	2	5	5	5
Erzurum- OL 04	3	4	10	10	10
Investment costs in Us Dollars					
Savsat- BT 04	276,000		566,880	333,333	1,058,667
Uzundere- TR 06	138,000			166,667	
Yusufeli- MC 03	138,000			166,667	
Ispir- UC 14	552,000	546,600		83,333	
Bayburt- UC 03	138,000	1,093,200	283,440	416,667	529,333
Erzurum- OL 04	414,000	2,186,400	566,880	833,333	1,058,667
Sub-total	1,656,000	3,826,200	1,417,200	2,000,000	2,646,667
Total					11,546,067

Table E.19 Investment requirements of livestock units

Unit: Million TL

	10 cow dairy Unit	100 Breeding ewes	100 sheep fattening unit	50 steer fattening unit
Procurement of stock	24,000	24,500	125,000	40,000
Building construction	20000(1)	41,332	24,800	50,000
Equipment	5,000			
Start up costs	2,000	6,000	2,000	
Permenant working capital	10,000	13,200	7,000	35,000
Total Investment	41,000	85,032	158,800	125,000

(1) The requirement is 10 sq meters per head at 200 million per sq m.
Source: Ministry of Environment and Forestry

Table E.20 Costs and benefits of the proposed investments

Unit: Millin TL

	Pasture improvement: Basakli			Cattle breeding: 100 cows			Dairy processing unit			Sheep breeding: 100 head		
Year	Costs	Benefits	Net benefit	Investments	Operating income	Net	Investments	Operating income	Net Rev.	Investments	Operating income	Net
1	35,621		-35,621	410,000		-410,000	1,746		-1,746	15,880		-15,880
2	41,250		-41,250		-37,134	-37,134		185	185		460	460
3	41,250	8,678	-32,572		20,480	20,480		531	531		923	923
4	41,250	26,298	-14,952		64,693	64,693		531	531		923	923
5	35,625	26,298	-9,327		64,693	64,693		531	531		923	923
6		26,298	26,298		64,693	64,693	60	531	471		923	923
7		26,298	26,298		64,693	64,693		531	531		923	923
8		26,298	26,298		64,693	64,693		531	531		923	923
9		26,298	26,298		64,693	64,693		531	531		923	923
10		26,298	26,298	5,000	64,693	59,693		531	531		923	923
11		26,298	26,298		64,693	64,693	407	531	124		923	923
12		26,298	26,298		64,693	64,693		531	531		923	923
13		26,298	26,298		64,693	64,693		531	531		923	923
14		26,298	26,298		64,693	64,693		531	531		923	923
15		26,298	26,298		64,693	64,693		531	531		923	923
16		26,298	26,298		64,693	64,693		531	531		923	923
17		26,298	26,298		64,693	64,693		531	531		923	923
18		26,298	26,298		64,693	64,693		531	531		923	923
19		26,298	26,298		64,693	64,693		531	531		923	923
20		26,298	26,298	5,000	64,693	59,693		531	531		923	923
IRR			12%			10%			25%			1%

Table E.21 Prices of live animals, livestock products, feed, and other inputs in June 2003 (1)

		Unit: Thousand TL
Pure bred breeding cow- Holstein breed		2,400,000
Breeding ewe- Morkaraman breed		245,000
Sheep- live weight/kg		3,000
Cattle- live weight/ kg		3,500
White cheese (Fetta)		2,500
Raw cow milk /lt		300
Raw sheep milk/lt		400
wool/kg		2,500
Cut hay/kg		125
Straw		80
Concentrate/kg		250
Hired labor- monthly gross cost		350,000
Prices of fertilizers- nutrient: TL/kg	N	1,200
	P	1,320

(1) Farmgate prices
Source: JICA Study Team

Table E.22 Soil conditions and topography in selected villages

Unit: hectars

		Soil Groups			Land Capability					Land Use			
	Slope	Brown Forest Soils	High Mountain Pasture Soils	No Data	IV	VI	VII	VIII	No Data	Agriculture	Forest	Pasture	No Data
Camlica	0 - 2%	8.85	32.99	0.15	6.76	32.99	2.09	0.15	0.00	0.01	0.35	41.62	0.00
	2 - 6%	31.26	105.11	3.22	11.71	105.11	19.55	3.22	0.00	1.60	2.72	135.27	0.00
	6 - 12%	49.12	130.76	7.65	15.73	130.76	33.39	7.65	0.00	2.21	1.83	183.49	0.00
	12 - 30%	325.96	34.05	90.57	41.80	34.05	284.16	90.55	0.02	18.47	50.82	381.29	0.00
	30 - 45%	127.95	2.75	107.63	8.26	2.75	119.69	107.63	0.01	5.83	41.72	190.79	0.00
	over 45	30.56	0.26	57.33	3.22	0.26	27.34	57.33	0.00	3.92	4.26	79.97	0.00
	TOTAL	573.69	305.91	266.55	87.49	305.91	486.21	266.52	0.03	32.03	101.69	1012.43	0.00
		Brown Soils	Colluvial Soils	No Data	IV	VI	VII	VIII	No Data	Agriculture	Forest	Pasture	No Data
Basakli	0 - 2%	4.60	0.00	0.03	0.00	0.00	4.60	0.03	0.00	0.00	0.00	3.47	1.15
	2 - 6%	40.41	2.09	1.78	2.09	0.00	40.41	1.00	0.78	0.00	0.00	37.74	6.53
	6 - 12%	59.13	5.15	3.18	5.15	0.00	59.13	2.60	0.58	1.58	0.00	59.37	6.52
	12 - 30%	262.80	7.07	27.61	7.07	0.00	262.80	25.50	2.11	2.10	0.00	262.66	32.72
	30 - 45%	132.76	4.06	24.20	4.06	0.00	132.76	24.15	0.05	0.26	1.19	155.62	3.94
	over 45	53.18	0.00	15.26	0.00	0.00	53.18	15.26	0.00	0.00	0.20	66.93	1.32
	TOTAL	552.87	18.36	72.06	18.36	0.00	552.87	68.53	3.53	3.94	1.39	585.78	52.18
		Chestnut Soils	Bazaltic Soils	No Data	IV	VI	VII	VIII	No Data	Agriculture	Forest	Pasture	No Data
Cankurtaran	0 - 2%	1.02	0.01	0.00	0.00	0.00	1.03	0.00	0.00	0.79	0.02	0.22	0.00
	2 - 6%	11.92	0.30	0.10	0.00	0.00	12.22	0.00	0.10	8.26	1.00	3.07	0.00
	6 - 12%	18.58	0.58	0.19	0.00	0.07	19.08	0.00	0.19	11.43	2.09	5.82	0.00
	12 - 30%	108.36	7.42	4.75	0.00	3.16	112.62	0.00	4.75	28.65	32.50	59.35	0.03
	30 - 45%	239.59	0.50	0.34	0.00	9.81	230.27	0.00	0.34	24.06	88.44	127.93	0.00
	over 45	84.28	0.00	0.00	0.00	1.62	82.66	0.00	0.00	5.23	13.41	65.65	0.00
	TOTAL	463.75	8.80	5.39	0.00	14.66	457.88	0.00	5.39	78.42	137.46	262.04	0.03

NOTE: Pasture area is that which overlaps with the designation of Forest Management Plan

F. Institution

CONTENTS

F.1 INTRODUCTION

Management for the Coruh Watershed Rehabilitation involves a lot of stakeholders including various government agencies at different administrative levels, academic institutions, NGOs as well as local communities and people. Among the stakeholders there is a serious difference of opinions and wishes about how to use the natural resource. In order to solve the conflicts among them, this report presents that the Coruh Watershed should be considered as a single management area and should be managed by a special management system, which consists of representatives elected from many government agencies at central and local levels, NGOs, local communities, and villagers. This report explains how each stakeholder should be involved in the management, who coordinates the activities by various stakeholders, and how the micro-catchment projects should be designed. The recommended management system would make effective utilization of related institutions capabilities. It will help the related implementing agencies perform the Coruh Watershed rehabilitation management more effectively.

The framework of this report consists of as follows: in Chapter 2 management activities and issues of the watershed management related agencies including MEF's four General Directorates are reviewed carefully, and their extension service is also reviewed. Basing on the examinations, Chapter 3 proposes to establish a special management system to effectively perform the Coruh Watershed rehabilitation management.

To design the management system the lessons leaned from experience of the Eastern Anatolia Watershed Project were referred to. Therefore, this management system would contribute to more effective management for the Coruh Watershed rehabilitation.

F.2 INSTITUTIONAL AND LEGAL FRAMEWORKS, AND EXTENSION

F.2.1 Institutional Framework

F.2.1.1 Main Government Agencies Involved in Watershed Rehabilitation and Management

The Ministry of Environment and Forestry (MEF), the Ministry of Agriculture and Rural Affairs (MARA), the General Directorate of Rural Services (GDRS) and the General Directorate of State Hydraulic Works (DSI) are main government agencies involved in the rehabilitation and management of watershed areas in Turkey. The roles of these agencies are described as follows.

(1) The Ministry of Environment and Forestry (MEF)

MEF was recently established by merging the previous the Ministries of Forestry and Environment, with the Law no. 4856, dated 5 August 2003. Organizational structure of MEF is shown in Figure 1.

The central structure of MEF is composed of the main service, consultancy, assistance and connected units, under the Minister, Undersecretary and its four assistants. The main service units include:

1) General Directorate of Environmental Management;
2) General Directorate of Environmental Impact Assessment and Planning;
3) General Directorate of Afforestation and Erosion Control (AGM);
4) General Directorate of Forest-Village Relations (ORKOY);
5) General Directorate of Nature Conservation and National Parks (DKMP);
6) Department of Foreign Relations and European Union; and
7) Department of Research and Development.

The consultancy units include:

1) Research, Planning and Coordination (APK) Board;
2) Legal Advisors;
3) Press and Public Relations; and
4) Inspection Board.

Assistant units include:

1) Personnel Department;
2) Administration and Finance Department;
3) Information/data Processing Department;
4) Secretariat of Civil Defense;
5) Department of Training and Extension; and
6) Special Secretary of Minister.

Apart from these units, MEF also has the following three connected units:

1) General Directorate of Forestry (OGM);
2) General Directorate of Meteorology; and
3) Special Environment Protection Agency.

(2) MEF's Main Agencies Involved in Watershed Rehabilitation Management

OGM, AGM, ORKOY, and DKMP in the MEF mostly relate to watershed rehabilitation management. They have responsibilities for planning, coordinating, supervising and developing the forest policies, strategies, programs and implementations in their respective fields. AGM, ORKOY and DKMP are placed in the main service units with direct budget funding in the MEF's organization. OGM is placed in the connected units and has as autonomous revolving fund and added budget (supplementary budget).

Budget allocation to these agencies is unique. In 2003, 1,201,177 billion TL are allocated to MEF. The budget allocated to AGM, ORKOY, DKMP, and other general directorates or departments (excluding OGM) is 317,496 billion TL, and budget allocated to OGM in 2003 is 883,681 billion TL (see Table 1). The amount of budget allocated to OGM accounts for 74 percent of total amount of budget.

Table F.2.1-1 Budget Allocated to MEF and OGM (2003)(Unit: Billion TL)

Budget allocated to MEF (except OGM)	2002	2003	Growth Rate	Allocation Rate
1.General Budget	159,893	220,896	38	18
2.Special Budget	37,361	70,000	87	6
3.Revolving Budget	18,045	26,600	47	2
Total (MEF except OGM)	215,299	317,496	47	26

Budget allocated to OGM	2002	2003	Growth Rate	Allocation Rate
1.Added Budget	198,620	290,981	47	24
2.Revolving Budget	415,725	592,700	43	49
Total (OGM)	614,345	883,681	44	74

Total (MEF+OGM)	829,644	1,201,177	45	100

Source: MEF (August, 2003)

The roles of these four general directorates in the watershed rehabilitation management activities are described as follows.

(i)AGM

AGM plans and implements the relevant rehabilitation activities (e.g. erosion control, reforestation, range improvement) on the forest areas in the watersheds. It is responsible for undertaking similar measures also on the non-forest state lands, where fragile conditions and severe degradation cause seriously threatens on the lives, infrastructures and agricultural lands, and urgent measures are needed to prevent them. To permit undertaking of such measures by AGM, such lands have to be taken under the forest regime for public interest.

(ii)OGM

OGM is responsible for protection of forests against the biotic and abiotic damages (e.g. fire, encroachment, illicit cutting), for regeneration and improvement of the forests, for sustainable utilization of wood, and non-wood products from forest areas, and for cadastral and land quality surveys.

(iii)ORKOY

ORKOY is responsible for supporting (through preparation and implementation of relevant

projects/programs) in social and economic development of the village populations living within and near forests in order to improve the relations and collaboration between the villagers and forestry organization and to facilitate conservation and sustainable development of national forest resources.

(iv)DKMP

DKMP[1] is responsible for designation, establishment and management of the protected areas (e.g. national parks, nature parks, nature reserves) and conservation and management of wildlife resources on suitable sites in watersheds.

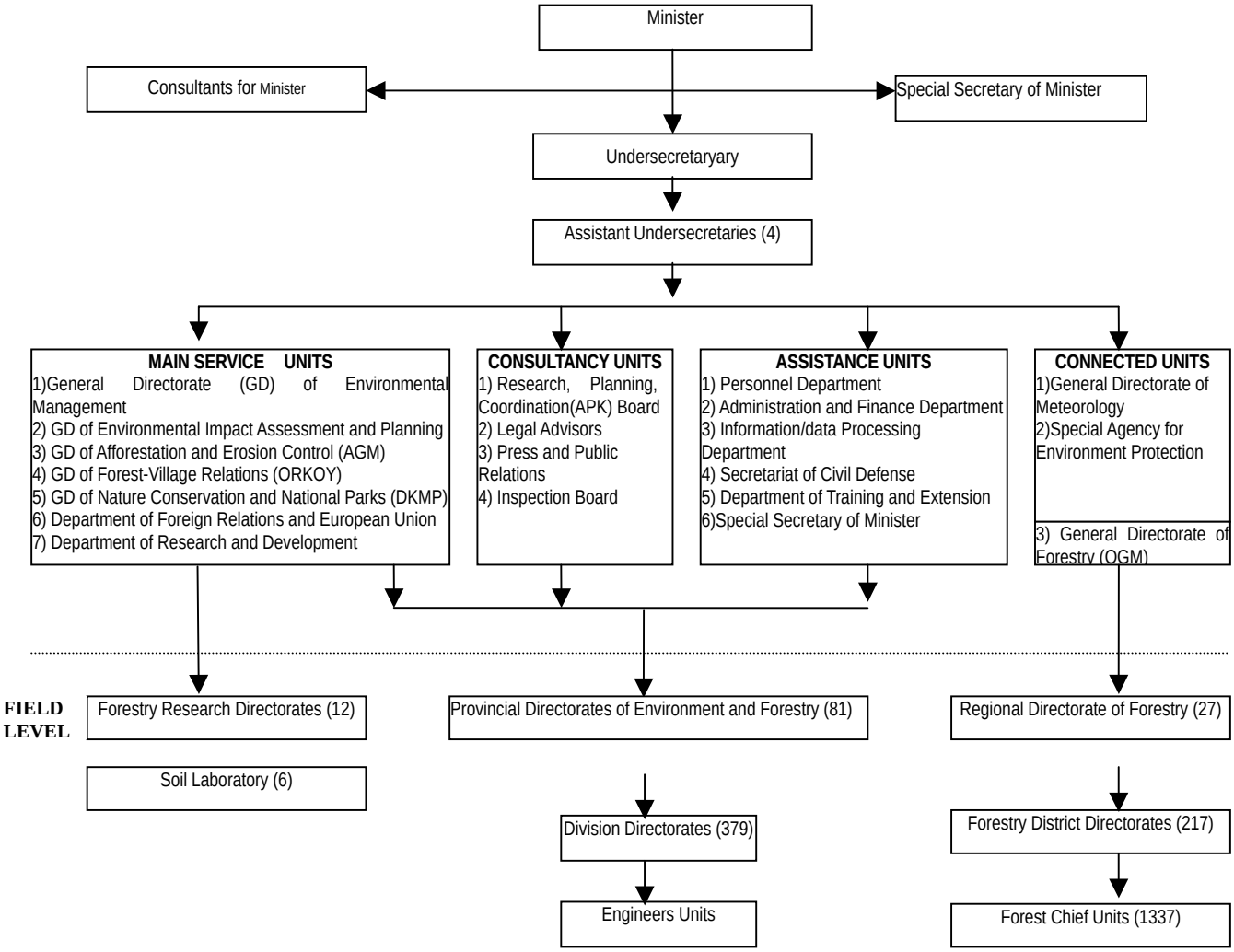
Field level organizational system of MEF was being reorganized as of August 2003. It is expected to be made up by:

- Provincial Directorates of Environment and Forestry;
- Regional Forestry Directorates; and
- Forestry Research Directorates and Forest Soil Laboratories.

Under the Provincial Directorates of Environment and Forestry, different division directorates (e.g. environmental conservation division, afforestation and erosion control division, survey and planning division, nature conservation and national parks division, forest-village relations division, administrative and financial works division) and under them engineer units at district levels are expected to be established and function.

Under the Regional Forest Directorates (27), field activities of OGM are carried out by the Forest District Directorates (217). Forest Chief Units (1,337) are the lowest level field implementation units of OGM.

[1] called as MPG, before the Turkish Ministries were reorganized on 5 August 2003



Source: MEF (August, 2003)

Figure F.2.1-1 Institutional Structure of Ministry of Environment and Forestry (MEF)

(3) The Ministry of Agriculture and Rural Affairs (MARA)

MARA is responsible for delineation, rehabilitation and sustainable use of the range lands outside of forest areas in the watersheds.

(4) The General Directorate of Rural Services (GDRS)

GDRS is in charge of undertaking soil conservation measures on agricultural lands, small scale civil engineering works and rehabilitation of agricultural lands in lower catchement areas.

(5) The General Directorate of State Hydraulic Works (DSI)

DSI undertakes flood prevention, bank stabilization and land rehabilitation measures on lower catchment areas. DSI has prepared comprehensive plans for the development of hydraulic engineering structures (dams, tunnels, intakes and other structures) on Coruh River and some of its tributaries, and this agency is vitally concerned about the possibility that the functional lifespan of such structures may be greatly reduced by the accumulation of suspended sediments and bedloads in Coruh River and its tributaries. DSI is providing some funding to AGM for erosion control measures in some parts of the catchment.

F.2.1.2 Other Related Organizations and Stakeholder Institutions in the Study Area

(1) Government Agencies

Following government agencies, which are directly or indirectly involved and play roles in watershed development, have their organizational structures at both provincial and district levels in the Study area.

- General Directorate of Land Cadastre;
- Ministry of Culture and Tourism (MCT);
- Ministry of Education (MOE); and
- Agriculture Bank.

(2) Village Institutions

Main village institutions include: i) village headman (muhtar) and elders council, and ii)village cooperatives (e.g. agricultural development cooperatives, forest village development cooperatives). In the Study area, there are 80 forest village cooperatives in Artvin, 32 in Erzurum, and 1 in Bayburt. Artvin Forest Village Cooperatives Union coordinates and supports the activities of 42 cooperatives with 4,642 members. Natural Resources and Culture Conservation Associations established in few villages have not been very active up to present.

In general, forest village institutions are weak in undertaking joint actions towards solution of their own problems, addressing poverty reduction and sustainable management and rational utilization of common natural resources within the village boundaries. Lack of budget resources for development is a distinct constraint on collaborative action in forest villages. Recent policy and pilot implementations of MEF about contract of forest conservation and rehabilitation activities to village communities are expected to contribute, besides better achievements, to strengthening village institutions and budget capacities.

(3) NGOs

Several associations, established at provincial and district levels, are involved in nature, environment and culture conservation, wildlife and hunting activities in the study area. Some of them are providing important roles, particularly in public education and awareness creation

on the environmental and natural resources related issues, in the region.

In the Study area, Turkish Erosion Combating and Natural Resources Protection Foundation (TEMA) and Turkish Development Foundation (TKV) have been well known for their past and/or current activities. TKV contributed to environment conservation as well as socio-economic development of the forest villages through soil erosion control, reforestation, and income-generation activities in Tortum district of Erzurum Province during the period of 1991-1996. Within the Study area, TEMA has been implementing two projects. One is the "TEMA-MACAHEL Rural Development Project for the Conservation of Natural Heritage". This project area is located in remote rural area of Borcka district in Artvin Province near the border of Georgia, and it aims to create income for the local community while protecting the nature. It includes the activities of production and marketing of the Pure Caucasian Bee (Apis Mellifera Caucasia) that thrives naturally in the area and the promotion of eco-tourism activities. As a result of the project activities, production of queen bees of Caucasian Bees has increased dramatically with remarkable increase in the income level of local villagers. Another project is "The Erosion Control Project in the Bayburt Region". This is implemented jointly with GTZ. In this project, two micro-catchment areas with the total area of 14,700 ha, which covers five villages in the East of Bayburt city were selected. This project is accordingly concerned not only with erosion control but also with rural development and the establishment of institutions which can continue and extend the work of the project after it ends. It aims at providing a model for rural development and ecologically sound approach to natural resources in Eastern Turkey.

(4) Universities and Research Institutions

They include, Forestry Faculty in Artvin, Agriculture and Veterinary Faculties in Erzurum, and Eastern Anatolia Forestry Research Directorate in Erzurum, Eastern Anatolia Agriculture/Range Research Institute in Erzurum.

The Forestry Faculty of Kafkas University in Artvin, established in 1997, has 200 students in its three departments of general forest engineering, landscape engineering and forest industry engineering. There are two professors, six assistant professors, one lecturer and two PhD assistants in the faculty, and there are also 25 assistants making research in other universities such as Eastern Black Sea Technical University and Istanbul University.

(5) Private Sector Institutions

They include small scale companies involved in forest products processing and trading, eco-tourism (e.g. tour operators, hotels, pensions, etc.), conducting erosion control, afforestation and other land rehabilitation activities on contract given by the related government agencies (MEF, GDRS, DSI, etc.).

(6) Local Administrations

The recently-established parliament is now discussing a decentralization law which is expected to be approved in the near future. It is expected that authorities of local administrations are reinforced by this law, and roles and responsibilities of local governments in natural resources management and watershed rehabilitation fields become important.

F.2.2 MEF's Management Issues of Watershed Rehabilitation Management

F.2.2.1 National Level Issue

It is required that watershed rehabilitation management is performed by a special management system that has a capability of organizing the following three fields: i)natural resources management; ii)erosion control management; and iii)improvement of livelihood of local people[2]. However, there is not such system in Turkey, currently.

As shown in Table 2, OGM, AGM and DKMP relate to "natural resources management". "Erosion control management" is performed by only AGM, and ORKOY most relates to the duties concerning "improvement of livelihood of local people". However, there is not an agency organizing the activities of OGM, AGM, ORKOY and DKMP. Any organization of them does not singly perform the tasks for all three fields. They do not have a mandate to cooperate with each other in order to cope with any watershed issues. This management system hinders sustainable management for watershed rehabilitation.

Table F.2.2-1 Relation of Three Necessary Fields for Watershed Rehabilitation Management and Related-activities of OGM, AGM, ORKOY, and DKMP

	Natural Resources Management	Erosion Control Management	Improvement of Livelihood of Local People
OGM	-Protection of forests against the biotic and abiotic damages (e.g. fire, encroachment, illicit cutting) -Regeneration and improvement of forests, for sustainable utilization of wood and non-wood products from forest areas -Cadastral and land quality surveys		
AGM	-Afforestation and reforestation of all classes of land and eroded/ degraded forest areas including sand dunes, urban green belts, eroded gullies and shelterbelts -Range improvement	-Erosion control management	

[2]The Study objectives of this Master Plan indirectly describe improvement of management in these fields as an important element.

ORKOY			-Social and economic development of the village populations living within and near forests (support of forest villagers in their income generating activities)
DKMP	-Establishment, management, planning, development, advertisement and operation of national park, nature reserve areas, wildlife reserve, and recreational forest areas -Conservation and development of protected lands, game and wildlife, in-forest water resources, rivers, lakes, etc. -Land hunting control		

F.2.2.2 Field Level Issue

Implementation of field activities in the Study area is under the jurisdiction of three Regional Directorates of OGM and three Provincial Directorates of Environment and Forestry under MEF. Field level institutional structure of MEF in the Study area (provinces of Artvin, Erzurum and Bayburt, and districts in their provinces) is shown in Table 3.

Table F.2.2-2 MEF Field Level Institutional Set-up in the Study Area

	Artvin	Erzurum	Bayburt
Organizational Structure Under OGM	**Forestry Regional Directorate of Artvin** - Artvin Forest District Dir. - Borcka Forest District Dir. - Ardanuc Forest District Dir. - Savsat Forest District Dir. - Yusufeli Forest District Dir.	**Forestry Regional Directorate of Erzurum** - Erzurum Forest District Dir. - Oltu Forest District Dir. - Senkaya Forest District Dir.	-Forest Chief Unit, under the Gumushane Forest District Directorate of the Forestry Regional Directorate of Trabzon
Organizational Structure Under Provincial Directorates of Environment and Forestry*	**Provincial Environment and Forestry Directorate of Artvin** - Afforestation and Erosion Control Division Directorate - Forest-Village Relations Division Directorate - Nature Conservation and National Parks Division Directorate - - Environmental Protection Division Directorate - Administrative and Financial Works Division Directorate	**Provincial Environment and Forestry Directorate of Erzurum** - Afforestation and Erosion Control Division Directorate - Forest-Village Relations Division Directorate - Nature Conservation and National Parks Division Directorate - Survey and Project Division Directorate - Environmental Protection Division Directorate - Administrative and Financial Works Division Directorate	**Provincial Environment and Forestry Directorate of Bayburt** - Afforestation and Erosion Control Division Directorate - - - - Environmental Protection Division Directorate - Administrative and Financial Works Division Directorate
Research Directorates, Forest Soil Laboratories	- -	- Eastern Anatolia Forestry Research Directorate, Erzurum. - Eastern Anatolia Forest Soils Laboratory Directorate.	- -

* This institutional structure will be officially announced shortly.

Existing staff in the field units of MEF that are involved in watershed management and rehabilitation activities are shown by provinces in Table 4.

Table F.2.2-3 Existing Staff of the Forestry Units of MEF in the Study Area (July, 2003)

Province	Unit	Regional director	Asst. Regional Director	Forest District Director	Asst. Forestry District Dir.	Forest Chief	Chief Engineer	Division Director	Research/Soil Labor. Dir	Engineer	Technician	Forest guard/nursery man	Office staff	Driver	Guard	Other staff	TOTAL	Permanent worker
ERZURUM	Forestry Regional Directorate	1	2					5		4	3		23			7	45	
	Erzurum Forest District Dir.			1	1	3	1			10	3	20	19	1	3	8	70	
	Oltu Forest District Dir.			1	1	1				3		32	9	4	1	4	56	
	Senkaya Forest District Dir.			1	1	3				1		24	11		1	3	45	
	AGM (Chief Engineering)						1			2		9	4	1		2	19	35
	ORKOY (Chief Engineering)						1			3			4	1		5	14	3
	DKMP (Chief Engineering)						1			1		5					7	15
	Forestry Nursery									2		3	2	1		1	9	68
	Forest Research Directorate								1	5		1	2				9	15
	Forest Soil Laboratory								1	4			1				6	
	Ex-Ministerial Regional Directorate (closed)									7			10	2			19	
	PROVINCE TOTAL	1	2	3	3	7	4	5	2	42	6	94	85	10	5	30	299	138
ARTVIN	Forestry Regional Directorate	1	2					3		1			45	1			53	
	Artvin Forest District Dir.			1	1	8						59	48	6			123	70
	Ardanuc Forest District Dir.			1	1	3						47	17	10			79	6
	Borcka Forest District Dir.			1	1	5						25	27	8			67	15
	Murgul			1		2						23	17	1			44	3
	Savsat Forest District Dir.				1	6						34	52	2	11	9	115	12
	Yusufeli Forest District Dir.			1		3						31	12	4	3	3	57	13
	AGM (Chief Engineering)						1			1	1	19	5	1	3	2	33	123
	ORKOY (Chief Engineering)						1			1	1		18	2	2	4	29	7
	DKMP (Chief Engineering)						1			2		7	5	6	12		33	39
	Forestry Nursery																	53
	PROVINCE TOTAL	1	2	5	4	27	3	3		5	2	245	246	41	31	18	635	331
BAYBURT	OGM (Forest Chief Unit)					1						4				2	7	
	AGM (Chief Engineering)											1				1	2	7
	Forest Nursery									2			1	1			4	15
	PROVINCE TOTAL					1				2		5	1	1		3	13	22
WATERSHED TOTAL		2	4	8	7	35	7	8	2	49	8	344	332	52	36	51	945	491

Source: MEF

From Table 4 following points become clear:

- Existence of excessive numbers of administrative and assistance staff in the offices (civil servants and permanent workers) creates high personnel and administration costs (particularly in Artvin Province). This situation causes limitations for allocation of adequate resources for field implementations and for better payments to forest workers/local villagers who are actually doing heavy field works.
- On the contrary, most of the technical/professional staff positions in the field units are vacant presently. This is particularly the case in Bayburt Province.
- Correction of this unbalanced staffing situation is a priority requirement for successful undertaking of the forestry and watershed management/rehabilitation programs and activities in the Coruh Watershed region.
- When specialists are employed from other related disciplines (e.g. rural economist, livestock specialist, wildlife specialist, biologist, etc.) to strengthen the capabilities of field units, it is required to pay much attention to selection of the candidates. They need to have capabilities of planning and implementing watershed development programs and activities appropriately.

F.2.3 Legal Framework

F.2.3.1 Current Legal Framework

There is not any specific Watershed Law in Turkey presently, or there are not legislations, adequately explaining that watershed management should be integrated by various organizations. Joint initiatives have been undertaken by NGOs, universities, MEF, MARA, GDRS and other stakeholders for preparation and enactment of a Watershed Law. Studies on the draft are continuing at the Parliament. This law is expected to serve for sustainable management of watersheds as well as for improved land use and soil resources utilizations in the country.

The current legal framework concerning rehabilitation management of watershed areas and resources comprises several different laws and regulations, including the Forest Law, National Afforestation Mobilization Law, National Parks Law, Forest Villagers Development Support Law, Range Law, Environment Law, Land Cadastre Law, Village Law, Organic Laws, that are prepared for different government agencies (MEF, OGM, MARA, DSI, GDRS, etc.), as well as the by-laws, instructions and circulars issued for implementations of the laws.

F.2.3.2 Related Laws

(1) Turkish Constitution

The following articles of the Turkish Constitution deal directly or indirectly with the watershed issues.

Article 44: The State takes necessary measures for protection and amelioration of soil, preventing soil erosion, increasing agricultural productivity and providing farmland to farmers who do not have any.

Article 45: The State simplifies providing necessary instruments to farmers for preventing abusing and destroying farmlands, pastures and grasslands, and for increasing agricultural production appropriate to agricultural planning rules.

Article 170: Necessary measures shall be introduced by the law to secure the cooperation between the state and the inhabitants of the villages located within or near forests, in terms of supervision and utilization of forests for the purpose of ensuring their conservation and improvement of the living conditions of their inhabitants.

(2) Forest Law no. 6831

The current Forest Law no. 6831 deals with the definition of forests, cadastre and delineation of forest areas, improvement of livelihood of forest villagers, protection of forests, utilization of pastures and rangelands within forest areas, establishment of conservation forests and protected areas on forest lands, rehabilitation of degraded forestlands, utilization of forest lands and resources, and provision of wood and non-wood forest products meeting the needs of forest villagers. The following articles of the Forest Law have particular relevance in relation to rehabilitation management of watershed resources.

Article 19: The access of any kind of domestic animal to forest is prohibited. The forestry administration only allows grazing for the animals suffering from malnutrition in drought regions as well as the animals belonging to the forest villages. This permission can be given under the terms and conditions of a given period, for the defined animal species and areas, and with the condition that no damage should be given to the forest.

Article 21: The grazing of herds on the State forest lands should be done according to the plans and permission of the forestry administration.

Article 31: In the villages that have productive forest within the village borders, necessary round wood and fuel wood are provided to village households at tariff value of the wood.

Article 32: In the forest villages that have only unproductive forest within their borders, necessary round wood are provided at cost price, and necessary fuel wood are provided at 1/3 of cost price from the closest wood pile.

Article 40: The local villagers and cooperatives are given priority for employment in the forestry activities.

Article 57: Suitable degraded forestlands can be long-term allocated to village communities or real persons for forest plantation establishment and utilization purposes.

Article 58: The state forestry organization undertakes all kinds of preventive and rehabilitation measures and afforestation activities for reinforcement of the stream banks, for protection and regulation of water resources within the forest areas, and for preventing soil erosion, floods and landslide problems.

Article 81: The village headman (muhtar) and the village elders committee are obliged to cooperate with the forestry organization in protecting the State forest within the village boundaries.

(3) The National Afforestation Mobilization Law

The National Afforestation Mobilization Law deals with the encouragement and involvement of the relevant public institutions and agencies, local communities, individuals and private agencies in reforestation and forest rehabilitation activities on suitable degraded forest areas, non-forest state lands and private lands. Such activities are supported by low interest credits provided from the budget resources allocated for these purposes.

(4) The National Parks Law

The National Parks Law deals with the establishment, planning and management of national parks and other protected areas on forest or non-forest lands. Accordingly, the watershed with special natural, historical and cultural values should be taken under the protected area status and managed according to special management plans to be prepared for this purpose.

(5) The Law for Supporting Development of Forest Villagers

The Law for Supporting Development of Forest Villagers deals with the development support to the forest village communities in order to improve their livelihood, to reduce dependency and pressures on forests and to improve the relations between the villagers and forestry organizations.

(6) The Environment Law

The Environment Law includes sections on banning of certain kinds of operations such as polluting the environment, requirements for environmental impact assessment, defining special environmental protection areas, providing sanctions to prevent pollution. The EIA Regulation, under the Environment Law, defines the administrative and technical procedures for the implementation of EIA. In terms of environmental considerations, EIA plays an

administrative role in regulating environmental impacts from development activities.

(7) The Range Law

The Range Law, enacted in 1998, regulates the activities and measures for delineation and registry of the borders, protection, improvement and sustainable utilization of the range, pasture and meadowlands. The law delegates heavy responsibilities and authorities to MARA on the government side. Village communities are also expected to be involved in the range conservation and management through establishment of the rangeland unions at village level. On the other hand, According to MEF/AGM authorities, rangelands delineation works undertaken by the commissions under MARA are not paid little and inadequate attention to the erosion risks and problems including several erosion prone, steep slopes (fragile OT areas) under the rangeland status. This situation shall create serious negative impacts in the watersheds. AGM authorities believe that such areas should be taken under the forest regime and soil conservation measures should be undertaken by MEF/AGM.

Under the existing legislations, undertaking of cadastral survey, land delineation and registry works by different agencies (land cadastral commissions, forest cadastre commissions, range cadastre commissions) create inconveniences and disputes for watershed resources, communities and agencies. There is urgent need for making legislative amendments to delegate all kinds of land cadastre, delineation and registry works to the competent multi-disciplinary commissions under one agency (e.g. General Directorate of Cadastre and Land Registry), that should also serve for the land use development purposes in the watersheds.

F.2.4 Extension

F.2.4.1 Main Agencies Providing Extension Service

AGM, OGM, ORKOY, DKMP, the General Directorate of Organization and Support (GDOS) of MARA, GDRS, DSI and Forest Cooperatives Central Union (OR-KOOP) are main agencies implementing extension service. These organizations' activities on extension service are shown below.

Besides, some NGOs have been contributing to dissemination of technical information about agricultural subjects during recent years. For example, TEMA mentioned in 2.1.2 (3), contributes to enhancement of agricultural productivity in the activities of its project, "Erosion Control in the Bayburt Region".

(1) Extension Service by MEF

MEF has a department dealing staff training and extension service for the forest workers and

farmers (Department of Training and Extension in Assistance Units: see Figure 1). This department prepares manuals and audio-visuals for disseminating technical information about forestry subjects and activities on income generation in cooperation with MARA. The manuals are distributed to the MEF's provincial directorates, and chief engineer's or engineer's level staff of the provincial directorates disseminates technical information to forest workers by using the manuals.

Concerning extension service for income generating activities such as forest product market development, sawmills, meat and milk production, poultry, animal feed production, handicrafts, orchards, vineyards, beehives, etc., ORKOY supports forest villagers in such activities by providing incentive credit facility as well as technical support (extension service).

(2) Extension Service by MARA

MARA has a responsibility for agricultural extension service to all villagers including forest villagers. MARA's extension service relates to dissemination of technical information about various agricultural subjects including horticultural crops, and livestock management, veterinary, and mechanization (how to operate tractors, harvesting machines, cultivating and planting machines).

(3) Extension Service by GDRS and DSI

GDRS and DSI provide civil engineering-concerned extension service such as irrigation construction.

(4) Extension Service by OR-KOOP

OR-KOOP, which is non-governmental agency, mainly relates to development of training program for forest workers, who are members of OR-KOOP. Fields of the program include reforestation, erosion control and range improvement activities, work security, worker health and ergonomics issues.

F.2.4.2 Issues of Extension Service in the Study Area

(1) Lack of Qualified Staff in ORKOY

In order to provide an appropriate extension service to beneficiary group, the service provider is required to have the chief engineer-or engineer-level capability. If staff structure of the Study area's provincial directorates is looked at, there are 56 chief engineers or engineers in total (see Table 5). Then, in the Study area, there are 56 personnel who have a capability of implementing an appropriate extension service on their technical fields.

However, if the number of chief engineers and engineers of ORKOY, which most relates to extension service on income generating is looked at, Erzurum has only four personnel (one chief engineer and three engineers), and Artvin has only two (one chief engineer and one engineer). Bayburt does not have any staff of chief engineer or engineer. There are six in total. Therefore, there are only six personnel who have a capability of providing extension service on income generation in the Study area with a population of 156,130 (2000). In most cases ORKOY asks MARA, GDRS or DSI for dispatch of their qualified personnel. Cooperation among these organizations is well, and accepting the ORKOY's requests is not interfering matter for the three agencies. However, these organizations can not always respond to the ORKOY's requests, because they do not have enough qualified staff to dispatch to ORKOY. Lack of the qualified staff hinders appropriate provision of extension service. Although such problem may be solved by hiring full-time or part-time consultants or retired staff who was an expert of the aforementioned agencies, hiring such personnel is not allowed due to some reasons. Constraint of budget for employment of non-governmental personnel is one of the main reasons.

(2) Lack of Marketing Specialist

ORKOY currently considers marketing promotion as one of the most necessary extension fields, but it does not have any specialist in marketing promotion. Private sector have more practical knowledge about how to analyze needs of consumers, how to prepare marketing plan, how to promote products, etc. more than government agencies. However, hiring such personnel is not possible. As mentioned in (1), constraint of budget for employment of non-governmental personnel is one of the main reasons.

Table F.2.4-1 Number of Chief Engineers and Engineers in the Study Area

Provincial Directorate	Unit	Chief Engineer	Engineer	TOTAL
ERZURUM	Forestry Regional Directorate		4	4
	Erzurum Forest District Dir.	1	10	11
	Oltu Forest District Dir.		3	3
	Senkaya Forest District Dir.		1	1
	AGM (Chief Engineering)	1	2	3
	ORKOY (Chief Engineering)	***1***	***3***	***4***
	MPG (Chief Engineering)	1	1	2
	Forestry Nursery		2	2
	Forest Research Directorate		5	5
	Forest Soil Laboratory		4	4
	Ex-Ministerial Regional Directorate (closed)		7	7
	PROVINCE TOTAL	4	42	46
ARTVIN	Forestry Regional Directorate		1	1
	AGM (Chief Engineering)	1	1	2
	ORKOY (Chief Engineering)	***1***	***1***	***2***
	MPG (Chief Engineering)	1	2	3
	Forestry Nursery			
	PROVINCE TOTAL	3	5	8
BAYBURT	Forest Nursery		2	2
	PROVINCE TOTAL		2	2
	WATERSHED TOTAL	7	49	56

Adapted from Table 1

F.3 Establishment of Special Management System for Watershed Rehabilitation Management

In the watershed area, there is a serious difference of opinions, wishes, etc. about how to use the resource among the stakeholders at both of the public and non-public sectors: many different government agencies at central and local levels, NGOs, local communities and people. Although the management for watershed rehabilitation involves a large number of stakeholders, it is quite important to get all stakeholders involved in planning and management of any projects concerning watershed rehabilitation.

In order to construct a mechanism to involve all stakeholders in planning and management of watershed, this sector proposes to establish a management system which has special duties to perform rehabilitation management in the Coruh Watershed area. MEF's four general directorates should become the leading agencies in the system. This system shall have the rights, obligations and responsibilities of plan, selection, implementation of the projects on natural resources management and village development, and provision of project staff training

and extension services to the villagers.

F.3.1 Key Agencies in the Management System

Managing agencies in the system shall consist of several representatives elected from governmental and non-governmental agencies at central and field levels. Key representatives should be elected from MEF's OGM, AGM, ORKOY, and DKMP. In order for the system to be organized well, the representatives elected from these four agencies are required to collaborate among them sufficiently at their central (head Quarters) and field (provincial) levels.

Table F.3.1-1 Key Agencies in the Special Management System

Related Organizations			Agency
Central Level	● Ministry of Environment and Forestry (MEF)		-General Directorates of Forestry (OGM) -General Directorate of Reforestration and Erosion Control (AGM) -General Directorate of Forest and Village Relations (ORKOY) -General Directorate of National Conservation and National Parks (DKMP)
Field Level	● Ministry of Environment and Forestry (MEF)	Erzurum Province	-Regional Directorate of OGM, Erzurum -Provincial Environment and Forestry Directorate of Erzurum (AGM, ORKOY, DKMP)
		Artvin Province	-Regional Directorate of OGM, Artvin -Provincial Environment and Forestry Directorate of Artvin (AGM, ORKOY, DKMP)
		Bayburt Province	-Forestry Chief Unit, Gumushane Forest District Directorate of Regional Directorate of OGM, Trabzon -Provincial Environment and Forestry Directorate of Bayburt (AGM)

F.3.2 Project Activities by the Management System

The Master Plan Study Team (the Team) prepared six model micro-catchments (MC) plans. The Team visited some villages in the Study area and conducted workshop meetings in order to survey the villagers' needs. Their problems were identified and what kind of project was necessitated was discussed though the meetings and they resulted in the villagers wishing the following activities in the projects.

It is expected that other villages, where the workshop meetings were not held, have also concern the following activities. Therefore, the special management system will need experts who have enough experience of these activities and qualification to provide their related extension services to the villagers.

(1) Activities for natural resources

- Soil conservation (afforestation, re-greening, gully plugging, natural regeneration, natural re-vegetation)
- Rangeland rehabilitation (natural regeneration, natural re-vegetation, controlled gazing, gully protection, rangeland improvement, watering troughs)

- Rehabilitation of degraded high forest (natural regeneration, rehabilitation)
- Rehabilitation of degraded coppice forest
- Energy forest plantation
- Riverside plantation (popular and/or willow row planting)
- Riverbank Reinforcement
- Afforestation
- Road rehabilitation

(2) Activities for village development

- Irrigation improvement (canal rehabilitation, farm pond construction)
- Greenhouse construction (intensive cultivation of tomato and cucumber)
- Agricultural land rehabilitation (removal of coarse rocky debris from arable land)
- Livestock improvement (animal breeding)
- Fodder production improvement
- Fruit orchard rehabilitation
- Agricultural mechanization
- Apiculture promotion
- Marketing improvement (installation of collection and shipment facility construction)

(3) Activities for training, awareness, capability raising, research, demonstrations, and technical assistance

- Training (training of national project staff, field forestry staff)
- Awareness creation in relation to natural resources management (rangeland management, forest management, disaster management, wildlife management)
- Research (disaster mechanism, assessment of past soil erosion control project, research on local plant species, rangeland assessment
- Demonstration
- Technical assistance (agricultural extension, pasture improvement, animal feeding technology, extension of irrigation technology, demonstration farm, agricultural organization, veterinary services)

F.3.3 Institutional Arrangements in the Management System

The special management system consists of following groups: headquarters, provincial, micro-catchment (MC), village level groups, and in addition a coordinating group among the three provincial level groups (Watershed Coordination Committee). Organization structure of this system is shown in Figure 2.

The special management system shall undertake the short-term priority actions and projects/ programs suggested by the Master Plan. Expected member organizations in the groups and their main duties are described below (see also Table 15).

As mentioned in 2.3, there is not any specific legislation on watershed rehabilitation management. MEF needs to prepare guidelines on the appropriate watershed rehabilitation management according to the JICA Master Plan report prepared by this Study, before the special management system is established.

F.3.3.1 Institutional Arrangements at the Headquarters (Ankara) level

(1) Central Project Management Group (CMG)

This group will consist of the staff of AGM, ORKOY, OGM and DKMP assigned specifically for the management and monitoring of the project on behalf of Central Steering Committee (CSC), mentioned later. AGM representative will act as the coordinator of this group. CMG's main responsibilities will include:

- preparation of work plans and programs of the project, management of project budget at the headquarters level;
- monitoring, assessment and supervision of the project implementations;
- regularly reporting to higher level authorities (e.g. the Minister, SPO, Treasury, Central Steering Committee.) about the technical, financial and administrative performance and progress of the project; and
- establishing necessary contacts and collaboration with the foreign donor/partner side (if it is a foreign financed project).

Table F.3.3-1 Expected Members of CMG

Position	Member Organization	Expected Position in the Member Organization
Coordinator	AGM	Division Director-level Staff
Member	ORKOY	Division Director-level Staff
Member	DKMP	Division Director-level Staff
Member	OGM	Division Director-level Staff

(2) Central Steering Committee (CSC)

This committee will consist of higher level representatives of the different units of MEF (AGM, OGM, ORKOY, DKMP, Research, Planning, and Coordination (APK) Board, Foreign Relations Department, Research and Development Department), representatives of SPO, and Undersecretariat of Treasury. Participation of the representatives of NGOs and other relevant government agencies (e.g. DSI, GDRS, MARA) should be provided, if possible. It will be chaired by the undersecretary (or assistant) of MEF.

Coordinator of CMG, who is an AGM staff, will act as the secretary of CSC. The group meeting at least twice a year, will assess the project performance, identify major problems and constraints, and provide higher level supports and advice for their solutions and successful conduction of the project.

Table F.3.3-2 Expected Members of CSC

Position	Member Organization	Expected Position in the Member Organization
Chairperson	MEF	Undersecretary
Member	AGM/MEF	Director General
Member	OGM/MEF	Director General
Member	ORKOY/MEF	Director General
Member	DKMP/MEF	Director General
Member	APK Board/MEF	Director-level Staff
Member	Foreign Relations Department/MEF	Director-level Staff
Member	Research and Development Department/MEF	Director-level Staff
Member	SPO	Director-level Staff
Member	Undersecretariat of Treasury	Director-level Staff
Some Members	NGOs	Some Representatives
Member	DSI	Director-level Staff
Member	GDRS	Director-level Staff
Member	MARA	Director-level Staff
Member/Secretary	CMG	Coordinator

F.3.3.2 Institutional Arrangements at the Provincial Level

(1) Provincial Project Management Group (PPMG)

This group will be established in each province of the Study area and consist of the chief engineers (division directors) of AGM, ORKOY and DKMP, and District Director of OGM (forest chief at Bayburt). AGM chief engineer will act as the coordinator of PPMG. This group will be mainly responsible for:

- planning, monitoring, assessment of the project implementations at the provincial level; and
- periodic reporting of the field level monitoring and assessment results to CMG, CSC, and Provincial Advisory Committee (PAC), mentioned later.

Table F.3.3-3 Expected Members of PPMG (established in Artvin, Erzurum and Bayburt)

Position	Member Organization	Expected Position in the Member Organization
Coordinator	AGM	Chief Engineer (Division Director)
Member	ORKOY	Chief Engineer (Division Director)
Member	DKMP	Chief Engineer (Division Director)
Member	OGM	District Director (Artvin and Erzurum)/Forest Chief (Bayburt)

(2) Provincial Advisory Committee (PAC)

This committee will be established in each province of the Study area and consist of the Provincial Director of Environment and Forestry, Regional Director of OGM, representatives of local NGOs, research institutions and universities in the province. Participation of the representatives of the other relevant government agencies (e.g. MARA, GDRS, DSI) should be provided, if possible. Coordinator of the PPMG, AGM staff will act as the secretary of the committee. PAC should meet at least twice a year to review the project progress and provide relevant advice and higher level support for solving the encountered problems and for smooth performance of the project.

Table F.3.3-4 Expected Members of PAC (established in Artvin, Erzurum, and Bayburt)

Position	Member Organization	Expected Position in the Member Organization
Chairperson	Provincial Directorate of MEF	Provincial Director
Member	Regional Directorate of OGM	Regional Director (Artvin and Erzurum)/ Regional Director of Trabzon (Bayburt)
Some Members	NGOs acting in the provincial area	Some Representatives
Some Members	Research Institutions/ Universities in the provincial area	Some Representatives
Member	DSI	Provincial or Regional Director -level Staff
Member	GDRS	Provincial or Regional Director -level Staff
Member	MARA	Provincial or Regional Director -level Staff
Member/Secretary	PPMG	Coordinator

F.3.3.3 Institutional Arrangements at the Village and MC Levels

(1) MC Implementation Group (MCIG)

This group will consist of local AGM, ORKOY, OGM and DKMP engineers. AGM engineer will act as the group coordinator. MCIG will involve in planning, implementation, monitoring and assessment stages of the MC projects jointly with Village Project Implementation Group (VIG), mentioned later.

Table F.3.3-5 Expected Members of MCIG (established in each micro-catchment)

Position	Member Organization	Expected Position in the Member Organization
Coordinator	AGM	Engineer
Member	ORKOY	Engineer
Member	DKMP	Engineer
Member	OGM	Engineer

(2) Village Project Implementation Group (VIG)

This group will comprise, under the head of village (muhtar) and representatives of different interest groups in the village (e.g. livestock group, bee-keepers, irrigated land owners, cooperative representative, village women, etc.). VIG will be in charge of getting villagers involved in planning, implementation, monitoring and assessment stages of MC plans jointly with MCIG.

Table F.3.3-6 Expected Members of VIG (established in each village)

Position	Member Organization	Expected Position in the Member Organization
Coordinator	Village Institutions	Muhtar (Head of village)
Members	Beneficiary Groups	Cooperative representative, representatives of livelihood group, bee-keepers, irrigated land owners, village women, etc.

(3) District Advisory Committee (DAC)

This committee will consist of the OGM District Director-level staff, representatives of the other related agencies, NGOs and district governors. DAC will be established in each district and chaired by district governor. Local AGM engineer will act as the secretary of DAC. DAC should review the project progress and provide relevant advice and higher level support for solving the encountered problems and for smooth performance of the project.

Table F.3.3-7 Expected Members of DAC (established in each district)

Position	Member Organization	Expected Position in the Member Organization
Chairperson	District Government	District Governor
Member	OGM	District Director-level Staff
Members	DSI	District Director-level Staff
Members	GDRS	District Director-level Staff
Member	MARA	District Director-level Staff
Some Members	NGOs acting in the district area	Some Representatives
Member/Secretary	AGM	Engineer in the district branch office of AGM

F.3.3.4 Coordination and Collaboration between the Provinces

Watershed Coordination Committee (WCC) will be established in order to coordinate among the three provincial level groups. WCC will be consisted of PPMG heads of the three provinces of the Coruh Watershed area and a representative from CMG. WCC meeting will be held alternately at one of the project provinces at least twice a year. This meeting will be coordinated by the head of PPMG of the hosting province and chaired by the CMG representative participating at the meeting. It is recommended that the WCC meetings should

be combined with the field trips to jointly examine and assess the project progress and to exchange the gained experiences. Findings and recommendations of WCCs will be reported to the headquarters unit (CMG).

Table F.3.3-8 Expected Members of WCC

Position	Member Organization	Expected Position in the Member Organization
Chairperson	CMG	Representative elected from CMG
Members	PPMG	Head/ representative elected from each PPMG
Member/Coordinator	PPMG	Head/ representative elected from the hosting province

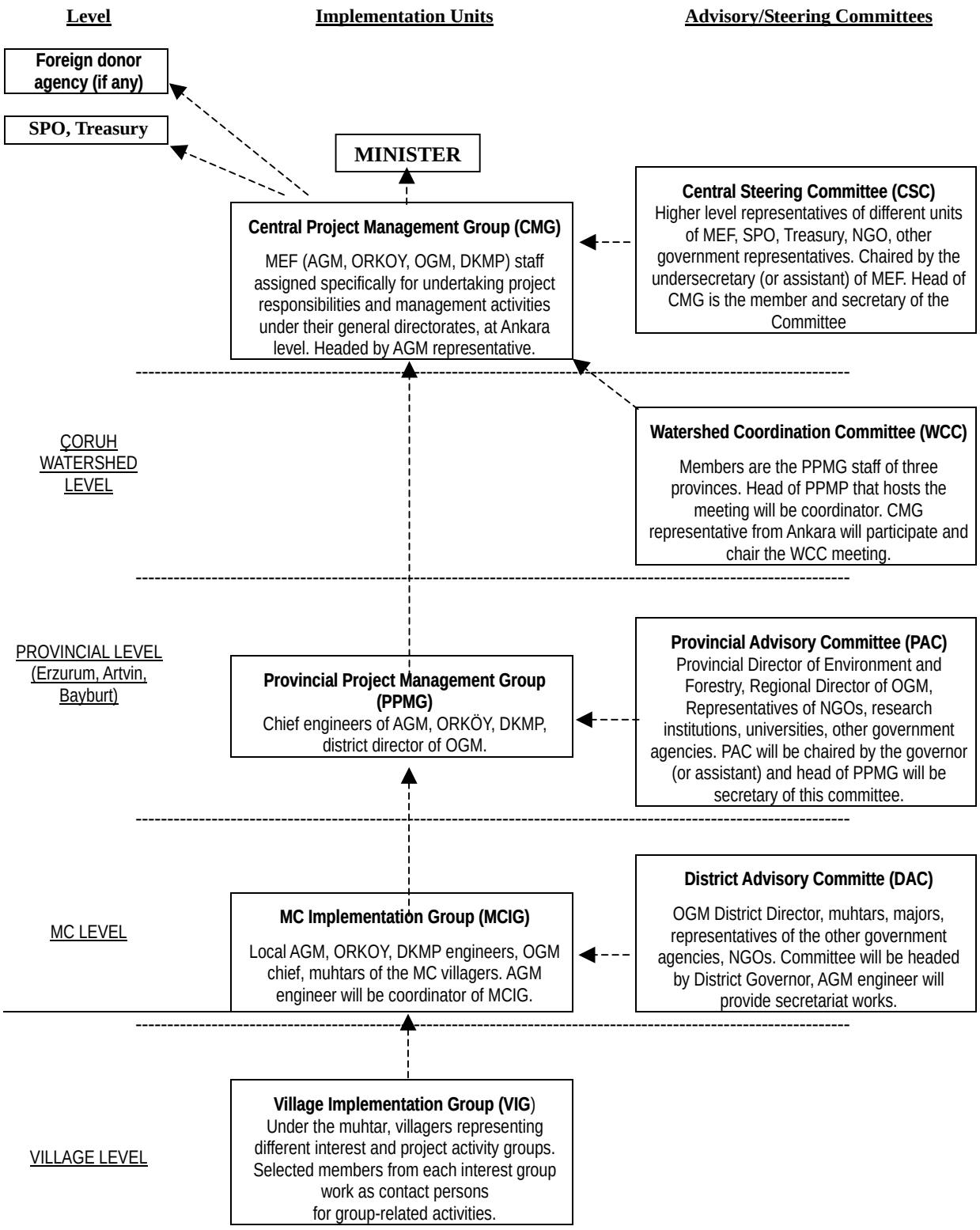


Figure F.3.3-1 Suggested Institutional Arrangements for Implementing the Projects Planned through the Master Plan

TableF.3.3-9 Expected Main Duties of Member Organizations in the Special Management System

Activities	MEF	Committee or Group Level							
		Central		Provincial	Village and MC				WCC
		CMG	CSC	PPMG	PAC	MCIG	VIG	DAC	
I. Institutional Setup									
1.Establishing a committee organization system for the rehabilitation management of the Coruh Watershed area	○								
2. Preparing guidelines on watershed rehabilitation management according to the JICA Master Plan report.	○								
3.Contacting with foreign donor/partner agencies, if they provide financial support		○							
II. Preparation of Project Implementation Plan									
1.Preparing implementation and budget plan of projects		○							
III. Project Planning and Implementation									
1.Project planning and implementation				○		○	○		
IV. Monitoring and evaluation of the Project Progress									
1.Collecting/recording relevant data/information						○			
2.Periodic assessment and reporting its result (twice a year)						○	○		
3.Provincial-level assessment and reporting its result to higher-level authorities (once a year)				○		○			○
4.Central-level assessment and reporting its result to higher-level authorities (once a year)		○							
5.Mid-and final-term evaluation		○	○			○	○		
V. Providing support and advice									
1.Providing support and advice (headquarters Level)			○						
2.Providing support and advice (provincial level)					○				
3.Providing support and advice (MC level)								○	

F.3.4 Key Points in the Process of Project Operation

(1) Project Planning

In the stage of project planning, it is quite important to introduce participatory approach for the project management. About this matter the Turkish side has recently experienced in the participatory approach, “Farmer Centered-Problem Census-Problem Solving (Sor-Sap-Coz)” through the Eastern Anatolia Watershed Project (EAWRP). Through “Sor-Sap-Coz”, any problems that local villagers perceive were elicited, priorities to solve the problems were ranked, and the problems were solved according to the priorities. It was observed that involvement of local villagers in decision making and implementation has given a positive effect on protection of the forest resources through this participatory approach. The practical experience of such participatory approach would help to do more effective management of the MC projects on this Study.

In order to more effectively plan the projects, qualified facilitator should be hired. Any staff including not only engineer-level personnel, but also university students could become a facilitator within a few days, if they are trained properly. Actually, most of Japanese planning consultants and government officials, and even some university students are trained to be such facilitator within a few days through a program conducted by the Foundation for Advanced Studies on International Development (FASID), which is a non-profit organization and established jointly by the Ministry of Foreign Affairs and the Ministry of Education, Science and Culture in Japan.

(2) Project Implementation

Extension service should be provided carefully through the project implementation. In the Study area, enough qualified staff has not been dispatched by the government side. Therefore, the management system needs to introduce new measure to collect such staff. Hiring such staff from the private sector should be taken into consideration. The special management system needs to pay much attention to allocating budget for hiring such staff.

(3) Monitoring and Evaluation System

In the stage of monitoring and evaluation, as shown in Table 15, the MC-level units of MEF will regularly collect/record relevant data/information, periodically assess (twice a year) the MC project implementations, according to relevant performance criteria to be developed. Relevant data and assessment results will regularly be reported to PPMG.

Periodic assessment meetings should be undertaken at the village-level, by initiation of MCIG and with participation of Village Project Implementation Group (VIG). Results will be provided to PPMG. Provincial-level participatory assessment meeting should be organized

once a year, under the coordination of PPMG and with the participation of the selected representatives from different MCs. Relevant data and assessment results from all these activities will periodically be reported to the Central Management Group (CMG) and the Central Steering Committee (CSC) in Ankara.

Participation of the VIGs' and MCIG's representatives in the periodic evaluation missions from central-level groups including CMG and CSC or from the Japanese side should be provided.

G. Environmental Considerations

CONTENTS

G.1 Project Outline

G.1.1 Objective of the Study

The objective of the Master Plan Study is to formulate a Master Plan on Participatory Watershed Rehabilitation in Coruh River in the Republic of Turkey in order to contribute to natural resources management, erosion control and improvement of livelihood of local people, and to transfer relevant technology to the counterpart personnel through on-the-job training in the course of the Study.

Under such Mandate, the objective of this Sector Report is to assess the necessity of further Environmental Impact Assessment studies in the course of realizing the projects/programs proposed in the Master Plan. This will be done by preliminarily assessing the possible environmental impacts by the proposed programs/projects (IEE) and by examining the environmental considerations obligated by the Turkish legislations. Preliminary assessments were made among the basic data collected through field reconnaissance and discussions with central and local government offices. Opinions stated in participatory workshops held in selected forest villages in the Study Area in course of the Master Plan Study were also taken into regard.

G.1.2 List of Proposed Activities and their Features

The activities proposed in the Master Plan are classified into four categories in accordance to their objectives and features. These are: programs/projects for natural resource rehabilitation and management; programs/projects for livelihood improvement and; programs/projects for human resource development.

The features of the proposed activities are as follows.

Proposed Programs and Projects

A. Natural Resources Rehabilitation, Management and Utilization	
- Multipurpose (functional) forest management planning	This project aims to prepare multipurpose forest management plan in pilot project area, which contribute to sustainable management and utilization of natural resources. In the project, comprehensive studies of natural resources conditions of the project area in combination with field reconnaissance and GIS / Remote Sensing analysis in the forest and rangeland area should be conducted first, and then multipurpose forest resource management plan will be formulated.
- National parks and protected areas management	This project aims to accomplish the study of wildlife conditions (especially of endangered species) in national park and wildlife protected area and their surroundings, and to formulate sustainable and effective management plans in both terms of conservation of natural values and satisfying forest villagers' needs.

Proposed Programs and Projects

A. Natural Resources Rehabilitation, Management and Utilization	
- Soil conservation	This project aims to prevent soil erosion by afforesting tree and herbaceous species, based on scientific consideration, in combination with the engineering works, or separately. Not only forest tree species (e.g. *Pinus sylvestris*, *Quercus* sp., *Robinia psedoacacia*) but also local tree species (e.g. *Ostrya carpinifolia*, *Populus tremula*) and local shrubs and grass species (e.g. *Astragalus gummifer*, *Berberis* sp.) should be recommended. "Nurse Block", which is the soil block that has penetrated hole centrally to encourage the growth of the root system, can be applied. Simple engineering structures, such as stone walls and brush walls for gully plugging, will be constructed with participation of local people. Closing up forest areas to effectively prevent forest villagers from entering and using the land can be useful in terms of getting rid of human and grazing pressures, while expecting spontaneous natural regeneration of vegetation, if village agreements for sustainable usage of these resources are established, along with income-substitution and compensation measures.
- Afforestation	This project aims to afforest seedlings of tree species (e.g. *Pinus sylvestris*, *Quercus* sp., *Robinia psedoacacia*) or other suitable tree species on conventional terrace along contour line. The appropriate sites should be carefully selected on the condition that the sites should be less than 30% inclination and the surface soil layer are comparatively thick.
- Rehabilitation of degraded high forest	This project aims to return Degraded Forests to a condition resembling Normal Forests, and thus to minimize the actual and potential erosion. The project also aims, to the greatest feasible extent, to improve the forest to a sound, healthy and vigorous condition, with the highest possible canopy coverage. The project should make every effort to follow the best practices in management and harvesting (rejuvenation cutting and thinning) and thus minimize soil erosion. In addition to the measures suggested above, enrichment planting might be feasible. Natural regeneration should be encouraged.
- Rehabilitation of degraded coppice forest	This project aims to adopt necessary rehabilitation measures for degraded coppice forest, such as restrictions on use by villagers and livestock intrusion, and by encouraging afforestation so that degraded coppice forest can be productive and serve protective functions. Coppicing and harvesting of branchwood (fuelwood) and foliage (fodder) should be carried out according to best feasible practices so as to maintain the highest possible canopy coverage and the least possible soil disturbance. Over-grazing must be avoided and the villagers must establish a rational grazing routine according to the capacity of the site to support grazing. On the other hand, enrichment planting such as oak planting and acorn seeding will contribute to the gradual improvement of such degraded coppice forests. As the growth of oak trees is very slow in the Study area, coppice forests needs to be carefully managed in sustainable manners over long periods.
- Energy forest plantation	This project aims to establish plantation of fast-growing and multipurpose tree species in order to supplement villagers' needs for charcoal and building-materials, based on villagers understanding and participation.

Proposed Programs and Projects

A. Natural Resources Rehabilitation, Management and Utilization	
- Rangeland rehabilitation	This project will protect the rangelands through promoting appropriate grazing strategies for different types of herds at different times and at different intensities of grazing. This project will promote the application of measures such as seeding and fertilizing to improve certain types of rangelands. After productivity is improved, the rangelands must be better managed, principally by improving grazing practices, to avoid preferential grazing. Gabion plugging (stone walls, brush walls) is also constructed if necessary. Setting of water troughs and salt through is also effective.
- Riverside plantations	This project aims to stabilize riverbanks by zigzag planting of poplars, willows and other suitable species.
B. Livelihood Improvement	
- Development of agricultural productivity program	This program is composed by the following projects: improvement of breed project by the conversion from local breed to pure breed variety, transformed grazing system project from pasture based grazing to stall feeding system and mechanized hay cutting project. Increase of the milk production and live weights will be expected by implementation of these projects. The improvement of the quality of milk and meat is promoted at the same time. Especially, the breeding improvement project is expected to contribute to reduce the pressure on natural resources.
- Development of stall feeding and livestock productivity program	This program is included irrigation improvement, greenhouse promote, fruit orchard rehabilitation, marketing improvement, fodder production improvement project. These projects will contribute to increase of agricultural income through the improvement productivity, promoting intensive agriculture and crop diversification. In particularly, irrigation development will play a key role in contributing to livelihood development, not only through increasing the productivity of crops but also through reducing grazing pressure on rangelands by increasing forage production for winter and stall feeding.
- Development of diversifying income generating program	The diversification of an agricultural income and the expansion of the employment opportunities are promoted through the apiculture project with the possibility on the production increase and the marketability.
- Strengthening of support system program	Agricultural, livestock and other income generation projects will be supported selectively by provision of adequate agricultural extension services and technical assistance; provision of livestock extension services, technical assistance and veterinary services; and promote of a small scale mechanization development-assistance.
C. Human Resource Development	
- Training program - Awareness creation program - Research program - Demonstration program - Technical assistance program	This program includes strengthening the capacities of both local villagers and MEF staff in terms of awareness creation, capability raising, training and applied research. The respective projects will include: training of engineers, nurserymen, forest guards, hunters and study tour for MC villagers; awareness creation through village meetings, lectures in primary schools and preparation of educational materials; various researches on subjects such as disaster mechanism, evaluation of past soil erosion control, local plant species, rangeland assessment, wildlife inventory, new energy development, eco-tourism potential; field demonstrations on livestock improvement and agricultural production using irrigation, and; technical assistance on soil erosion control, agricultural extension, veterinary service and pasture improvement.

G.2 Features of the Study Area

G.2.1 Natural Conditions

(1) Location of the Study Area

The Study area covers the Coruh River Catchment which has a total area of some 2 million hectares. The catchment is located in the northeast of Turkey, south of the Black Sea and next to the national border with Georgia. The last few kilometers of the Coruh River flow through Georgia and then into the Black Sea.

(2) Topography

The topography of the Study Area demonstrates significant spatial distribution of different slope classes. In general, the downstream part of the Study Area is much more mountainous than the upstream area. More specifically, steep land is concentrated in the three northeastern Sub-Catchments (SCs) of Berta, Lower Coruh and Middle Coruh. The area between Yusufeli and Artvin is particularly steep. The gentlest topography is found in the southern and western part of the catchment, notably in the SCs of Oltu, Tortum and Upper Coruh. The Upper Coruh SC has the least steep land, and many of the areas have inclines of less than 6%, which are presumably suitable for irrigation.

(3) Climate

One of the major characteristics of the Coruh River catchment is its harsh climate. The Study area has extremely low temperatures in Winter, but is generally hot in Summer. Precipitation in the area is generally low, with occasional high intensity storms. There are following five meteorological stations located within the Study area.

The meteorological station of Artvin, located in the most downstream area and with the lowest elevation, records the mildest climate with only 18 days of frost per annum and the annual precipitation of 660 mm. The more downstream parts of the Coruh catchment, north and east of Artvin town, are reported to have more annual rainfall although there are few reliable records.

(4) Hydrology

The Coruh River rises in the western part of the catchment at altitudes of about 2,000 m, and flows some 300 km distance to the Black Sea via Georgia. Extreme ranges between maximum and minimum discharges are seen in the river, especially in its tributaries. Particularly in Oltu SC, the ratio of minimum and maximum discharge ranges up to 220 times. They are very

"flashy" streams, subject to extreme storm events, which will produce rapid, massive, very erosive flows. The discharge of the river demonstrates a clear seasonal pattern, with the highest discharges during the period of roughly March to June due to snowmelt, very low discharges in Summer, and generally low flows in Autumn and Winter.

Suspended sediments demonstrate strong correlations with river discharge. The annual average sediment discharges measured at stations within the Study area range from as low as 61 ton/km^2 to as high as 653 ton/km^2.

(5) Soil and Land Use

The most common soils in the Study area are Basaltic Soils, Brown Forest Soils, Brown Soils, Chestnut Soils and High Mountain Pasture Soils. These soils cover about 77% of the whole catchment, while the other soils cover only about 13%. However, some of the less common soils may be locally important– as Alluvial Soils, which are not common in terms of area, but are very important to villagers as they are highly productive. In addition, some SCs have locally high occurrences of particular soils. Most of the soils are moderately or strongly erodible, especially on steep slopes. Most of the soils possess only moderate fertility, and present severe constraints such as shallowness and stony subsoils.

Land use of the Coruh river catchment was analyzed from Landsat images taken in September 2001. The results indicate that some 4,402 km^2 or 21.7 % of the total catchment are forests. Other land uses include: transitional woodland shrub (2,365 km^2 or 11.7 %), rangeland (9,352 km^2 or 46.2 %), arable land (2,808 km^2 or 13.9 %), and other areas (1,316 km^2 or 6.5 %).

Forest areas are mainly found in the lower and middle reaches of the Coruh river, the whole Berta river catchment and part of the middle reach of Oltu river. On the other hand, agricultural lands extend mainly over the plains in the upper reaches of the Coruh and Oltu rivers. Transitional woodland and shrub are found mainly in the middle and upper reaches of the Coruh, and parts of Tortum and Oltu rivers, and rangeland occupies the upstream area of the Coruh and major parts of the Oltu and Tortum rivers.

(6) Flora and Fauna

Vegetation

The main vegetation cover of the Study Area consists of forests, steppes and alpine vegetation. In addition to these covers, plants species of Mediterranean taxonomy are seen in the low valleys due to microclimatic conditions. The forests in the area tend to spread on the hills of Artvin where the climate is somewhat milder than the other areas of the Study Area. These forests stretch out to the mountains along the Coruh River up to Ispir. Another portion of the forests also lay on the mountains of Oltu, while the rest of the area are dominated by shrubs and grasslands.

The typical vegetation species that are seen in the area are *Picea orientalis, Abies nordmanniana, Acer trautvetteri, Acer cappodocicum, Fagus orientalis, Alnus glutinosa, Castanea sativa, Laurocerasus officinalis, Buxus sempervirens, Corylus avellana, Rhododendron sp., Lonicera caucasica, Sambucus nigra, Vaccinium arctostaphylos*. With coppice and planted forests of *Quercus macrantha subsp. syspirensis, Quercus petrae subsp. iberica, Pinus sylvestris*.

The bushes in the steppe mainly consist of *Paliurus spina-christi, Rhamnus pallasii, Jasminum fruticans, Cotinus coggygria, Colutea cilicica, Ephedra major, Berberis vulgaris, Arbutus andrachne*.

The Mediterranean species are *Olea europea, Artemisia austriarus, Astragalus microcephalus, Capparis ovata, Sedum sempervivoides, Teucrium orientale verilebilir*.

For alpine vegetation, there are *Acer divergens, Acer divergens var. trilobum, Arbutus andrachne, Caragana grandiflora, Cerasus prostrata, Capparis spinosa var. spinosa, Colutea cilicica, Cotinus coggygria, Ephedra major, Euphorbia macrocloe, Inula helenium, Juniperus oxycedrus, Juniperus excelsa, Laurus nobilis, Lonicera caucasica, Melica ciliata, Ostrya carpinifolia, Paliurus spina-christi, Pistacia terebinthes subsp. palaestina, Punica granatum, Quercus macranthera subsp. syspirensis, Quercus petrae subsp. iberica, Rhamnus pallasii, Rhus coriaria, Rosa elymaitica, Rosa pisiformis, Sedum spurium*.

Endangered species

The Red data book of Turkish plants compiled by the Society for the Protection of Nature (DHKD) has 70 plant species listed for the three provinces of where the Study Area is located. Though the Study Area is said to be rich of rare and endemic species, comprehensive inventories or measures for the protection of these species are either taken by the MEF.

Endangered Plant Species Reported in the Three Provinces

Category		Specie		Reported Province
EX:	**Extinct**	—		—
EW:	**Extinct In The Wild**	—		—
CR:	**Critically Endangered**			
	COMPOSITAE	*Anthemis calcarea*	var. *calcarea*	Artvin
			var. *discoidea*	Erzurum
		Centaurea leptophylla		Artvin
		Centaurea straminicephala		Erzurum
		Centaurea taochia		Erzurum
	DIPSACACEAE	*Cephalaria anatolica*		Erzurum
	GUTTIFERAE	*Hypericum fissurale*		Artvin
	LABIATAE	*Stachys bayburtensis*		Bayburt
	LEGUMINOSAE	*Lathyrus woronovii*		Artvin
EN:	**Endangered**			
	BORAGINACEAE	*Onosma arcuatum*		Erzurum
		Onosma Circinnatum		Artvin
		Onosma mirabilis		Erzurum
		Symphytum savvalense		Artvin
	CAMPANULACEAE	*Campanula choruhensis*		Artvin, Erzurum
		Campanula troegerae		Artvin
	CARYOPHYLLACEAE	*Silene ispirensis*		Erzurum
		Silene scythicina		Artvin

Category		Specie		Reported Province
EN:	**Endangered**			
	COMPOSITAE	*Cirsium davisianum*		Erzurum
		Helichrysum artvinense		Artvin
		Hieracium diaphanoidiceps		Artvin
		Hieracium foliosissimum		Artvin
		Hieracium nydeggerorum		Erzurum
		Hieracium radiatellum		Artvin
	CRUCIFERAE	*Clypeola raddeana*		Artvin
		Erysimum leptocarpum		Erzurum
	DIPSACACEAE	*Blysmus compressus*	subsp. *subulifolia*	Erzurum
		Scabiosa sulphurea		Erzurum
	ERICACEAE	*Rhodotamnus sesillifolius*		Artvin
	GERANIACEAE	*Geranium platypetalum*	var. *albipetalum*	Artvin
	GRAMINEAE	*Elymus sosnowskyi*		Erzurum
	GUTTIFERAE	*Hypericum marginatum*		Artvin
	IRIDACEAE	*Crocus biflorus*	subsp. *artvinensis*	Artvin
			subsp. *fibroannulatus*	Artvin
	LABIATAE	*Lilium carniolicum*	var. *artvinense*	Artvin
		Ornithogalum byzantinum	var. *proliferum*	Artvin
	MORINACEAE	*Morina persica L.*	var. *decussatifolia*	Erzurum
	ORBANCHACEAE	*Orbanche armena*		Artvin
	RANUNCULACEAE	*Consolida cornuta*		Erzurum
		Delphinium munzianum		Erzurum
	RESEDACEAE	*Reseda armena*	var. *scabridula*	Erzurum
	RUBIACEAE	*Asperula virgata*		Erzurum
		Galium totumense		Erzurum
	SCROPHULARIACEAE	*Verbascum decursivum*		Erzurum
		Verbascum gracilescens		Erzurum
	UMBELLIFERAE	*Ferula huber-morathii*		Erzurum
		Heracleum sphondylium		Artvin
VU:	**Vulnerable**	—		—
VR:	**Lower Risk**	—		—
DD:	**Data Deficient**			
	BORAGINACEAE	*Paracaryum montbretii*		Erzurum
	COMPOSITAE	*Centaurea eugenii*		Erzurum
		Hieracium artvinense		Artvin
		Hieracium caloprasinum		Erzurum
		Hieracium cinereostriatum		Artvin
		Hieracium debilescens		Artvin
		Hieracium floccicomatum		Artvin
		Hieracium insolitum		Artvin
		Hieracium koenigianum		Erzurum
		Hieracium leptogrammoides		Artvin
		Hieracium onosmaceum		Erzurum
		Hieracium subartvinense		Artvin
		Hieracium subhastulatum		Artvin
		Hieracium variegatisquamum		Erzurum
		Hieracium virosiforme		Artvin
		Tanacetum oxystegium		Erzurum
	LABIATAE	*Starchys huetii*		Erzurum
	LEGUMINOSAE	*Astragalus imbricatus*		Artvin
		Astragalus psilacmos		Erzurum
		Astragalus spectabilis		Ersurum
	LILIACEAE	*Allium koenigianum*		Artvin
		Gagea tenuissima		Artvin
	SCROPHULARIACEAE	*Verbascum artvinense*		Artvin
	UMBELLIFERAE	*Ferulago latiloba*		Artvin
NE:	**Not Evaluated**	—		—

Source: Red data book of Turkish plants, 2000, Turkish association for the conservation of nature/Van Centennial University

(7) Fauna

Numerous species of animals are reported in the Study Area. The Coruh Watershed Tourism and Recreation Development Project Report has indicated twenty-one mammals, fifty birds and four fish species as extracted from several publications. The Study Area plays an important roll as the habitat for important animal species as five out of the twenty-one mammal species and thirteen out of the fifty bird species listed in the abovementioned report are identified as protected animals according to the Land Hunting Law (No. 3167). The Study Area is also important for from the view of bird migration for birds migrating between the continents of Eurasia and Africa as it is located in one of the two major migration routs in Turkey. The majority of bird species migrating through the Study Area are *Pernis apivorus* and *Aquila rapax*, along with other birds of prey.

Wildlife Species Reported in the Three Provinces

Mammals species	
Cervus elaphus maral, (red deer)	*Canis lupus*, (Gray Wolf)
Capreolus capreolus, (Western Roe Deer)	*Canis aureus*, (Golden Jackal)
capra aegagrus, (Wild Goat (Capra aegagrus))	*Meles meles*, (Eurasian Badger)
Rupicapra rupicapra, (Chamois)	*Lepus europaeus caucasicus*, (European Hare)
Capra cretensis Capra picta, (Wild Goat (Capra aegagrus picta))	*Lutra lutra*, (European Otter)
	Martes martes, (European Pine Marten)
Sus scrofa, (Wild Boar)	*Martes foina*, (Beech Marten)
Ursus arctos, (Brown Bear)	*Mustela erminea*, (Ermine)
Vulpes vulpes, (Red Fox)	*Mustela nivalis*, (Least Weasel)
Lynx lynx, (Eurasian Lynx)	*Sciurus anomalus*, (Caucasian Squirrel)
Panthera pardus tuliana, (Leopard)	*Cipera kaznakov*, (Caucasus (Kaznakov's) viper)
Birds species	
Accipiter brevipes, (Levant Sparrowhawk)	*Falco biarmicus*, (Lanner Falcon)
Accipiter gentilis, (Northern Goshawk)	*Falco columbarius*, (Merlin)
Accipiter nisus, (Eurasian Sparrowhawk)	*Falco subbuteo*, (Northern Hobby)
Aegypius monachus, (Cinereous Vulture)	*Falco vespertinus*, (Red-footed Falcon)
Alectoris chukar, (Chukar Patridge)	*Falco naumanni*, (Lesser Kestrel)
Anas platyrhynchos, (Mallard)	*Falco tinnunculus*, (Common Kestrel)
Anas strepera, (Gadwall)	*Gypaetus barbatus*, (Lammergeier)
Aquila chrysaetos, (Golden Eagle)	*Gyps fulvus*, (Griffon Vulture)
Aquila heliaca, (Imperial Eagle)	*Haliaetus leucoryphus*, (Pallas's fishing eagle)
Aquila clanga, (Greater Spotted Eagle)	*Haliaetus albicilla*, (White-tailed Eagle)
Aquila rapax, (Steppe Eagle)	*Hieraeetus fasciatus*, (Bonelli's Eagle)
Aquila pomarina, (Lesser Spotted Eagle)	*Hieraeetus pennatus*, (Booted Eagle)
Buteo lagopus, (Rough-legged Buzzard)	*Lyrurus mlokosiewiczi*, (Caucasian Black Grouse)
Buteo rufinus, (Long-legged Buzzard)	*Milvus migrans*, (Black Kite)
Buteo buteo, (Common Buzzard)	*Milvus milvus*, (Red Kite)
Circaetus gallicus, (Short-toed Eagle)	*Neophron percnoptenus*, (Egyptian Vulture)
Circus cyaneus, (Hen Harrrier)	*Oriolus oriolus*, (Golden Oriole)
Circus macrourus, (Pallid Harrier)	*Otis tarda*, (Great Bustard)
Circus pygarcus, (Montagu's Harrier)	*Pandion haliaetus*, (Osprey)
Circus aeruginosus, (Marsh Harrier)	*Pernis apivorus*, (Eurasian Honey-Buzzard)
Columba livia, (Rock Dove)	*Scolopax rusticola*, (Eurasian Woodcock)
Coturnix coturnix, (Common Quail)	*Streptopelia turtur*, (Turtle Dove)
Falco peregrinus, (Peregrine Falcon)	*Tetraogallus caspius*, (Caspian Snowcock)
Falco eleonorae, (Eleonora's Falcon)	*Turdus pilaris*, (Fieldfare)
Falco cherrug, (Saker falcon)	*Turdus merula*, (Blackbird)
Fish species	
Salmo trutta, (Brown trout)	Barbus cycloepsis, *(Barbel (No common name for exact spece)*
Cyprinus carpio, (Carp)	
Silurus glanis, (Wels catfish)	

G.2.2 Social Conditions

(1) Demographic features

The population in the whole Coruh river catchment totals 432,259 as of year 2000 with the rural population of 268,459. The population density in the watershed is as low as 21.8 people/km^2. During the last decade the population decreased by 49,275 or 10.2% from 481,534 in 1990. Annual average population growth rate in the last decade was –1.1% on average. In contrast to the increase in urban population at 1.6% per annum on average, rural population has decreased at 2.4% annually on average during the same period. Population decrease occurred rapidly in Murgul, Savsat and Yusufeli districts of Artvin and in Olur, Oltu and Ispir districts of Erzurum with annual average population growth rate of –3.5% or less.

The population of males and females in the whole catchment is almost even: 216,995 for males and 215,294 for females respectively, but the female population surpasses the male population by 10,000 in rural areas. There is a common tendency for all three Provinces for more males in urban areas and more females in rural areas. In Erzurum Province particularly, the urban male population is 14% more than the urban female population.

(2) Economy

Employment opportunities in urban areas are limited in the three Provinces. Urban unemployment rates are 14% for Artvin, 22% for Erzurum and 18% for Bayburt respectively. While the unemployment rate for male in urban area ranges between 11% and 21%, employment opportunities for urban females are very limited, with unemployment rate of over 30%. On the other hand, most of the labor force, both male and female, in rural areas is employed.

The agriculture sector absorbs 63% of the total employment in the three Provinces, followed by community, social and personal services with 19%, wholesale and retail trade, restaurants and hotels with 5.6%, construction with 4.1%, manufacturing industry with 3.0%, transportation, and communication and storage with 2.3%. Self-employment in the agricultural sector is dominant in rural areas. Some 80% of males and almost all females are engaged in agriculture including livestock. Actually in most cases female are employed as unpaid family labor. Among sub-sectors of agriculture, cropping and livestock are the major income sources.

(3) Health and hygiene

There are 117 clinics and 178 sanitary stations in the Study Area. The ratio of villages and medical facilities (clinics and sanitary stations) in the Study Area is highest in Artvin, reaching 47 %. This is followed by Bayburt and then by Erzurum. There are no hospitals

capable of executing operations, thus patients in the Study Area must be transported to the general hospital in Erzurum city for such treatment. Though there are two hospitals in Erzurum city, transportation in assumed to be difficult as road failures frequently occur due to natural disasters and winter snow.

(4) Disasters

The number of reported natural disasters in the Study Area in the year 1997 is listed in the table.

The number of Floods, counting up to 2,826 times as the total for each village is the most frequent natural disaster in the Study Area, and occurs twice as much as the following disasters which are land slides and avalanches, counted 1,294 times and 1,186 times respectively. The casualties of floods were 22, which was also the largest number in the reported natural disasters.

As mentioned in the section of climate, the precipitation in the Study Area is generally low, but with occasional high intensity storms. The degraded forest areas and graze lands with low water holding capacity allows the water to run off directly to the river course causing these disasters. Some extent of the villages with their fields formed near the river course for the utilization of the rich soils and water are be easily influenced. The intense storms also causes landslides, which is one of the other major disasters in the Study Area. The degraded forest areas and graze lands are also promoting factors of this disaster, lacking of stability and water gradual water infiltration. The other major reported disasters are avalanches, earthquakes and fires.

Considering that bare land with no coverage is one of the major factors causing floods and landslides, and that avalanches could be at some extent, prevented or mitigated by rehabilitation of the watershed, namely forest and graze land rehabilitation. In the field study, the Study Team visited Aksu village in Ispir district, where villagers actually had been controlling grazing and the cutting of trees in the slopes adjacent to the settlements to prevent the landslides that had been previously occurring. This indicates the strong interests of villagers for such damages and their potential of putting effort for such kind of activities.

Number of reported natural disasters in the Study Area

A. Number of Disasters, B. Number of Disasters with death reported, C Number of Disasters with damage to property

	Number of Villages	Type of Disaster																	
		Earthquake			Flood			Landslide			Avalanche			Fire			Others		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Artvin	311	1	-	1	423	9	46	357	2	43	132	5	11	190	2	66	8	-	3
Erzurum	403	656	16	79	2055	12	108	837	0	22	863	9	16	264	8	83	291	2	15
Bayburt	175	340	1	12	348	1	32	100	-	2	191	4	10	87	3	39	4	1	1
Total	889	997	17	92	2826	22	186	1294	2	67	1186	18	37	541	13	188	303	3	19

Source: 1997 Village inventory, 2002, SIS

G.2.3 Sensitive Areas

(1) National Parks and other protected areas

The Turkish EIA Regulations nominates various areas defined under various laws as "Sensitive areas". These areas, where all development activities are obligated to IEE, include National Parks, Natural Parks, Natural Monuments and Nature protection areas. The followings are the protected areas existing in the Study Area. Besides these sites there are also a number of candidate areas (e.g. Tortum Lake Area in Erzurum, Karcal Mountain, Murgul Valley Areas in Artvin) for which assessment and establishment works are continuing.

Existing Protected Areas in the Study Area

Name of the area	Location	Status	Area (Ha.)
Karagöl-Shara National Park	Artvin-Şavşat	National Park	3,766
Hatilla National Park	Artvin	National Park	17,104
Camili Efeler Ormanı	Artvin-Borçka	Nature Reserve	1,453
Camili-Görgit	Artvin-Borçka	Nature Reserve	490
Karagöl-Nature Park	Artvin-Borçka	Nature Park	368
Çoruh Valley Wildlife Conservation Area	Artvin-Yusufeli	Wildlife Conservation Area	21,821
Oltu Wildlife Conservation Area	Erzurum-Oltu	Wildlife Conservation Area	5,400
Verçenik Mountain Wildlife Conservation Area	Erzurum-Ispir	Wildlife Conservation Area	50,435
Pazaryolu Wildlife Conservation Area	Erzurum-Pazaryolu	Wildlife Conservation Area	20,326

Source: MEF

(2) Areas of cultural and historical values

There are numerous sites with cultural, historical and/or other values in the Study Area, of which are registered by the Ministry of Culture. However, adequate research work for identifying the actual values are not carried out for most of the sites.

Cultural, Historical and Other sites Registered by the Ministry of Culture

		Natural	Archeological /Historical	Cultural /Religious	Administrative /Military	Others
Artvin	Ardanuc	3	1	13	8	
	Borcka		2	16	2	
	Merkez		2	14	8	1
	Savsat			6	6	
	Yusufeli	2		5	7	
Erzurum	Ispir		1	7	1	
	Narman		2	1	3	
	Oltu	1	2	9	7	
	Olur	1		1	1	
	Pazaryolu			1		
	Senkaya			3	1	
	Tortum		1	3	1	
	Uzundere	1				
Bayburt	Aydintepe		1		2	
	Demirozu			2	2	
	Merkez	8	12	35	17	
Total		16	24	116	66	1

Source: Ministry of Culture

(3) Other areas to be considered

There are no sites protected under International Conventions in the Study Area.

G.3 Organizations and Legislations concerning Environmental Impact Assessments

G.3.1 Government organizations related to environmental conservation

The Ministry of Environment

The Ministry of Environment and Forestry (MEF) was organized in 8. May 2003 by merging the former two ministries of Forestry and Environment. The MEF inherits the responsibilities among the activities for the protection and improvement of the environment with the aim of ensuring appropriate land use, protecting natural resources, plants and animal species, and preventing pollution. The major duties of the Ministry in view of environmental aspects are as follows.

- Drafting laws, preparing rules and internal regulations
- Creating institutions (such as village environment associations and commissions to manage waste)
- Supervising and planning environmental designs, interventions and actions as appropriate
- Managing watershed water quality and regional waste
- Creating environmental policies and strategies
- Coordinating environmental activities at international and national levels
- Conducting research, applying measurements, monitoring compliance, collecting data
- Managing finances
- Carrying out extension and training

Other relevant organizations

Though MEF is the main ministry responsible of environmental conservation, the Turkish administrative system consists of various organizations and institutions each with some extent of authorization upon environmental administration. These ministries and institutes carry out their activities related to the environment in their own administrative territories. In addition, municipalities are also responsible for some related activities, such as providing infrastructure and services for protection and management of the environment.

The followings are the major organizations and institutes performing activities related to environment.

Organizations and Institutions Performing Environmental Activities

Organizations	Responsibilities
Ministry of Culture (MoC)	Monitoring and management of natural, cultural and historical assets and resources.
Ministry of Health (MoH)	Monitoring of air pollution, and granting of permits to industries for stack gas emissions, Monitoring of drinking water quality
State Planning Organization (SPO)	Preparation of economic, social and environmental policies for the 5-year development plans, and annual and public investment programs
General Directorate of Rural Services (GDRS)	Providing sewerage services to villages with population of 3,000 or less
The State Hydraulic Works (DSI) Electricity Survey Administration (EIE)	Flood control, Creating and applying water quality and quantity measurements
Turkish Standard Institute (TSI)	Establishment of certain environmental standards
Local governments	Management of solid waste

G.3.2 Laws related to environmental conservation

Related laws

Turkey's environmental legislation consists of the Environment law(2872) based on article 56 of the constitution, and various other laws relevant to environment. The Environment law defines activities to prevent and solve environmental problems. The law states articles on banning of certain kinds of operations polluting the environment, requiring of environmental impact assessment (EIA) for specific activities, definition of special environmental protection areas, providing sanctions to prevent pollution, promoting incentives for less pollution, creating an environmental fund, and securing participation in decision making bodies (councils and committees).

Some other laws related to environmental issues, including land use and natural resources in the Study Area are listed below.

- Forest Law (No. 6831)
- National Parks Law (No. 2873)
- Land Hunting Law (No. 3167)
- Culture and National Resource Protection Law (No. 2863)
- Water Products Law (No. 1280)

G.3.3 Environmental Impact Assessment Regulation

Environmental Impact Assessment (EIA) Regulation

As the in other laws, the Environment Law has various regulations related to the environment. Out of the relevant regulations listed below, the Environmental Impact Assessment Regulation (EIA Regulation) defines the administrative and technical procedures in the implementation of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE). As a tool used commonly throughout the world for environmental consideration, EIA plays an administrative roll for regulating the environmental impacts from development activities.

The EIA Regulation consists of thirty articles, six temporary articles five annexes.

Main Procedures of EIA

A. The review and evaluation commission is formed by MEF consisting of representatives of relevant central and local government agencies including MEF, the owner of the activity or its representative, and other personnel deemed necessary by MEF.

B. A public participation meeting is held with the attendance of commission members to obtain public opinions and recommendations.

C. Scoping of environmental issues will be done and the general EIA format indicated in annex III of the EIA regulation will be examined under the results. The opinions obtained in the public meeting will be considered at this point. The necessary professions for the study team preparing the EIA report will be decided. These results will be informed to the owner of the activity in order for him to prepare the EIA report.

D. After submittal of the EIA report, the commission reviews and evaluates the report with the following criteria.
   - Whether the EIA report and its annexes is appropriate and sufficient.
   - Whether the reviews, evaluations and calculations in the report are sufficient in details, and whether they are based on accurate information, data and documents.
   - Whether the environmental impacts of the activity is reviewed in details.
   - Whether necessary precautions have been taken to prevent the environmental impacts generated by the activity.
   - Whether public participation meetings have been done according to its appropriate procedures, and whether the issues have been solved or come to consent in the meeting.

E. When the commission comes to conclusion, the review-evaluation process will be ended with the acceptance or the Final EIA report along with other necessary documents.

F. During the review-evaluation period, the public can access the report at the ministry or

provincial environmental directorate, and submit opinions through the governor or the ministry.

G. During the review-evaluation period, if the commission finds that there are important lacks or failures within the report, it will be informed to the owner of the activity in order to prepare recover these lacks or failures. The owner of the activity is able to revise the report up to two times.

H. The commission may ask from the owner of the activity to provide tools, equipment, information, resource and documents to make tests, experiments and measurements related with the activity during the review-evaluation period. ME can also ask the opinions of from authorized institutions and organizations.

I. MEF will send EIA positive or negative certificates to the owner of the activity and relevant central and local agencies and organizations after the submission of the final EIA report to MEF.

Main Procedures of IEE

A. The owner of the activity submits an Preliminary Environmental Evaluation (IEE) Report based on the items listed in annex IV of the EIA regulation, and a petition to the governor.

B. If the IEE report is found appropriate by the governor, the owner of the activity will notice the public for obtaining public opinions by methods decided in joint with the governor. The solutions of the opinions will be studied under the supervision of the governor.

C. After this process, the IEE report will be submitted to MEF which examines the report in reference to the annexes I, II and IV of the EIA regulation. MEF will then decide the necessity of EIA, and will declare it to the governor and the owner of the activity.

D. The governor will announce the decision to the public ending the procedures of IEE.

E. During this period, MEF can ask the opinions of from authorized institutions and organizations.

G.4 Environmental Issues

G.4.1 Issues related to Organizations and Regulations

Issues concerning boundaries of environmental administration

Though MEF is the main responsible ministry on environmental conservation, the boundaries of jurisdiction concerning environmental protection are scattered to various agencies, complicating the administrative system. Propelled by the uncertainness of cadastral

boundaries between forests, rangeland and agricultural areas, the administrative boundaries among responsible agencies are unclear. In order to supplement this situation and enforce efficient and sufficient environmental protection, close cooperation between these agencies is essential. However, with agencies being somewhat nervous on administrative interventions, the unclearness is likely to lead to improper or lacking management of these areas.

The range of activities obligated to EIA

The EIA regulation has in its annexes, a list of activities that are obligated to EIA or IEE. Concerning this Study, the transformation of forestland to areas for different use is listed in annex II, which is the list of activities obligated to IEE. When taken literally, all activities changing the land use of forests are obligated to IEE no matter what size or kind.

Regarding that the magnitude of negative or even positive impacts to the environment largely differs depending on the kind and size of the activities, the description may compel unnecessary administrative procedures to certain activities.

The unclearness of responsibilities of relevant government agencies

The EIA regulation states various areas defined under laws as "sensitive areas" of which should be considered in EIA and IEE procedures. On the other hand, interviews with technical officials of MEF revealed that these descriptions were not necessarily stated from the viewpoint of their impacts on the environment, but from the viewpoint of MEF working as an coordination agency of providing permits for development activities, where development activities in these areas are prohibited by law. Some of these descriptions, associated with law and not actually with environmental protection, leave an extent of the responsibilities of decision making to relevant agencies. However, regarding that the procedures aims at environmental protection, the actual responsibilities of the relative agencies with in the procedures are not quite clear.

Insufficient consensus building

The Regional directorate of MEF carries out numerous projects involving forest villagers. A project for growing walnut seedlings seemed to be managed with ample consensus with the villager involved, baring benefit for both the ministry and the villager. On the other hand some projects seemed to have borne discord among the villagers and between villages. It was deemed that consensus building may have not been amply practiced especially with the people who do not receive benefit from the projects.

Deficiency of integrated data among protected areas

MEF is responsible for the management of protected areas such as National Parks, Natural Parks and Nature Conservation Areas. However, the ministry does not have comprehensive data among the status of natural environments of these areas nor sufficient Management Plans in order to effectively protect, manage and utilize the natural resources under the protected status. This also results in causing conflicts between MEF staff and local villagers, as the lack

of Management Plans results in prohibiting all activities in these areas.

Issues concerning provincial offices of the MEF

Provincial offices of MEF of which are engaged with the activities of the General Directorate of Environmental Impact Assessment and Planning have been recently established in Artvin and Bayburt. However, with limited personnel and materials, the activities of these offices are yet restricted to certain extents such as management of solid waste from urbanized areas. On the other hand, the provincial office of Erzurum is rather active, but also aims mainly at environmental issues in the urban areas such as air pollution and noise, and the natural environment in the rural areas seemed to have little priority. Regarding the weight of priority that MEF has put on issues such as biological diversification, there seems to be discrepancy between the interests or the actions of the central and local administrative bodies.

Issues concerning environmental considerations obligated by donor organizations

International organizations which may fund the activities of the Master Plan to be formed in this study generally obligate environmental considerations to funded projects. For example, JBIC obligates three steps for confirming that due consideration is made for the project as aforesaid. According to the JBIC guideline, projects in the forestry sector is assumed to have significant adverse impact on the environment and is obligated to the preparation of an EIA report. Referring the appendix of the JBIC guideline, one of the assumed impacts are

The same obligation is applied to projects in or near National Parks and nationally-designated protection areas. In the JBIC guideline, projects with less adverse environmental impacts are also obligated to conformation of environmental considerations through environmental reviews performed upon information submitted in formats attached to the JBIC guideline.

G.4.2 Issues Related to the Natural Environment of the Study Area

Forest degradation and soil erosion

The major issues related to the natural environment of the Study Area are forest degradation and soil erosion. The degradation of forests leads to poor biological diversity and threats to rare species through decreasing the living environment of resident species. Forest degradation may also influence migrating bird species through decreasing resting places and/or temporary residents.

Soil erosion will influence the ecological structures of the aquatic environment through water turbidness and sedimentation in rivers and lakes.

Furthermore, there is a vicious circle consisting of forest degradation and soil erosion where each leads to the other propelling the exacerbation of the environment.

These issues originate not only from harsh natural conditions such as steep topography, and low temperature and precipitation, but also from social factors mainly derived from the lack of resources in the forest villages. The forest villages utilize the forest through cutting trees

for income and fuel, clearing the forest for establishing agricultural fields and using degraded forests as rangelands. These activities, currently performed in unsustainable manners, lead to further deterioration of remaining forests, and limit the regeneration of new ones. Administrative factors such as unclearness of forest borders and administrative responsibilities propel the unsustainable usage of forest resources. In addition, improper management of areas besides forests (graze lands, agricultural fields, etc.) is another factor propelling soil erosion within the area.

National Parks and Protected Areas

There are two National Parks and three nature conservation areas in the Study Area for the protections of natural environment. In addition, there is also one candidate national park.

Other issues

As for other environmental issues, negative impacts to water resources brought by solid waste and sewerage, as they are often dumped in to little streams near the villages, may be occurring in the Study Area.

G.4.3 Issues Related to the Social Environment of the Study Area

Environmental awareness of forest villagers

One of the factors propelling soil erosion and forest degradation in the Study Area is the over grazing of livestock. The villagers put pressure too intensively on the range lands and destroys its potential to regenerate in the next season, leading the area to bold. Also, in many villages observed in the Study Area, solid waste and sewerage was dumped into small streams, and ridges of the fields were often made vertically to the slope, propelling the outflow of soils. These environmentally exacerbating manners are borne from numerous factors such as being forced by financial reasons, or lack of environmental education, but in general, the environmental awareness of the forest villagers seemed to be low, or with lower priority compared to other factors.

On the other hand, in Aksu village of Ispir district, villagers had been voluntarily controlling grazing and the cutting of trees in the slopes adjacent to the settlements to prevent landslides. Besides the strong interest of the villagers against the damages brought by disasters, this indicates the ample capability of implementing necessary measures when their interest is strong enough for the issue.

Social issues causing pressure on forest resources

As mentioned above, the forest villages are dependant on forest resources. The villagers utilize the trees and land of forest areas in various and often in unsustainable ways.

With harsh climate and limited areas suitable for agricultural production, the villagers have conventionally relied on animal husbandry, raising goat and sheep. However, limited areas of natural pasture and insufficient technology for efficiently producing fodder crops lead to the

intense usage of grazing areas. The villagers grazed their livestock up to the boundaries of forests, gradually invading the deteriorating edge of the forests. In fact, some extent of the forests is assumed to be cut or burned down to obtain graze land or agricultural fields. The intense usage of graze land caused exhaustion of resources which lead to less productivity. To compensate for this situation the villagers had to increase the heads of livestock, which lead to greater need of graze land, forming another vicious circle. On the other hand, villagers also used the trees for fuel and revenue.
The lack of income sources was deemed to be one of the major factors compelling pressure on forest resources.

Living environment within the forest villages of the Study Area
Though there is no comprehensive data indicating the state of living environment within the forest village s of the Study Area, the impacts of pollution is deemed to be rather small. Regarding the number of sources such as factories or highways, noise problems or large-scale air pollution are not likely to be occurring. Problems concerning solid waste, along with water pollution as abovementioned, may be occurring with in the villages but in small extents. However, these issues may grow as the development of forest villages proceeds.

Natural and cultural assets
Though numerous sites are registered by the Ministry of Culture as areas of natural, cultural and other values. However, studies for identifying the actual values of these sites are not done in most cases.

G.5 Possible Environmental Impacts of the Master Plan

The probable positive and negative environmental impacts of each major proposed activity under the project have been assessed and summarized in the following table. The results of the assessment demonstrates that virtually all the proposed activities will have positive environmental impacts, some very strongly so. Very few of the activities will have negative environmental impacts, and then only at minor levels of severity. It is expected that any such impacts can be mitigated through careful project design and implementation.

Probable Environmental Impacts of the Master Plan

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

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

Probable Environmental Impacts of the Master Plan

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

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

Probable Environmental Impacts of the Master Plan

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

G.5.1 Positive Environmental impacts

The programs/projects proposed in this Master Plan mainly aim at the rehabilitation of the degraded natural resources of the Coruh River catchment, and generally considered to have more positive impacts to the environment than negative. The presumed positive environmental impacts of the programs/projects under the respective categories are as follows.

Natural resource rehabilitation and management

Programs/projects under this category will have positive impacts on factors such as: accumulation of sediment and course rocky debris; mass earth movements and; prevention of various natural disasters. The programs/projects will also contribute in increasing productivity of rangelands, agricultural lands and forest areas by preventing land degradation. Regeneration of green coverage through natural regeneration and planting local species will improve the natural habitats of flora and fauna as well as conserving bio-diversity. Furthermore, natural resources rehabilitation and management activities of will provide employment opportunities contributing in income improvement of local villagers.

Livelihood improvement

Programs/projects under this category mostly consisting of rehabilitation and enhancement of existing facilities and activities, is considered to have significant to moderate positive impacts to livelihood improvement of the local villagers. The combination of natural resource rehabilitation and management with livelihood improvement as incentives will promote smooth and efficient implementation of the programs/projects, and will contribute to the rehabilitation of the catchment area.

Cross Micro-Catchment Planning

Projects under this category supports the appropriate and efficient management of the natural resources in the whole catchment. Particularly the National parks and protected areas management project will enable effective and appropriate conservation, management and utilization of important flora/fauna species and biodiversity.

Human resource development

Human resource development is for enabling efficient implementation of the Master Plan and will contribute in the rehabilitation of the natural resources and in maintaining the sustainability of the Master Plan through programs/projects under the abovementioned categories.

G.5.2 Adverse environmental impacts

As aforementioned, the activities proposed in the Master Plan is considered to have positive environmental impacts, some very strongly so. Very few of the activities will have negative

environmental impacts, and then only at minor levels of severity. It is expected that any such impacts can be mitigated through careful project design and implementation. The following description assesses the possibilities of adverse environmental impacts on some major issues and necessary considerations to be made.

Life of local residents

The projects/programs proposed in the Master Plan aim at improving villager livelihood by enhancing the current lifestyle and is considered not to have major impacts on the lives of local residents. However, it should be carefully considered in the stage of detailed design that the benefits of the implemented programs/projects are not mal-distributed in order to avoid frictions between villagers. Furthermore, as commercial nomadic grazing were seen in parts of the Study Area, ample consensus building should be made with the nomads taking them in regard as one of the stakeholders.

Demographic features

The implementation of the projects/programs proposed in the Master Plan is considered to alleviate the state of out-migration and promote the return of migrants. However, this is of improving the demographic situation of the depopulated forest villages, and is considered not to have significant adverse impact.

Economic activities

The projects/programs proposed in the Master Plan will create employment opportunities and improve the economic situations of the forest villages. However, it should be carefully considered in the stage of detailed design that the benefits of the implemented programs/projects are not mal-distributed.

Health and hygiene

Increase in use of agrochemicals may occur due to extension of agricultural techniques. Appropriate kinds and amounts of agrochemicals to be used should be carefully considered and villagers should be enlightened in the course of extension. The conversion from grazing to stall feeding may result in increased animal excrements in the villages. Appropriate utilization and management methods shall also be enlightened to the villagers.

Historical sites, cultural heritages and landscape

Historical sites of which their values are not amply investigated spread scattered within the Study Area. Significant impacts are considered not to be likely as projects/programs are to be generally implemented in areas already utilized. However, the existence of such castles and churches should be taken into regard at the stage of detailed planning.

Important flora/fauna species and biodiversity

As programs/projects for livelihood improvement are mostly implemented along existing land use, programs/projects that may change the existing vegetation is mainly of natural resource

rehabilitation and management. However, the impact on flora species are considered minor as of the following reasons: i) re-greening of degraded areas emphasizes natural regeneration; ii) re-greening of severely degraded areas will contribute in reducing bare land and will contribute in the conservation of biodiversity; iii) re-greening will be done at the extent possible with local flora species and; iv) afforestation in degraded forest areas of which the present state is grassland may change the vegetation at some extent but will not have significant effect on the ecosystem considering the large extent of grasslands in the Study Area. Furthermore, under these considerations, habitats of important wild life species are considered not to be largely effected by the programs/projects proposed in the Master Plan.

The programs/projects proposed in the Master Plan, with the exception of cross MC planning, are not implemented in the Protected Areas within the Coruh River catchment. Furthermore, the projects under cross MC planning are for the effective and appropriate conservation, management and utilization of natural resourced of the catchment, including important flora/fauna species and biodiversity. In regard of these understandings, the effects on important flora/fauna species and biodiversity by the implementation of the Master Plan is considered to be small.

Land/soil resources

One of the aims of the programs/projects proposed in the Mater Plan is to prevent soil erosion. Thus the implementation of the proposed programs/projects will prevent land degradation and maintain soil fertility through appropriate management of land resources. However, as extension of agricultural techniques may lead to changes of agrochemical and water usage, appropriate management plans should be carefully considered at the stage of detailed design to prevent soil pollution/degradation.

Hydrology, water quality

The programs/projects proposed in the Master Plan aim at preventing soil erosion, which consequently result in alleviating flood damages and sedimentation. Implementation of the programs/projects is considered to improve the hydrological features of the catchment. However, as extension of agricultural techniques may lead to changes of agrochemical usage, appropriate management plans should be considered at the stage of detailed design to prevent water pollution.

Atmospheric environment

The effects of the proposed programs/projects to atmospheric environment is generally considered negligible. However, as the conversion from grazing to stall feeding may result in increased animal excrements in the villages, appropriate utilization and management methods shall be enlightened to the villagers.

G.6 Necessity of Environmental Impact Assessment

The Turkish Environmental Impact Assessment Regulation points out in its Annexes I and II, various sorts of activities obligated to Environmental Impact Assessment (EIA) and Initial Environmental Examinations (IEE). In regard to the activities pointed out in Annex I of the Regulation, the activities proposed in the Master Plan are not obligated to procedures of EIA. On the other hand, Annex II, which lists activities obligated to IEE includes the following activities.

i) reconstruction of agricultural lands
ii) projects with the aim of utilizing agricultural or non-agricultural lands for intensive agriculture
iii) water management projects for agricultural purposes
iv) projects with the aim of transforming forest areas into areas with other purposes

However, the criteria mentioned above are rather of general statements, and neither specific magnitudes nor kind of the activity are regarded. There is at some extent ambiguousness among what are the actual conditions for a projects to be regarded as the stated projects (e.g. from what point is agricultural practices regarded as "intensive" agriculture). Among this point, officers from the General Directorate of EIA and Planning insisted in the possibility of considering the necessity of procedures on projects of small scale, premised that the components of the plans are consulted.

As the projects proposed in the Mater Plan includes activities such as the introduction of agro-chemicals, and small scale irrigation, some of the items described in Annex II of the Regulation may be applied. However, considering that the proposed projects are relatively of small-scale, and that most of them will have positive effects on the environment on some manner, it is recommended that consultations based on detailed plans are made with the General Directorate of EIA and Planning for final decisions.

H. Geographic Information Systems

CONTENTS

H.1 Remote Sensing

H.1.1 Background

This Study has the objectives to grasp the natural and land use conditions in the Coruh River basin of approximately 2 million ha, which is a poor region of Turkey and the land of which is deteriorated due to deforestation and soil erosion. Also the it has the objectives to select 5 to 6 preferential small basin models based on the analysis of the Coruh River basin, to prepare detailed project plans for these small basins models, and to create land-use vegetation maps as basic materials through the satellite image analysis in order to formulate the participatory watershed rehabilitation program. In addition, the land use and vegetation maps to be created through satellite image analysis, the natural conditions, the forest and village inventory survey, the socioeconomic overview, the agricultural/social infrastructure, the residents' organizations and other study results shall be brought into the centralized information management, and the GIS database based on the information shall be developed as a development tool for analyzing the reciprocal relations of these conditions.

H.1.2 Objectives of the Study

The Landsat image processing is quite useful to know accurately the condition of land cover or vegetation of land in the study area occurred in the present.

This main objective of this study is to investigate the present condition of land coverage and the damages of forest and vegetations area by analyzing the Landsat image data, supported by other related data, which could be used for the watershed rehabilitation plan of Coruh river basin and create the land use and vegetation map of the scales 1:100,000.

H.1.3 Study Area

By the results of discussions with the counterpart agency and the results of field identifications, the study area changed into an area of approximately 2 million ha from that of approximately 1.17 million ha over the Coruh River basin in Turkey.

H.1.4 Scope of work

The scope of work consists of the following conditions:

- Preparing a Landsat digital image from less than 10 % of cloud coverage
- Collecting field sample data and other supported data in purpose of interpretation
- Geometric correction of ETM data and map projection
- Field reconnaissance (Ground Truth)
- Creation of digital mosaic images of 5 scenes of ETM data

- Digitizing and overlay of existing topographic maps (of 1:100,000 and 1:50,000 scale)
- Calculation of VI (vegetation index) values from ETM data and classification of coverage categories based on CORINE land cover classes
- Category classification by land use and vegetation classification items
- Overlay of existing digital map information
- Digital interpretation (land use and vegetation classification) of the above satellite image
- Creation and output of land-use vegetation map based on the field reconnaissance and the results of various field identifications
- Estimating the land erosion and forest area in the study area

In order to attain the above-mentioned item, it analyzed based on the following flow charts:

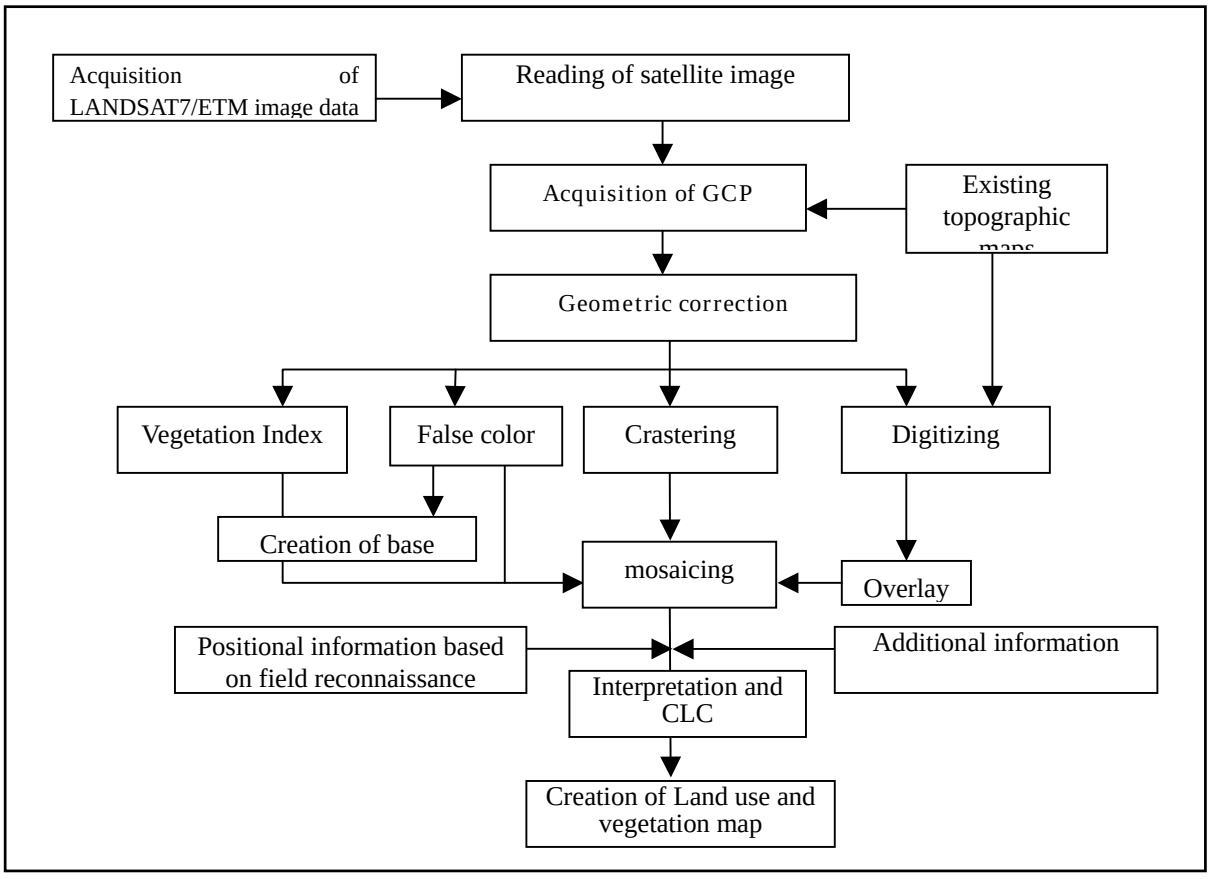


Figure H.1-1 The method of analyzing satellite images (ETM data)

H.1.5 About LANDSAT 7 ETM

LANDSAT-7 satellite was launched on April 15 of 1999 and provided with the enhanced Thematic Mapper Plus (ETM+) sensors which were added a panchromatic band and two gain ranges to improved resolution in the thermal band.

The ETM+ is a fixed position, nadir viewing, "whisk-broom", multi-spectral scanning radiometer and is capable of providing high-resolution imaging information of the earth's surface. Radiations in both the visible and infrared regions of the spectrum are detected by the instrument in eight distinct bands. The ETM+ is an improved version of the Landsat 4/5 Thematic Mapper (TM) payloads, but still provides data continuity with all prior Landsat missions. Improvements in the instrument include increased spatial resolution of the thermal IR band (Band 6), improvement of the radiometric calibration equipment, and the addition of a panchromatic band (Band 8). Below is a simplified diagram of the ETM+.

Band	**wavelength band**	**Resolution**
1	0.45-0.52 m	30m
2	0.52-0.60 m	30m
3	0.63-0.69 m	30m
4	0.76-0.90 m	30m
5	1.55-1.75 m	30m
6	10.4-12.5 m	60m
7	2.08-2.35 m	30m
8	0.50-0.90 m	15m

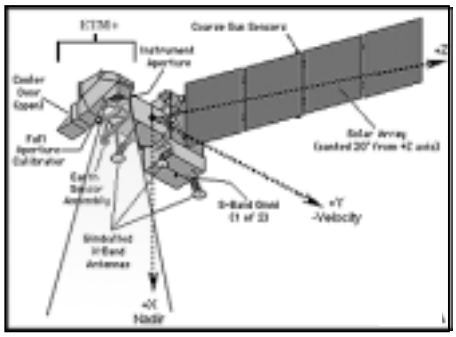


Figure H.1-2 Spectral Band widths of LANDSAT ETM+

H.1.6 Satellite image data

The Landsat coverage map of a total Coruh river basin shows in below. As pictured on the image, study area is covered by 5 scenes. Landsat images for each of the 5 scenes with no or little cloud cover and which were collected from 2000, were preliminarily selected based on the information provided by the data venders.

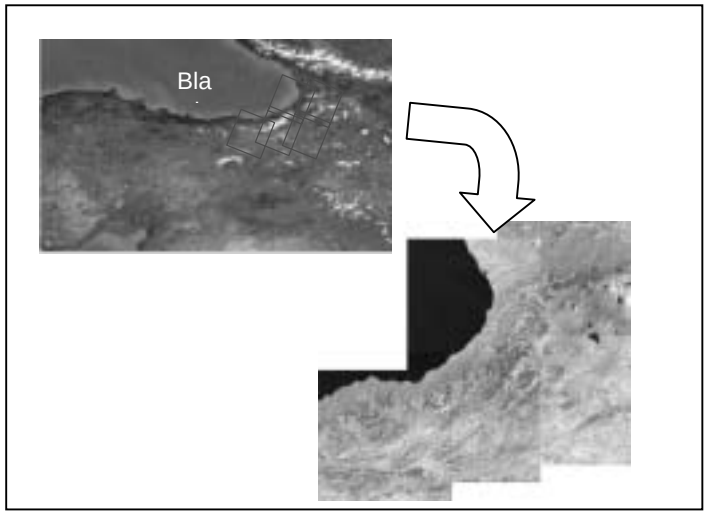


Figure H.1-3 Coverage map of Landsat7/ETM

H.1.7 Observation date of satellite image

The study area is located in high land zone, the considerable amount of snow coverage is observed in winter season on the steep Pontos mountain range along the valley. Moreover, seasonal change in vegetation was thought to be very drastic. Generally satellite images collected in autumn and winter are not suitable for interpretation of vegetation cover, because color on image which are collected after leaf fall or snowfall often make it difficult to classify deciduous forest from herbaceous vegetation and bare ground. Therefore, when satellite images were selected in this study, the satellite images taken at the time in July to September when analysis of the maximum flow and land covering vegetation, etc. tend to read is acquired as follows.

Table H.1-1 Photography position and data acquisition

Orbit (Path/Row)	Acquisition data
Path 171 – Row 31;	2000/09/05
Path 171 – Row 32;	2000/09/05
Path 172 – Row 31;	2000/07/10
Path 172 – Row 32;	2000/09/12
Path 173 – Row 32;	2000/09/19
Specification and Media	Level Systematic, Geo-Tiff format, Full Frame, CD ROM

H.1.8 Data collection

This step of work covers data collecting, compilation and quality control of both primary data and secondary data and also other supporting data.
Primary data in this study is the Landsat satellite image which is consists of above 5 scenes. The difference of acquisition time is minimum should be summer season.
Secondary data is any supporting data which could assist the interpreter in image interpretation. Data could be a topographic map, thematic maps and the related numeric and analogue data.

The Secondary data needed are:

- Topographic map (1/100,000 scale) of the related the study area, needed as georeference.
- Related thematic maps:
  Land use map (1/25,000)
  Forest map (1/25,000 and 1/100,000 scaled analogue data)
  Soil map (1/25,000)
  Land classification map (1/25,000)
  Slope map (1/25,000)

- The supporting data are:
  Administrative boundary data (vector data)
  Infrastructure location data (vector data)
  Population data
  Erosion control data
  Census data
  Field survey data

H.1.9 Referenced specifications

Georeferencing refers to the process of assigning map coordinates to the image data. The images were not geocoded to the proper map coordinate system. Rectification involves georeferencing since all map projection system are associated with map coordinates. By using Image processing software, the georeference process were done for all images separately based on UTM Projection System with the parameters of International 1909 spheroid and European 1950 datum.

- Reference ellipsoid: International 1909
- Reference datum: European 1950
- Map projection: UTM
- Classification index: CORINE land cover classes (CLC)
  The classification indexes were determined through discussions based on CORINE land use classes used in EU.

The Government of Turkey has already established and modified the 1:100,000 scaled topographic maps. This study utilized a total of 17 sheets of 1:100,000 scaled topographic maps covering the Coruh river basin as the base map for simple geometric correction and resampling.

The map sheets name and Number of the topographic maps and index map are as follows:

Table H.1-2 Sheet number of topographic map(1:100,000)

Name	Scale	No.
ARTVIN	1:100,000	F-46
ARTVIN	1:100,000	F-47
ARDAHAN	1:100,000	F-48
TRABZON	1:100,000	G-44
TORTUM	1:100,000	G-45
TORTUM	1:100,000	G-46
TORTUM	1:100,000	G-47
KARS	1:100,000	G-48
KARS	1:100,000	G-49
TRABZON	1:100,000	H-43
TRABZON	1:100,000	H-44
TORTUM	1:100,000	H-45
TORTUM	1:100,000	H-46
TORTUM	1:100,000	H-47
KARS	1:100,000	H-48
KARS	1:100,000	H-49
ERZINCAN	1:100,000	I-43

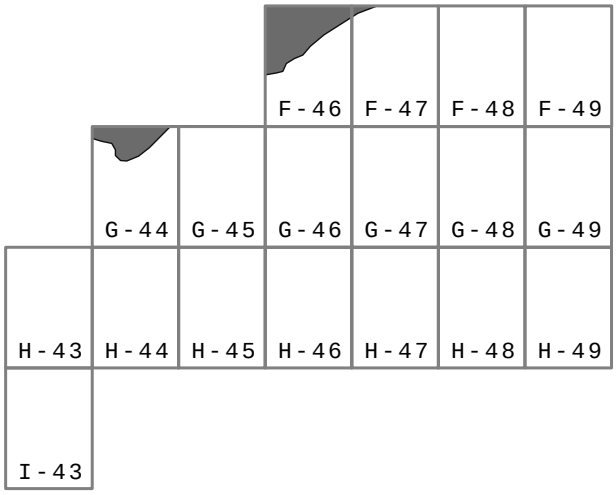


Figure H.1-4 Index map of the study area

H.1.10 Remote Sensing processing

To determine CLC for Coruh Basin based on remote sensing and geographic information system, the following image processing techniques and steps were as follows:

(1) Geometric correction

Geometric correction carried out to eliminate the distortion effect to the pixel position caused

by the earth curvature and sensor movement, so the pixel position could be integrated with map coordinate at the scale of 1:100,000. For the rectification process of GCP, the projection system was used UTM with international 1909 ellipsoid, with a procedure as follows:

- Creating an algorithm for the satellite image data and referenced data
- Selection of GCP
- Coordinate transformation
- Resampling

(2) Resolution merge:

Resolution merge is the process of gaining good quality resultant images for interpretation. Since Landsat7/ETM images have both panchromatic and multi spectral bands, resolution merge process was applied for each scene by using panchromatic and multi spectral bands of 7, 4 and 3.

(3) Mosaic of Images

To get the whole Coruh basin images, the resultant of 5 different resolution merge images mosaiced together. After mosaicing of images, the study area of Coruh river Basin image was obtained

(4) Data analysis

The data are processed and analyzed by computer to make satellite images. Data analysis means to process the observation data according to purpose for instantaneous understanding. Color composite is one of the image emphasizing methods. Color composite is to select bands from the observation data composed of several bands, and to allot the band to the three primary colors, R, G and B for simply realizing the visible characteristics of the objects. As typical data analysis work, the following three types of color composition.

(a) Natural color

Natural color is one of the methods of color composite, which assigned Near-infrared band data, sensitive to vegetation, to green, red band data to red and green band to blue. In the resultant image, it can be seen high vegetation places as green. The area with many plants like forests and grass fields is colored in green, which is our image of plant. The area with no plant and residential area are colored in raspberry. This color image is shown in Figure 1-5.

(b) False color

False color analysis simulates the colors of a color-infrared image. In this method, it is assigned Near-infrared band data, sensitive to vegetation, to red, red band data to green and green band data to blue. In the resultant image, high vegetation places look red. Hence, it can

be distinguish the vegetation on the map. The area with many plants like forests and grass fields is colored in red. The darker red depicts thicker plants, and the area with no plant is colored in gray. False color image is shown in Figure 1-6.

(c) True color

In this method, it can be assigned blue band data to blue, red band data to red and green band to green. In the resultant image, it can be seen nearly natural image and also artificially colored similarly to what human eyes see. True color image is shown in Figure1-7.

(5) Determination of Class Boundaries:

According to reflectance value of different features in the images and by helping the secondary data such as 1:100 000 scaled topographic maps and the supporting data such as Administrative boundary data, CLC Classes of Coruh basin were determined and were ISODATA method.

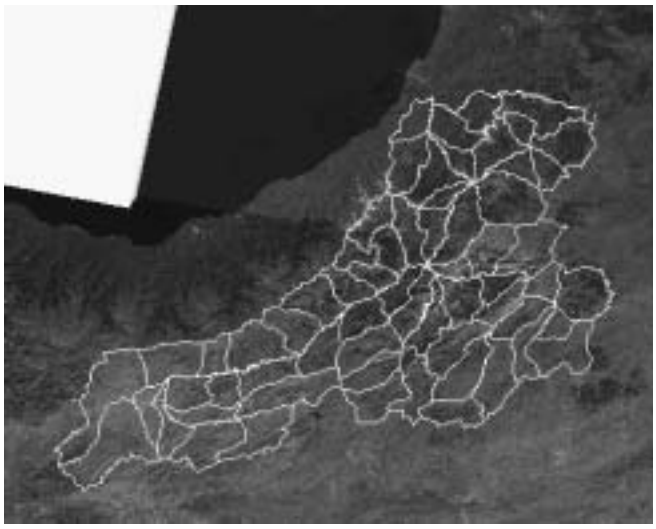


Figure H.1-5 63 micro-catchment's boundaries of Coruh river basin

(6) Ground truth and Validation of Classes Results

The field verification study has been conducted in this study area to have an idea about land coverage classes based on the 1:100,000 scale base map printed out. During this study, information was collected by using GPS as the ground control points. Considered with the minimum precision, it is necessary to require to topographic map at 1:100,000 is within 50m and the precision of GPS is about 10m. Therefore, it was guaranteed this precisions for 100,000 scale work.

The Ground control points have been collected and photos taken to make a better land cover mapping. The ground truth survey made by GPS was acquired approximately 30 points and over along the Coruh river basin between the provinces Artvin, Erzurum and Bayburt district.

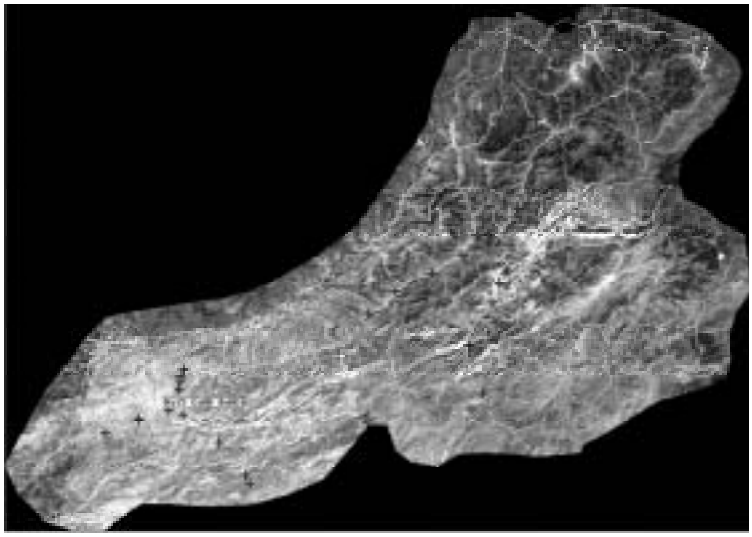


Figure H.1-6 Location of GCPs

H.1.11 Image classification process

(1) Un-supervised Classification

For Landsat TM images, generally, it is to use the Band 4 image to determine vegetation density and the Band 3 to comprehend the leave covering, because these bands presented an inverse relationship with the chlorophyll component. As well as, it is to utilize the Band 5 and Band 7 as the bands with information about dead biomass and for the bare soils.

For the exposed previously, from all bands compositions executed, the corresponding to the false color compositions of RGB: 453 was selected for the classification process for land coverage. On the other hand, by making a combination of these bands, it was carried out samplings to separate the covering of this Study area. The classification of ISODATA method was adopted in this process and it was determined the best result of the classification, since it appeared more compact.

(2) Image interpretation

The Landsat image interpretation was carried out along with the established CLC category. The interpretation was carried out by using color, texture, shape as the keys with the assistance of ground truth and the existing data. The existing data and maps on land conditions and vegetation of the study area were collected. And using these data and information, environmental characteristics of the study area such as vegetation distribution, topography, soil, water system, infrastructure etc. were analyzed. Then the land use classification was determined referring to these basic data. In addition to supervised and un-supervised, the computer-aided image interpretation for the training data. The land use classes adopted for this study, based on CLC consist of three levels as follows.

Table H.1-3 Categories of CLC

No.	LEVEL I	LEVEL II	LEVEL III
1	Artificail surfaces	- Urban fabric	
		- Industrial, Commercial and transport units	- Road networks and associated land - Airports
		- Mine, dump and construction sites	
2	Agricultural areas	- Arable land	- Non-irrigated arable land - Permanently irrigated land
		- Permanent crops	- Fruit trees and Berry plantation
		- Pastures	
		- Heterogeneous agricultural areas	
3	Forests and Semi-natural areas	- Forest	
		- Shrub and/or herbaceous vegetation association	- Natural grassland - Moors and heatland - Transitional woodland shrub
		- Open spaces with little or no vegetation	- Glaciers and perpetual snow
4	Water bodies	Inland waters	- Water courses - Water bodies

However, since classifying in detail in this Study is impossible in time, only LEVEL-1 would be classified as a result of discussion with the counterparts. And so, about Forest and Agricultural areas, it analyzed by six classifications by dividing into two, respectively. The classification item is as follows.

(a) Forest

Area occupied by forests and woodlands with a vegetation pattern composed of native or exotic coniferous (such as PINUS) and/or deciduous trees (such as POPULAS) and which can be used for the production of timber or other forest products. The forest trees are under normal climatic conditions higher than 5 m with a canopy closure of 30 % at least.

(b) Transitional woodland and shrub

Area occupied by bushy or herbaceous vegetation with scattered trees.

(c) Rangeland

All surface occupied by predominantly graminoid grass cover of floral composition, not under a rotation system. Mainly used for grazing, but the fodder may be harvested mechanically.

(d) Arable land

Lands occupied by permanent crops for fruit production and also under a rotation system used for annually harvested plants and fallow lands, which are permanently or not irrigated.

(e) Water bodies

Lakes and ponds of natural origin containing fresh (i.e non-saline) water and running waters

made of all rivers and streams. The artificial fresh water bodies include reservoirs and canals.

(f) Bare land

It corresponds to the non vegetation areas where is not classified. This type is characterized because it presents regularly erosive processes such as gully erosion.

Figure H.1-7 Field Photo (Forest)

Figure H.1-8 Field Photo (Transitional woodland/shrub)

Figure H.1-9 Field Photo (Rangeland)

Figure H.1-10 Field Photo (Arable land)

Figure H.1-11 Field Photo (Bare land)

H.1.12 Creating of land use and vegetation map

The land use and vegetation map completed by Landsat image processing as the ISODATA method is shown in below. 6 categories are classified as explained the previous section.

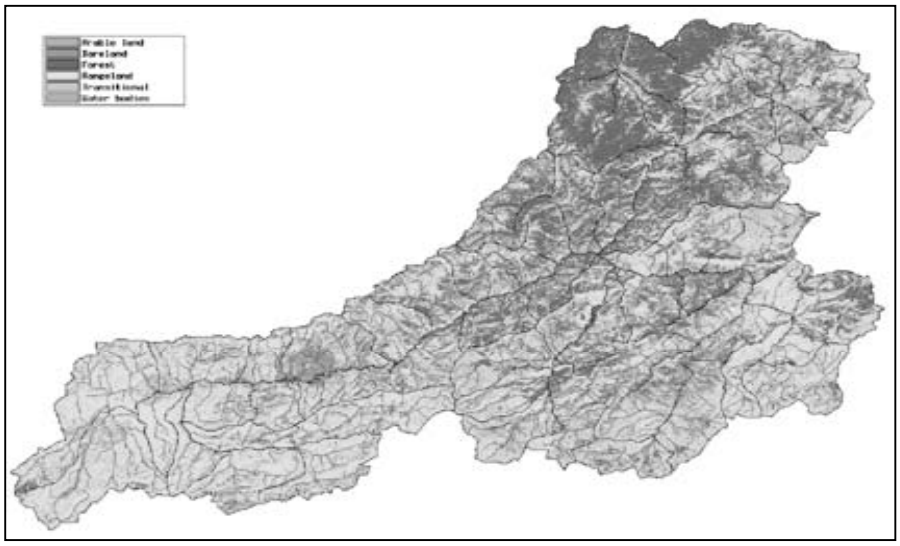


Figure H.1-12 Land use and vegetation of the study area

According to the map, the northeastern zone of study area along the Coruh river is occupied by forests and forest vegetation is confined to mountainous terrain of northeast parts.
The remainder such as grass land controlled and agricultural land extends from low and flat terrain along riverside to lower slope of mountains. The lower half-plane of map consists of comparatively low and flat terrain, and western zone is occupied by agriculture area. The grass land of mainly consists non forest vegetation exists on drier southern slopes while forest grows on less dry northern slope, in border zones between forest and grass land in the study area. In consequence, it turns out that the mountain terrain is the main territory for forest stand. The low and flat terrain is important for farming.

The land use and vegetation map is divided into 18 pieces according to the coverage Landsat scenes and the shape and size of this study area as follow.

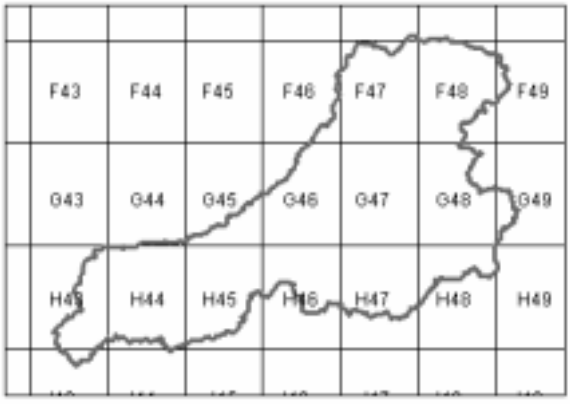


Figure H.1-13 Index map

H.1.13 Area measurement

Based on Land use and vegetation map which the above created, the total area for every 63 sub-micro-catchments which classified Coruh river basin is performed, and the present condition of vegetation coverage for every sub-micro-catchment has been grasped. Area and component ratio of land use feature are shown in below.

	Forest		Transitional woodland shrub		Water bodies		Arable land		Rangeland		Bareland		Total
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)
BT	78,192	34.2	45,565	19.9	2,851	1.2	18,338	8.0	83,516	36.5	69	0.0	228,531
LC	127,035	71.3	18,757	10.5	1,716	1.0	3,759	2.1	26,739	15.0	98	0.1	178,103
MC	99,244	38.3	22,188	8.6	441	0.2	51,800	20.0	67,090	25.9	18,628	7.2	259,391
OL	70,427	14.0	69,985	13.9	3,299	0.7	71,090	14.2	253,207	50.4	34,276	6.8	502,284
TR	28,829	14.1	27,328	13.4	636	0.3	36,000	17.7	92,387	45.3	18,675	9.2	203,855
UC	36,500	5.6	52,695	8.1	0	0.0	99,853	15.3	412,282	63.2	50,912	7.8	652,243
Total	440,227	21.7	236,517	11.7	8,944	0.4	280,840	13.9	935,220	46.2	122,659	6.1	2,024,407

H.2 Geographic Information System (GIS)

H.2.1 Preparation of Introduction of GIS database

GIS is a computer system capable of assembling, storing, manipulating and displaying geographically referenced information. Geographic information can be consisted of three type spatial data: 1) geographic information indicating positions of objects, 2) attribute information including textual data, numerical values and 3) digital image data. Since GIS makes it possible to link graphic and attribute information, one can find an attribute of an object on a map, such as a road, building, and so on, or display objects having a specific attribute on a screen. GIS may be considered an analytical tool, because it can simultaneously handle geographic data and attribute data by computer, and also it has benefits for information management

In this Study, It was introduced the GIS for supporting to create database of survey results for the purpose of unitary management for geographic spatial data related to Coruh River basin.

However, it is difficult to create data newly. Therefore, it is necessary to collect the existing data for the increase in efficiency of the Study.

(1) GIS and acquisition of a database

The following situations were found when surveyed for database collection. There have been some dispersed situations about the geographic spatial data database regarding to the watershed management in Turkey at the present.

Therefore, the common problem that it is difficult for each other to share the data between ministries and departments has been arisen in each organization. Consequently, in each organization, GIS database which was produced proprietary and sold exists. However, an organization will tackle the creation of geographic spatial data from it's own point of view on restrictions of its budget. As the results of collecting survey, many analogue data was seen.

In this Study, to turn to practical use of data was not easy in fact and it took much a labor and time, although utilizing for the maximum the GIS database which can be used in order to create a database efficiently was expected.

The list of databases acquired and purchased by JICA Study team is as follows.

Table H.2-1 List of the acquisition database

Available GIS database	Type	Resource
Topographic map of scale 1:100,000	Analogue	HGK of Military
Topographic map of scale 1:25,000	Analogue	HGK of Military
10 m elevation contour data	Digital	HGK of Military
Soil database of scale 1:25,000	Digital	GDRS
Infrastructure database of 1:25,000	Digital	GDRS
Boundary database of 1:25,000	Digital	GDRS
Geology map of1: 500,000	Analogue	MTA
Forest map	Analogue	OGM
Forest manage Plan of 1:25,000	Analogue	OGM

(2) Preparation of GIS database

In the Phase 1 of this Study, it was creation of GIS database about land use and vegetation map of 1:100,000 scale. However, it changed with the database creation of 1:25,000 scaled for selected 6MCs as a result of discussion between C/P of ministry of forest and JICA Study team in the phase 2.

Therefore, detailed database creation of 6MCs extracted from the database of the whole Coruh river basin will be performed.

In executing creation and analysis for database of 1:25,000 scale, since unreasonableness arose in accuracy, the boundary of 6MCs was corrected on 1:100,000 and MC community

based on the topographic map. The numerical value of land use and vegetation which changed with correction is as follows:

Table H.2-2 The Results of Modified Land Use of 6 MCs (Based on 1/25,000 Topographic Map)

MC No.	Area(ha)	Forest		Transitional woodland shrub		Rangeland		Arable land		Bareland		Water bodies	
BT-04	19,207.03	4,955.55	25.8%	6,900.52	35.9%	5,818.73	30.3%	1,427.17	7.4%	0.00	0.0%	104.06	0.5%
MC-03	22,644.48	9,874.59	43.6%	687.82	3.0%	4,772.79	21.1%	4,162.35	18.4%	3,145.93	13.9%	0.00	0.0%
OL-04	38,604.31	5,983.20	15.5%	3,063.70	7.9%	18,483.71	47.9%	8,002.81	20.7%	3,069.89	8.0%	0.00	0.0%
TR-06	31,240.70	8,626.74	27.6%	945.41	3.0%	11,466.25	36.7%	5,986.44	19.2%	4,214.86	13.5%	0.00	0.0%
UC-03	21,758.57	1,238.10	5.7%	1,349.78	6.2%	16,223.77	74.6%	2,429.87	11.2%	516.05	2.4%	0.00	0.0%
UC-14	31,935.26	5,157.77	16.2%	2,650.54	8.3%	14,002.23	43.9%	6,838.99	21.4%	3,284.73	10.3%	0.00	0.0%

(3) GIS Database contents

The GIS database consists of basic base map of a topographic map, thematic map, evaluation map, demographic statistics, and attribute data obtained by villager's participation type workshop and socio economy survey.

The data item which JICA Study team created is as follows.

Table H.2-3 List of GIS database

Item of GIS database	Content
(1) Base map	Topographic Raster data of 1:100,000 scale and 1:25,000scale for compilation.
(2) Satellite image data	Color composite image Land coverage map from Satellite image
(3) Topographic map	Vector data of 10m contour, River stream, geological map and land capability.
(4) Terrain model data	DEM, Aspect, Slope and Edge enhancement
(5) Administrative boundary data	Administrative boundary, point data for various type of settlements, census data
(6) Forest villages inventory data	Results of Socio economic survey and workshop of 6MCs
(7) Grid data of 6MCs	Evaluation maps
(8) Planning map	Implementation Plan location
(9) Environment reserve map	Protection area and conservation area for ecological and developmental protection
(10) Forest and Forest management plan map	Forest area managed by AGM

H.2.2 GIS Database contents

The contents of the database created by this Study are explained below.

(1) Base map (1:100,000 and 1:25,000-scale Topographic Maps)

GIS database were prepared from the topographic maps of 1:100,000 scale and 1:25,000 scale by using a digitizer. The GIS database JICA Study team created consists of MC's boundaries (polygon), rivers (line), roads (line), District, forest villages and normal villages (point), contours (line), and elevation points (point).

The base map created based on these data is as follows:

- Base map of 1:100,000 scale and 1:25,000 scale

(2) Satellite image data

JICA Study team created several thematic maps of satellite image data to monitor and to analyze the forest vegetation and geological condition through Field reconnaissance for 6MCs in the phase 2 and the Ground truth survey carried out in the phase 1.

Landsat/TM Image data are able to be handled in the same way as the GIS data. Image data are called Raster GIS data. In this Study, land use and vegetation data, forest coverage data and false color images were prepared by remote sensing processing and shown in Figure 2-1_4.

The thematic maps created based on satellite image are as follows:

- Color composite image of False color Image
- Land use and vegetation map
- Enhanced Image of interpretation for geological structure

(3) Topographic map

In phase2, it modified GIS database creation of 1:25,000 scale as it was mentioned above. Therefore, the topographic maps of 6MCs were created and are shown in Figure 2-5.

JICA Study team created to GIS database based on the existing data and the newly results. And the geology map was created from the existing analogue geology map of 1:500,000scale of MTA. About other soil and the land classification maps utilized the digital data of GDRS. The Contour data was used elevation data which acquired from HGK of military and compiled the main contour line (100m) on this data. Road data was created by digitizing from the base map of 1:25,000.

The following maps were created using above data and are shown in Figure2-6_10.

- Topographic map of 1:25,000 scale for 6MCs
- River Drainage map of 1:100,000 scale
- Boundary maps of MCs
- Geology map of 1:500,000 scale
- Land capability map

- Soil map

(4) Terrain model data

DEM was created from 10 m interval vector contour data from HGK. Surface model analysis was performed for created DEM, and As the results of analysis, the slope, the aspect, and the shading were calculated, These thematic maps are shown in Figure 2-11_14.

The thematic maps created based on DEM are as follows:

- Slope map
- Slope erosion map
- Bird-eyes view map
- 3D map of 6MCs

(5) Administrative boundary map

The administrative boundary, the district points, the normal villages and the forest villages (the inside forest villages and the nearly forest villages) which acquired from GDRS, were created as GIS database.

About creation of the basin boundary of MC level, it were digitized and compiled to GIS data from the delineated map on topographic map interpreted by JICA study team based on this database and the river basin map which it was mentioned (3), this thematic map is shown in Figure 2-15.

The following maps were created using above data.

- Settlement map for Coruh river basin

(6) Forest villages inventory data

Forest village's inventory is database about the protect area of watershed management which villegers demand and which was proposed by JICA Study team as feasible area, as a result of workshop which JICA Study team held. Furthermore, the results of Socio-economic survey carried out in the forest villages of 6MCs were related with point data as attribute data.

The following maps were created using above data.

- Settlement map for Coruh river basin

(7) Grid data of 6MCs

In order to evaluate potential for the re-vegetation development, it is essential to comprehend adequately the bio-physical condition of each MC's. The information on such the bio-physical conditions is mainly related to terrain and forest coverage condition. About terrain, it is necessary to take evaluation of the geographical feature (altitude, slope and

aspect). These evaluation maps are shown in Figure 2-16_22.

- Geology map of 6MCs
- Land capability map of 6MCs
- Soil map of 6MCs
- Soil erosion map of 6MCs
- Land use and vegetation maps of 6MCs
- Slope classification map of 6MCs
- Re-vegetation potential map of 6MCs

(8) Planning map

The result of the inventory stated in (6) was examined carefully and produced database for the implementation area considered by JICA Study team. As the results of the bio physical feature's factor and evaluation, this database is considered adjustment with forest management plan described further below, utilized GIS database efficiently and selected the planning area and is shown in Figure 2-23.

- Planning map of 6MCs

(9) Environment conservation map and Forest management plan map

Environmental conservation map was compiled to thematic map for environmental management to show the preservation area and conservation area of forest, vegetation, ecology and hunting.

This data was created by using the analogue map of the environmental preservation collected, or the drawing figure by the MPG official.

It was digitized and compiled to GIS data from the delineated map on topographic map interpreted by MPG staff based on Milli Parklar ve Av Yaban Hayati Genel Mudurlugu, 2001.

The forest management plan is the so-called forest type map, and is positioned as foundations map of forestry management of national forests (Figure 2-24). However, this data is only analogue, and also is considering as mixture between what it was created decade years ago and what is not updated while it had been created 20 years ago. Therefore, although mosaic of each map was very difficult and there was a problem in accuracy, it was created database because of indispensable forest data. About the shortage of this data, it was assigned blank data.

H.2.3 GIS application for Forest sector

Generally, an example of GIS application in the forestry sector is forest planning information management system in which forest inventories are added to a forest planning map as attributive information. This system enables users to comprehend existing forest conditions visually and systematically, to set up various plans (forest management plans and

implementation plans), and to calculate forest area and wood supply capabilities. By using the GIS, it is possible to adopt other evaluation factors such as geology and topography other than forestry and carry out the evaluation of mountain disaster prevention, environmental conservation, eco-tourism, and so on.

In this Study, evaluation of selection of potential area for afforestation was carried out by applying GIS through comprehending forestry potentiality in each MCs and evaluating various classifications by using results of bio-physical analyzing and forest management plan data. Furthermore, the results of the implemented workshop for forest villages were also input to support local inhabitants.

Additionally, it can manage now unitary by using the GIS about various collecting maps and the analysis results which have so far been dealt with scatteringly. If GIS operating technology transferred, it will be possible not only to implement forestry management, evaluation and planning in field offices whenever need arises, but also to apply all the process of evaluation methods and forest management planning adopted in this Study to other regions.

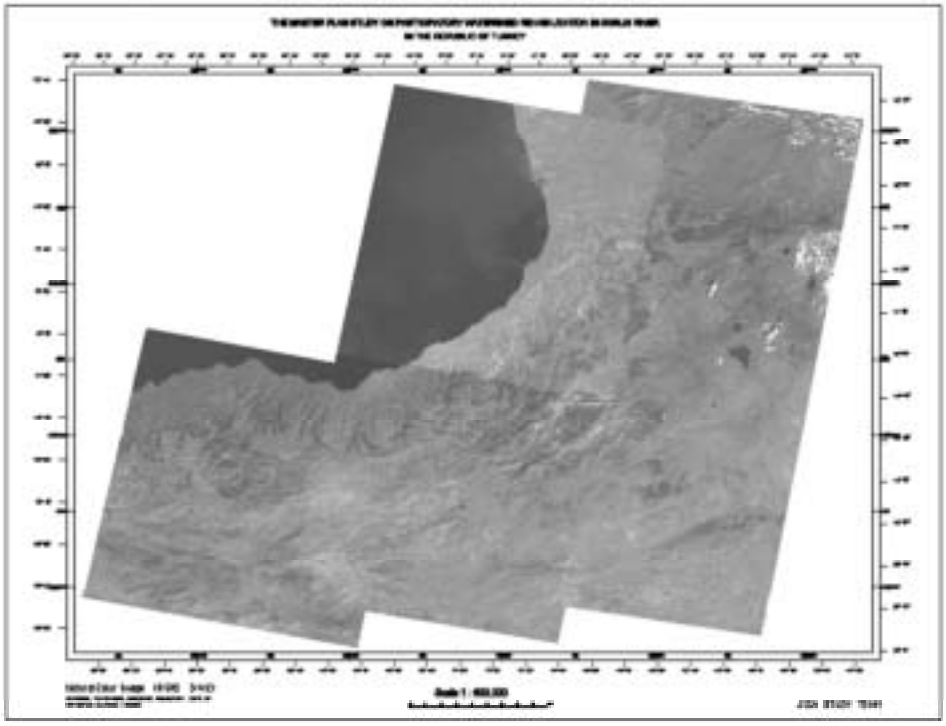


Figure H.2-1 Natural Color Composite Image

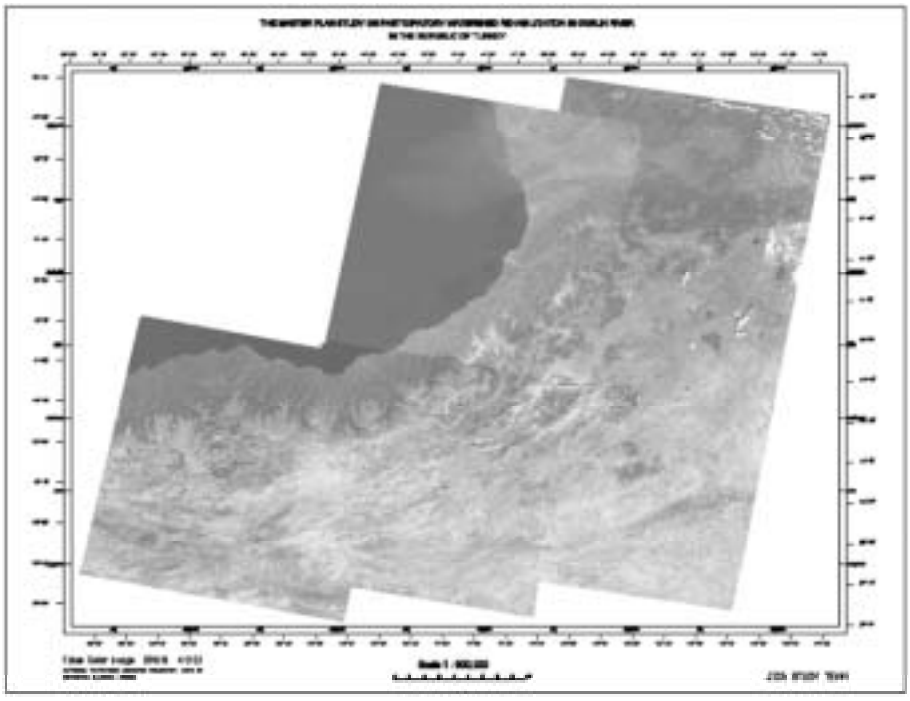


Figure H.2-2 False Color Composite Image

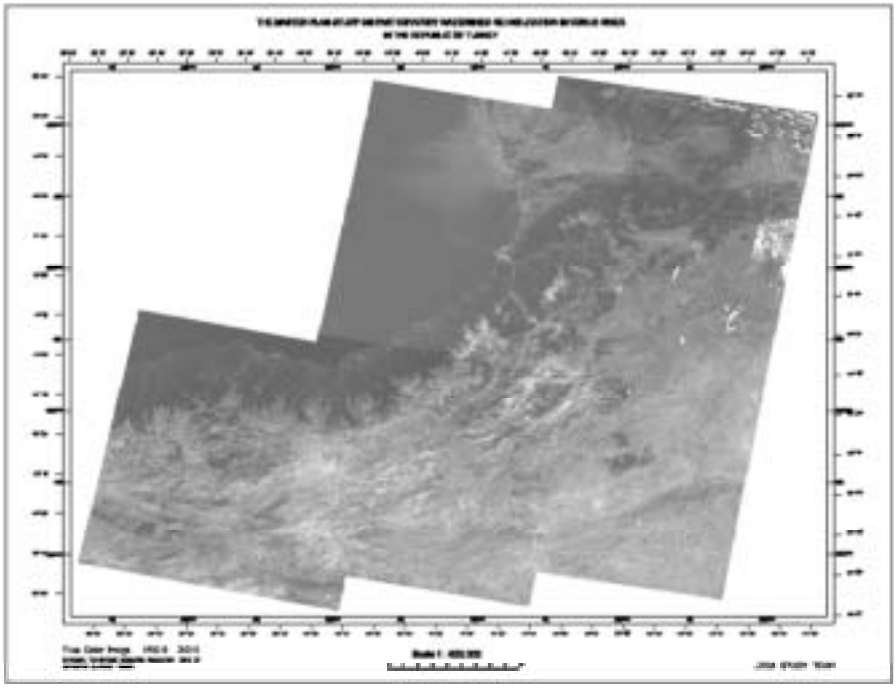


Figure H.2-3 True Color Composite Image

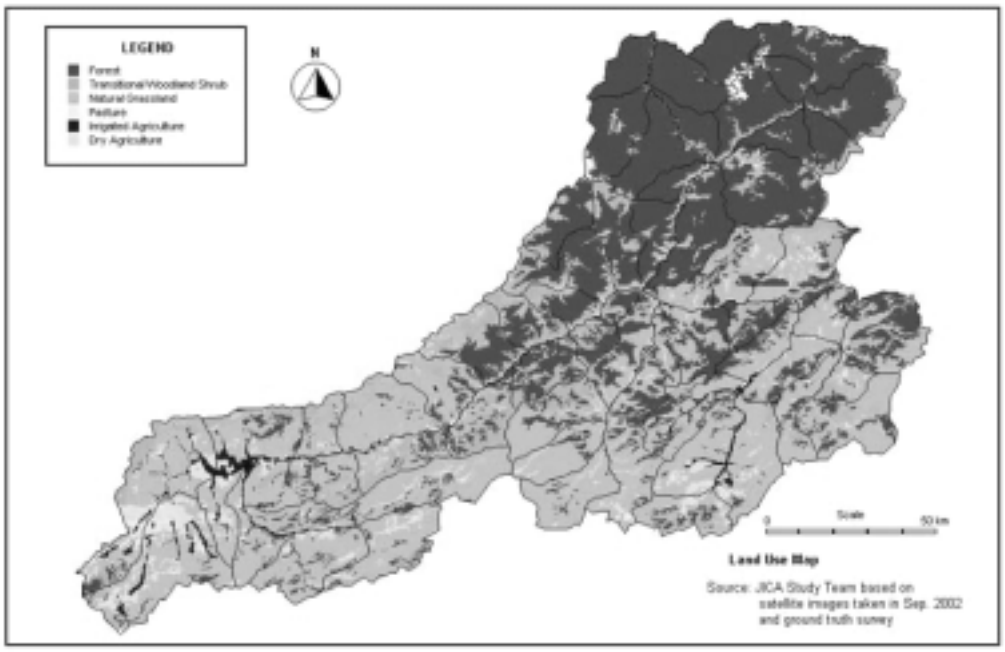


Figure H.2-4 Land Use and vegetation Map

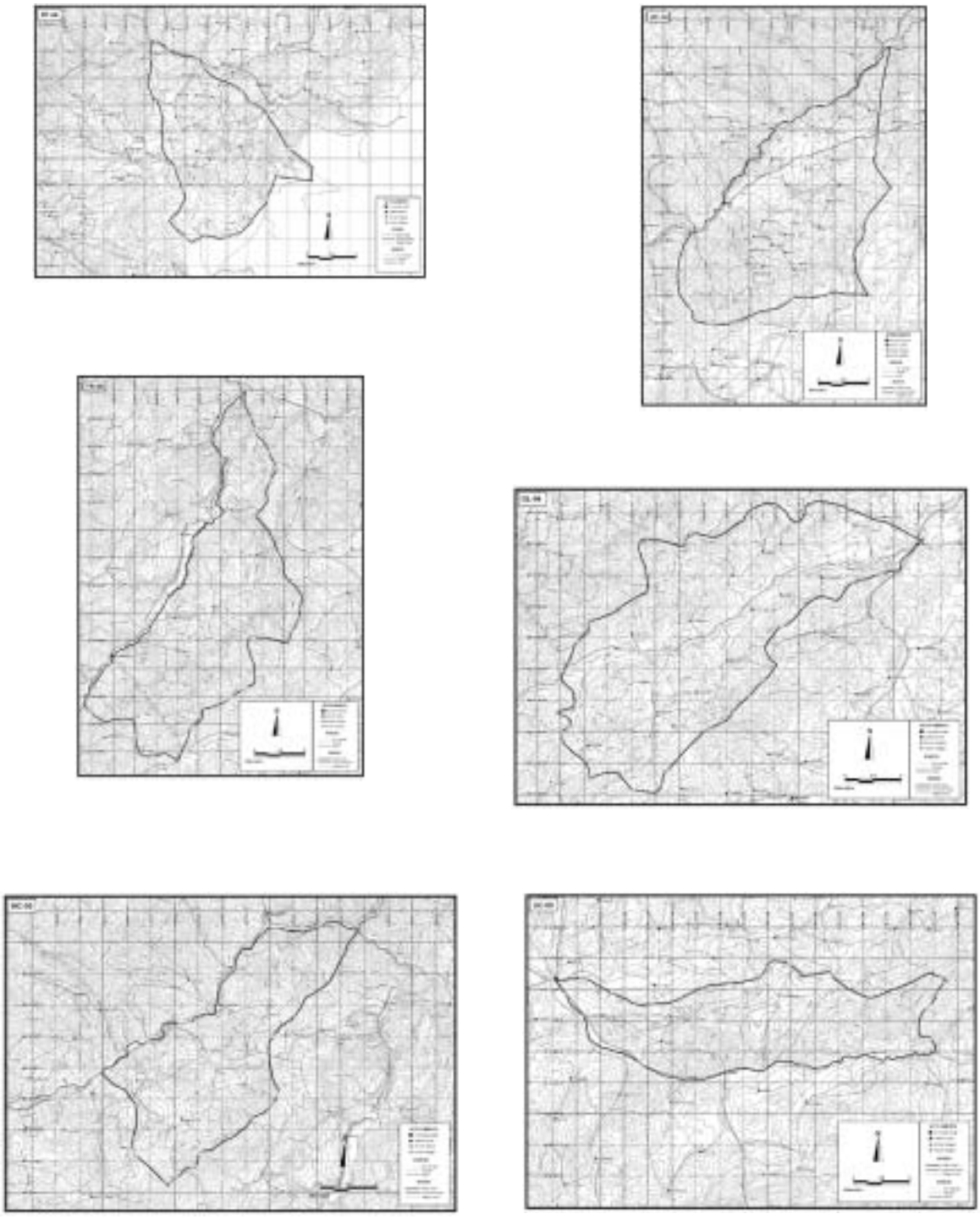


Figure H.2-5 Topographic maps(1:25,000) of 6MCs

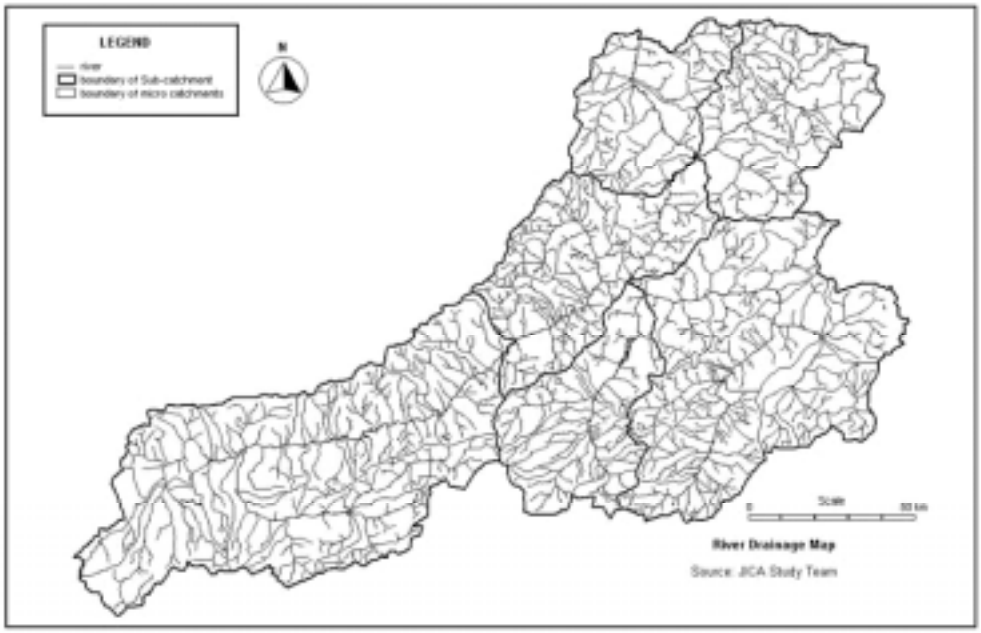


Figure H.2-6 River Drainage Map

Figure H.2-7 Boundary Of MCs Map

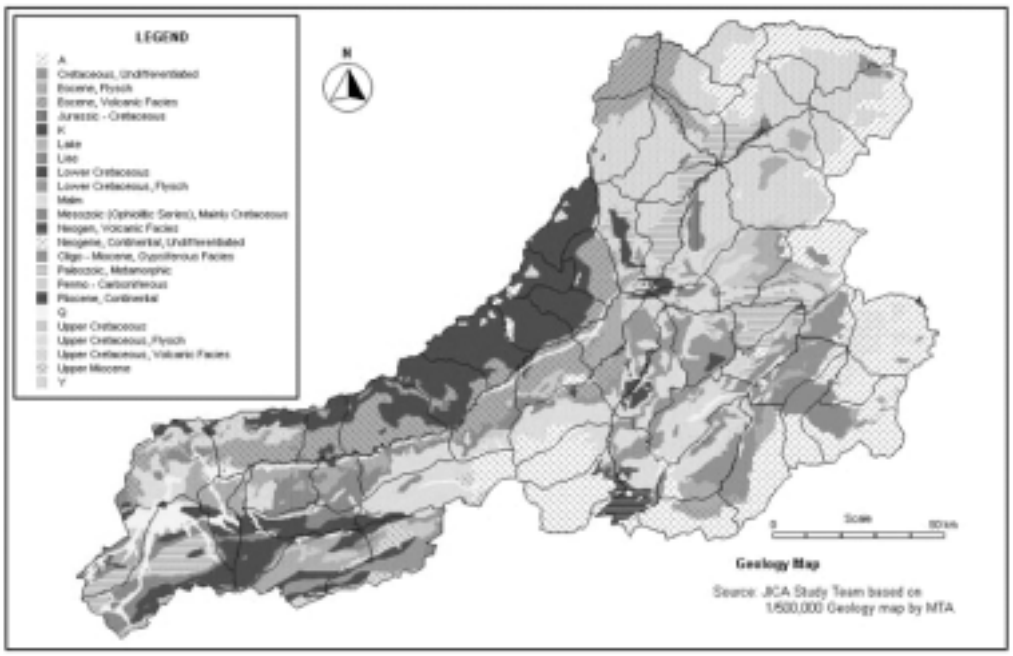


Figure H.2-8 Geology Map

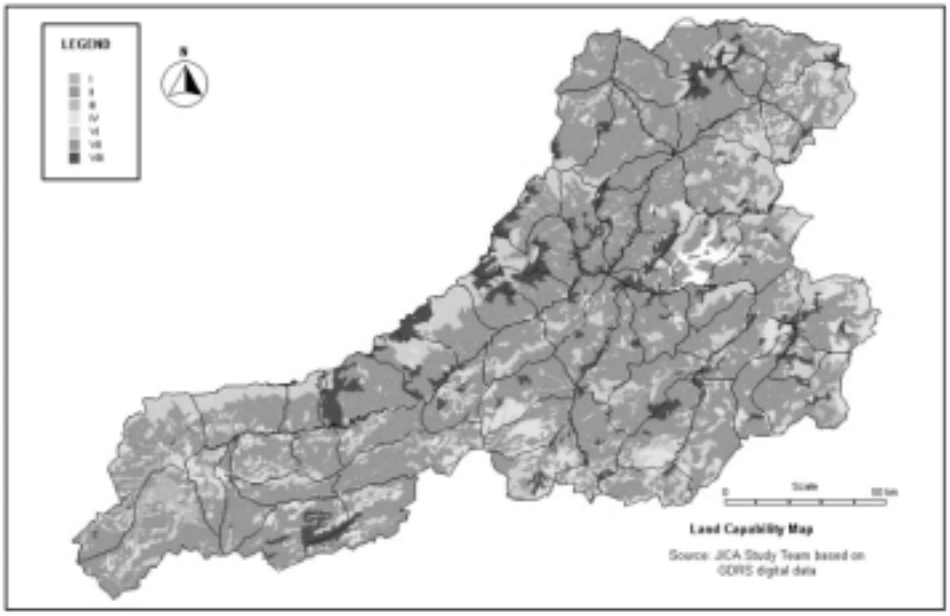


Figure H.2-9 Land Capability Map

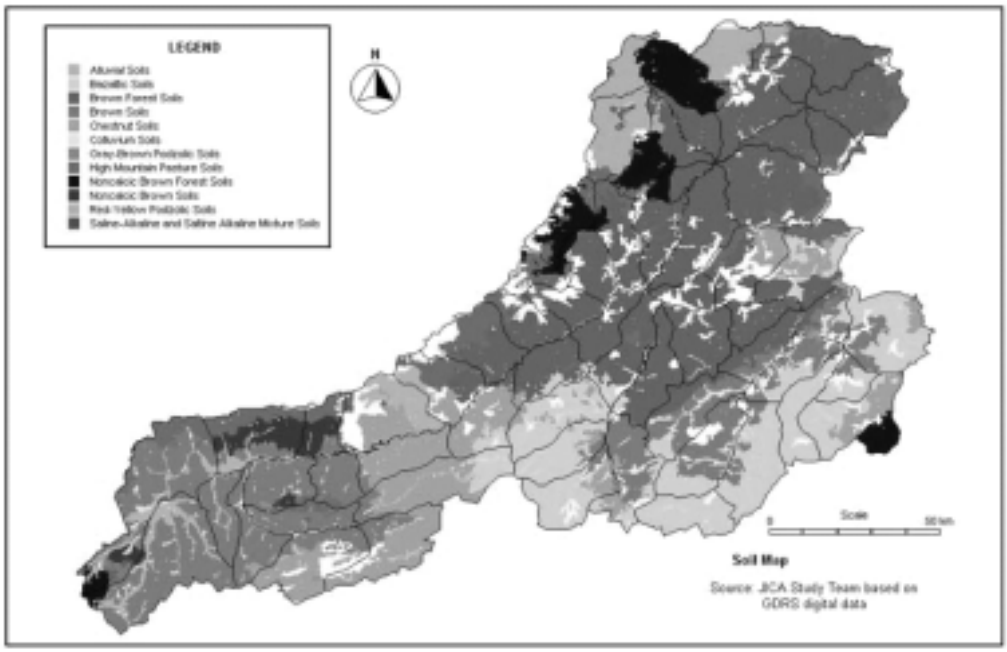


Figure H.2-10 Soil Map

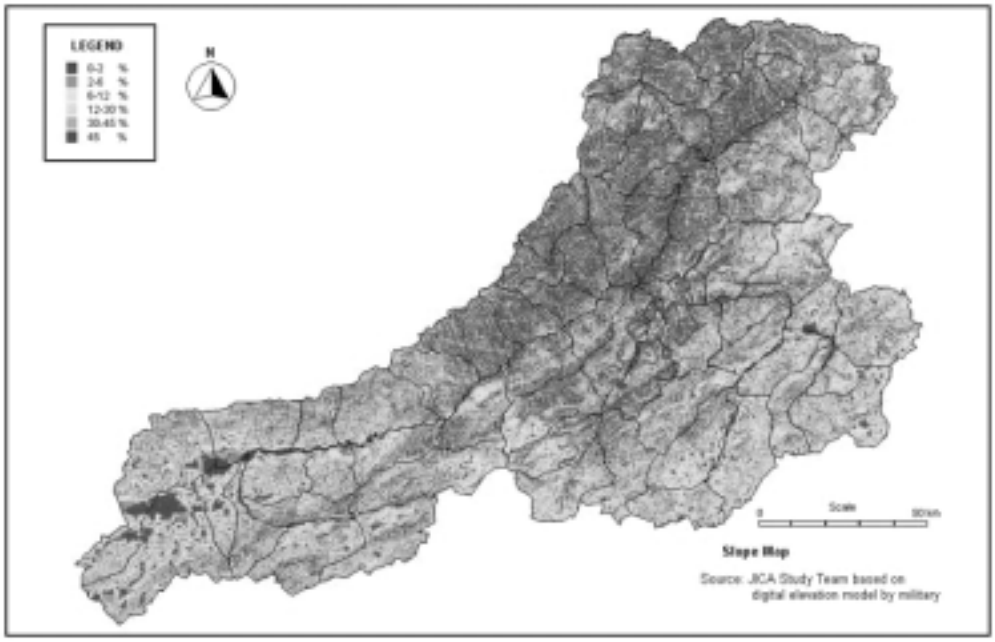


Figure H.2-11 Slope Map

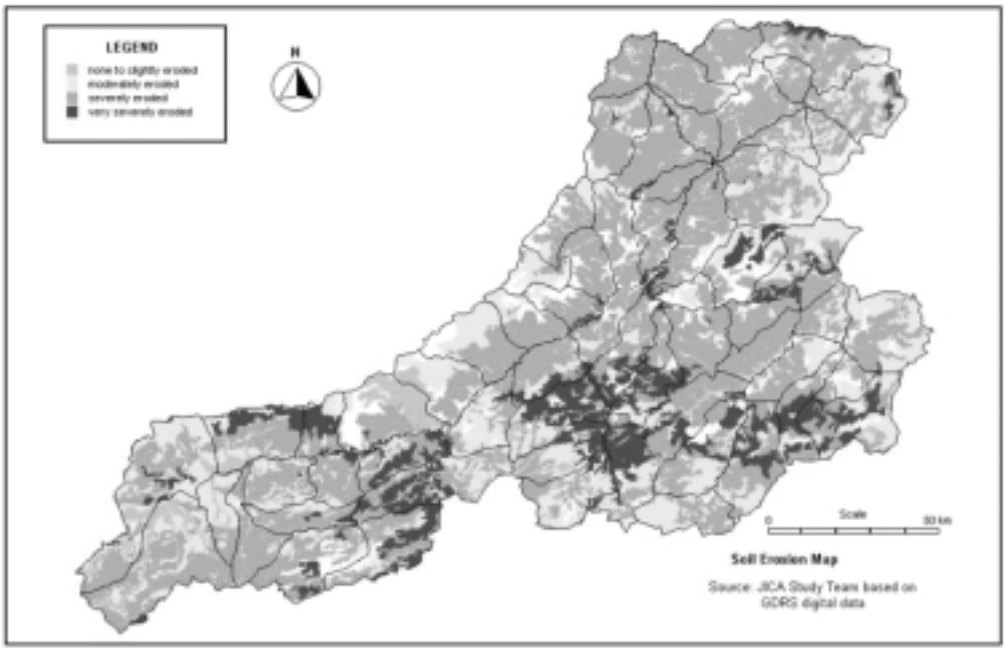


Figure H.2-12 Soil Erosion Map

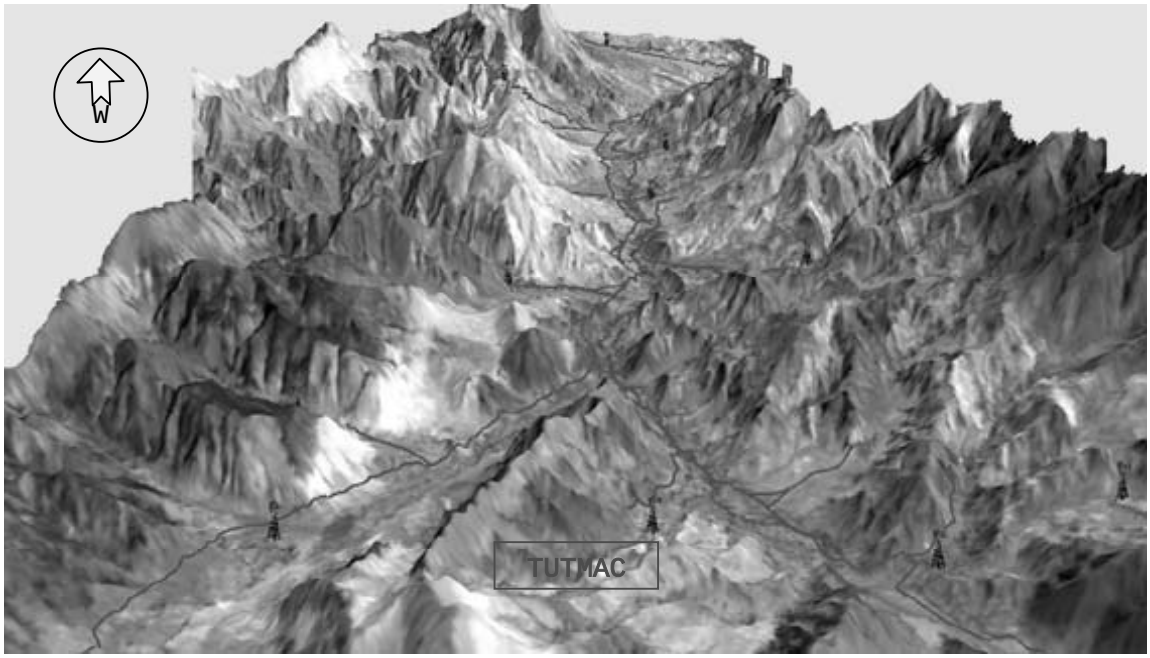


Figure H.2-13 Bird-Eyes View Map (OL-04)

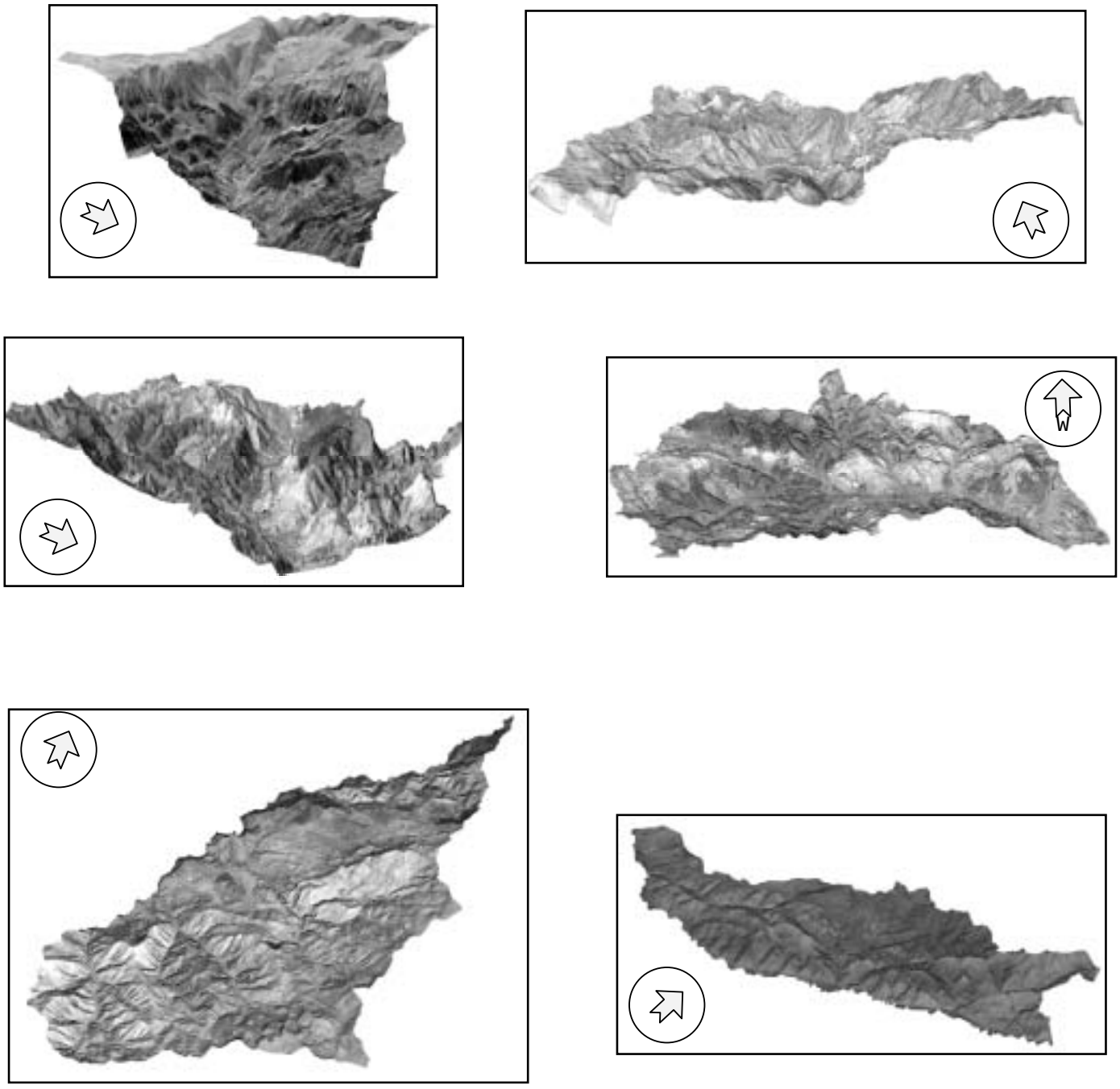


Figure H.2-14 3-D maps of 6MCs

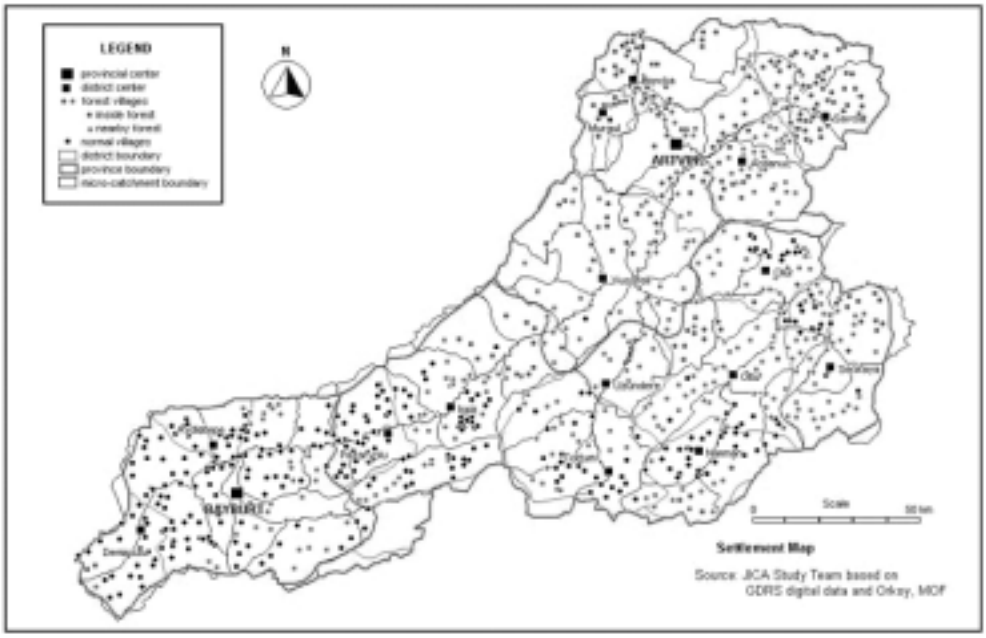


Figure H.2-15 Settlement Map

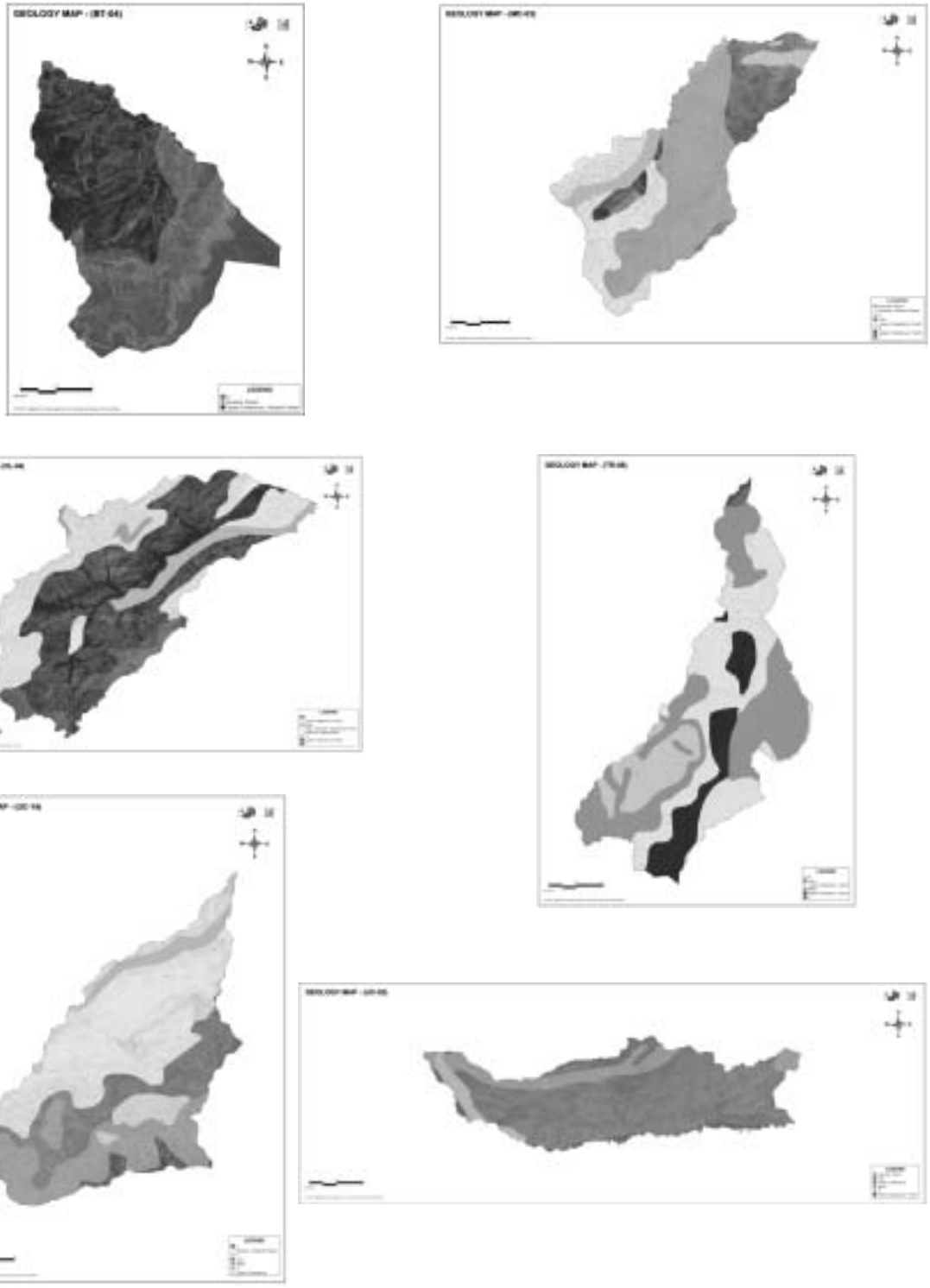


Figure H.2-16 Geology Maps of 6MCs

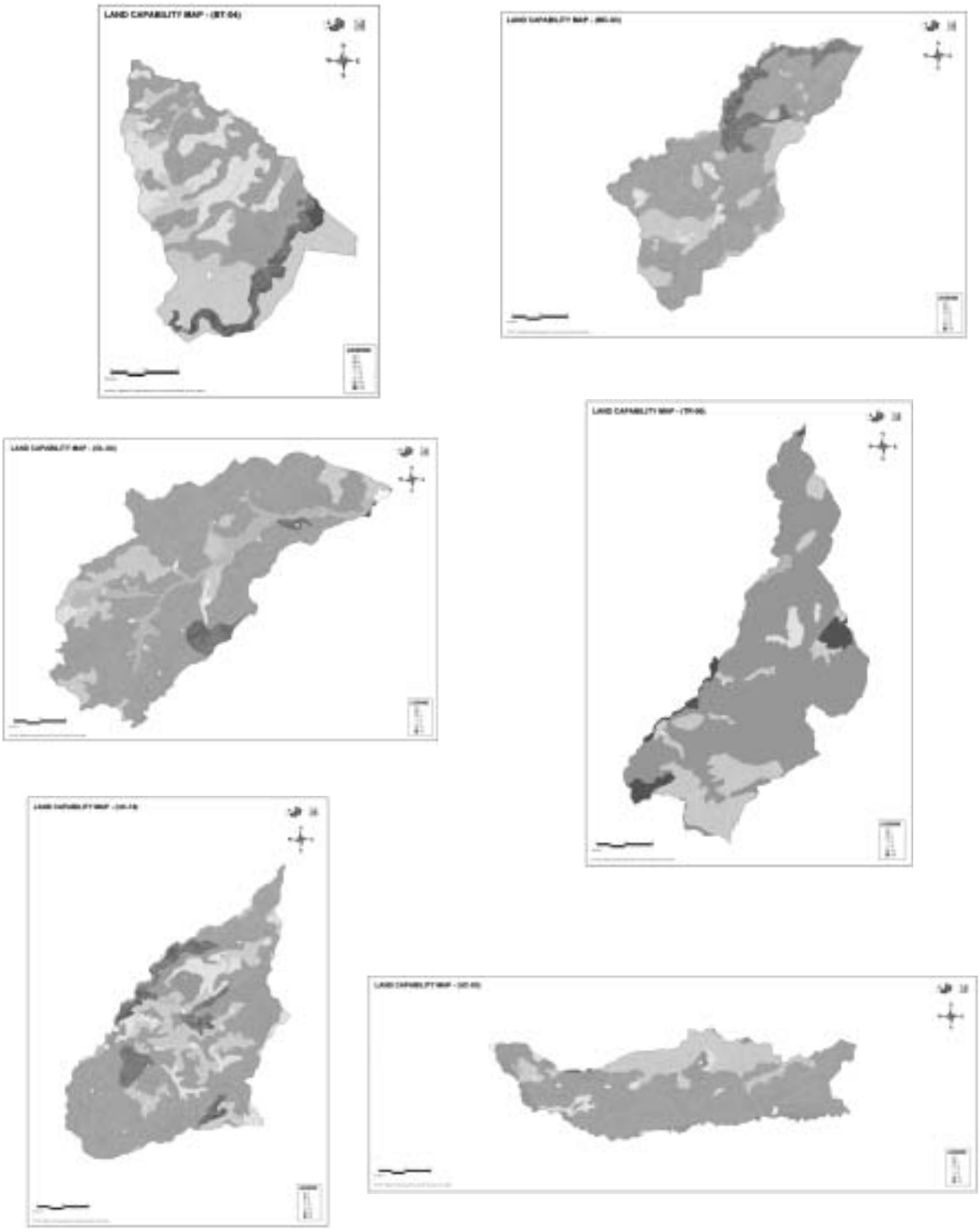


Figure H.2-17 Land Capability Maps of 6MCs

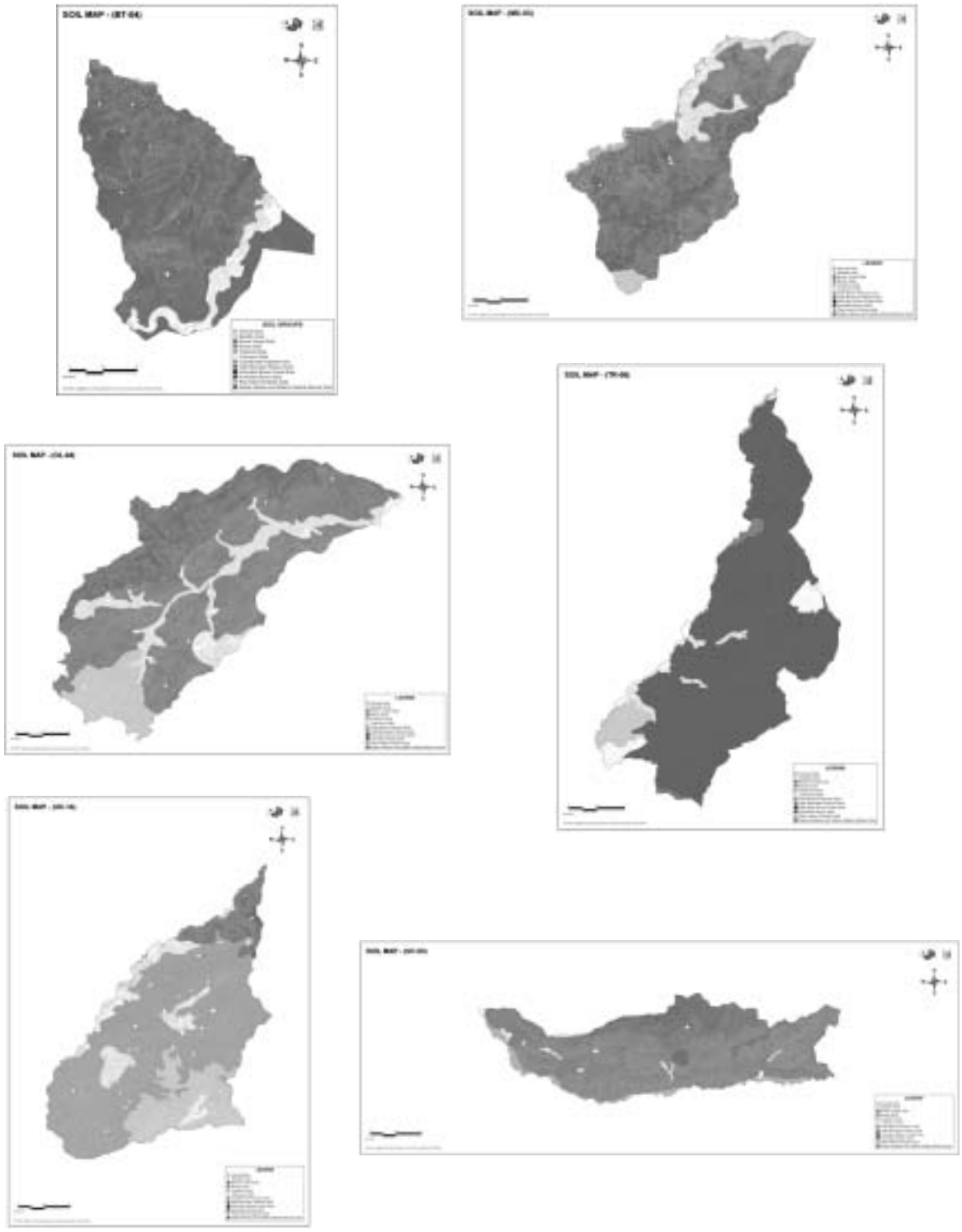


Figure H.2-18 Soil Maps of 6MCs

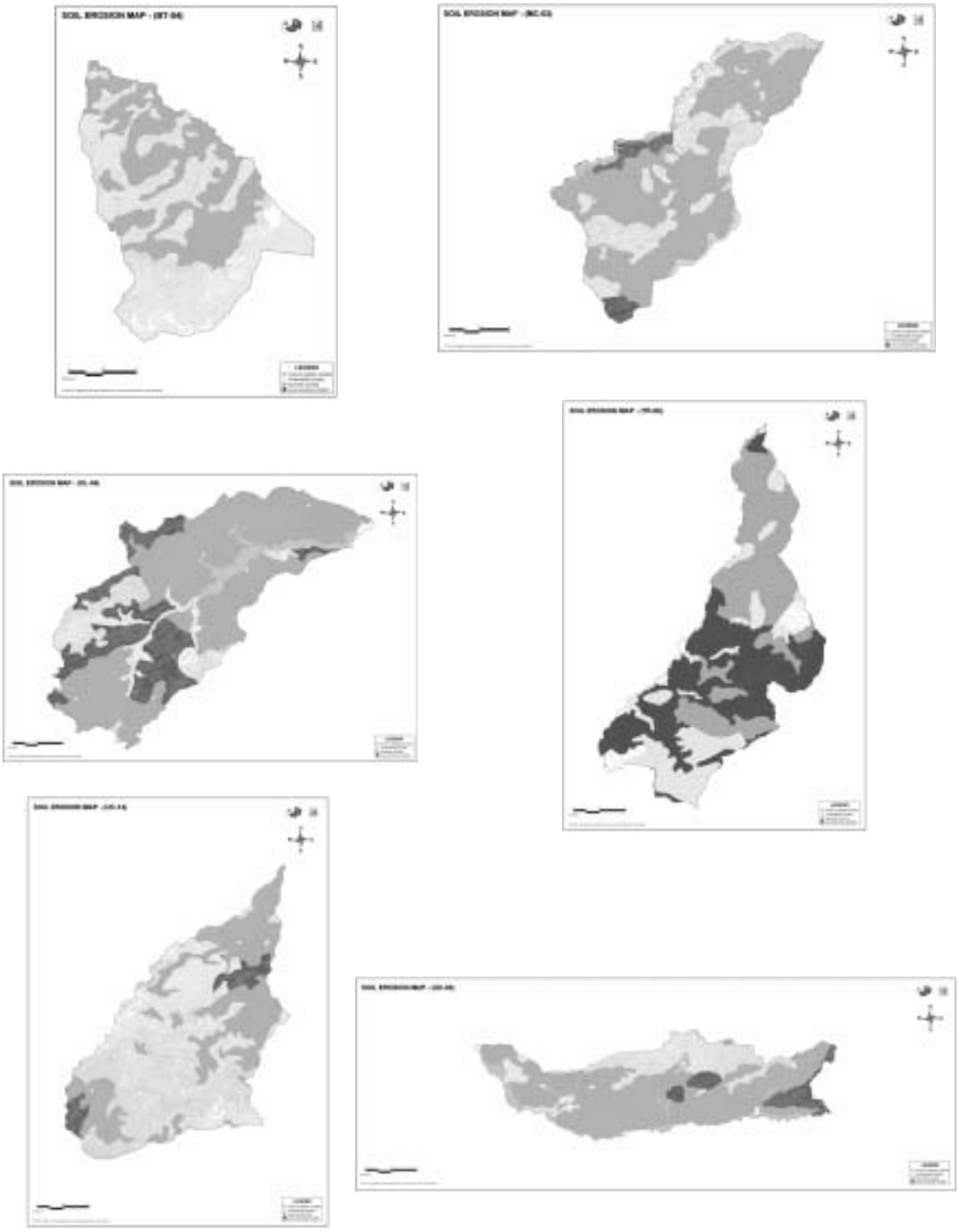
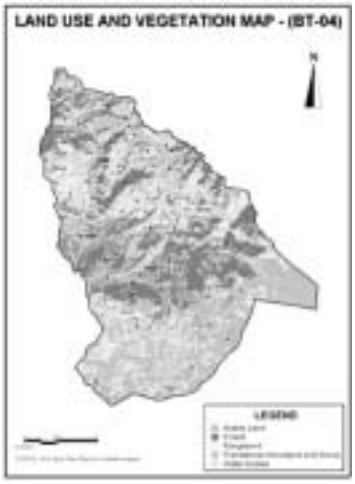
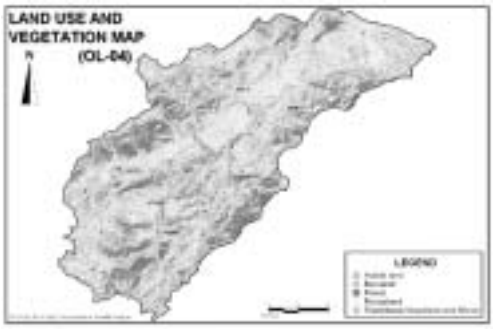


Figure H.2-19 Soil Erosion Maps of 6MCs





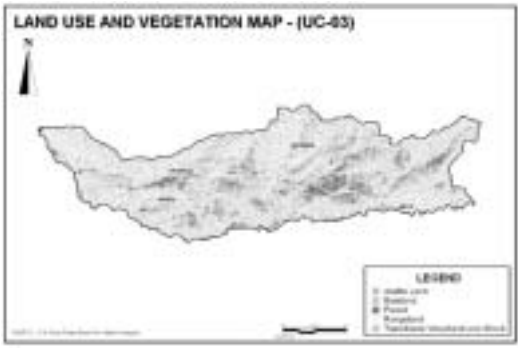
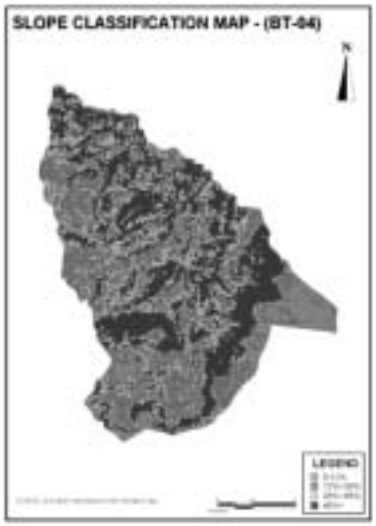
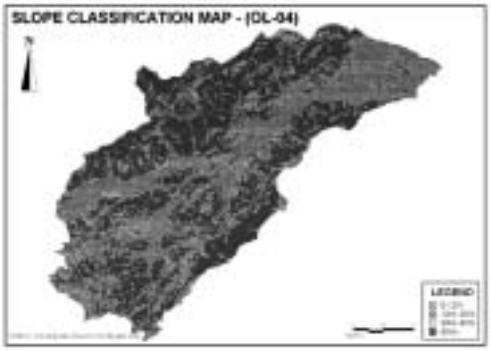
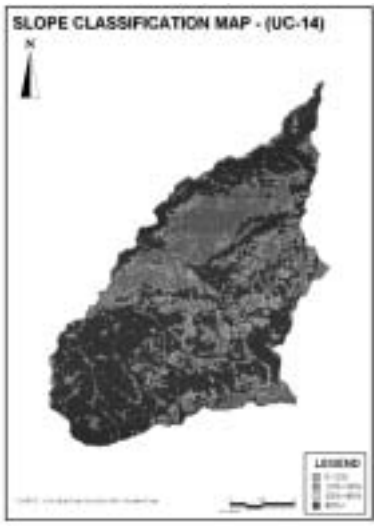


Figure H.2-20 Land Capability Maps of 6MCs







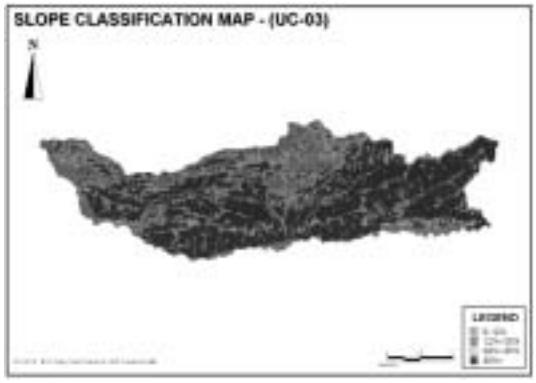
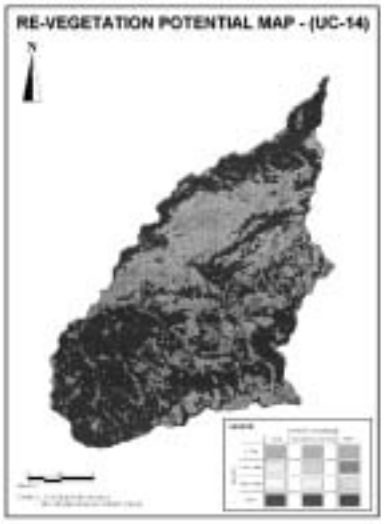


Figure H.2-21 Slope Classification Maps of 6MCs



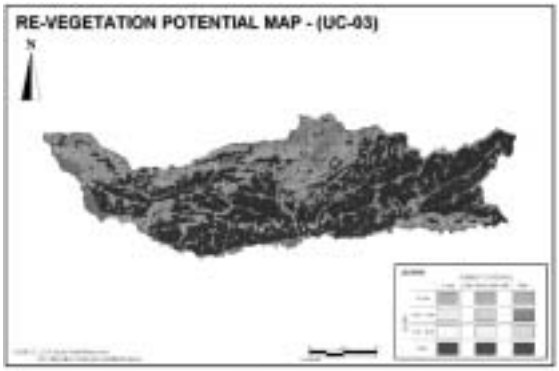


Figure H.2-22 Re-Vegetation Potential Maps of 6MCs

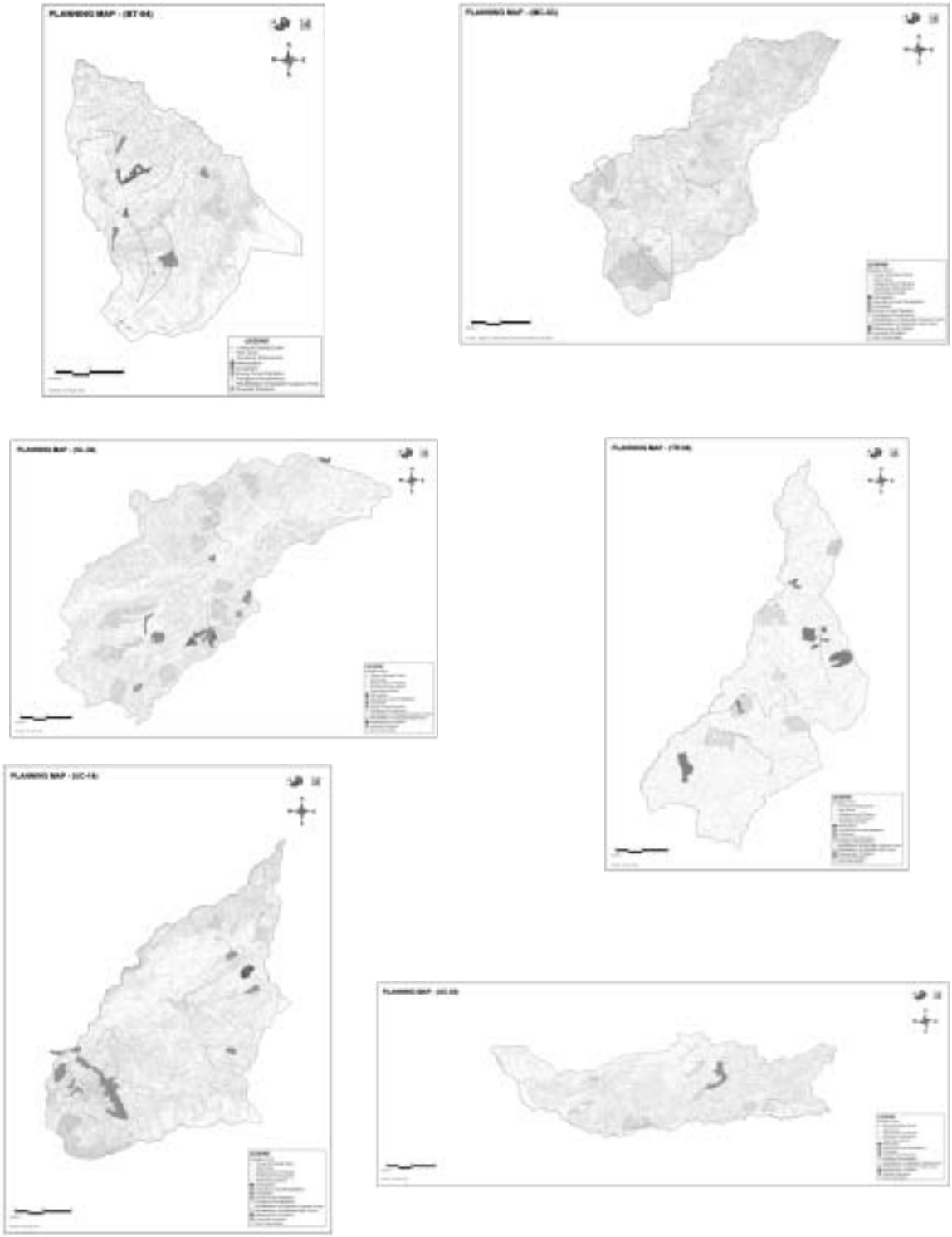


Figure H.2-23 Planning Maps(1:25,000) of 6MCs

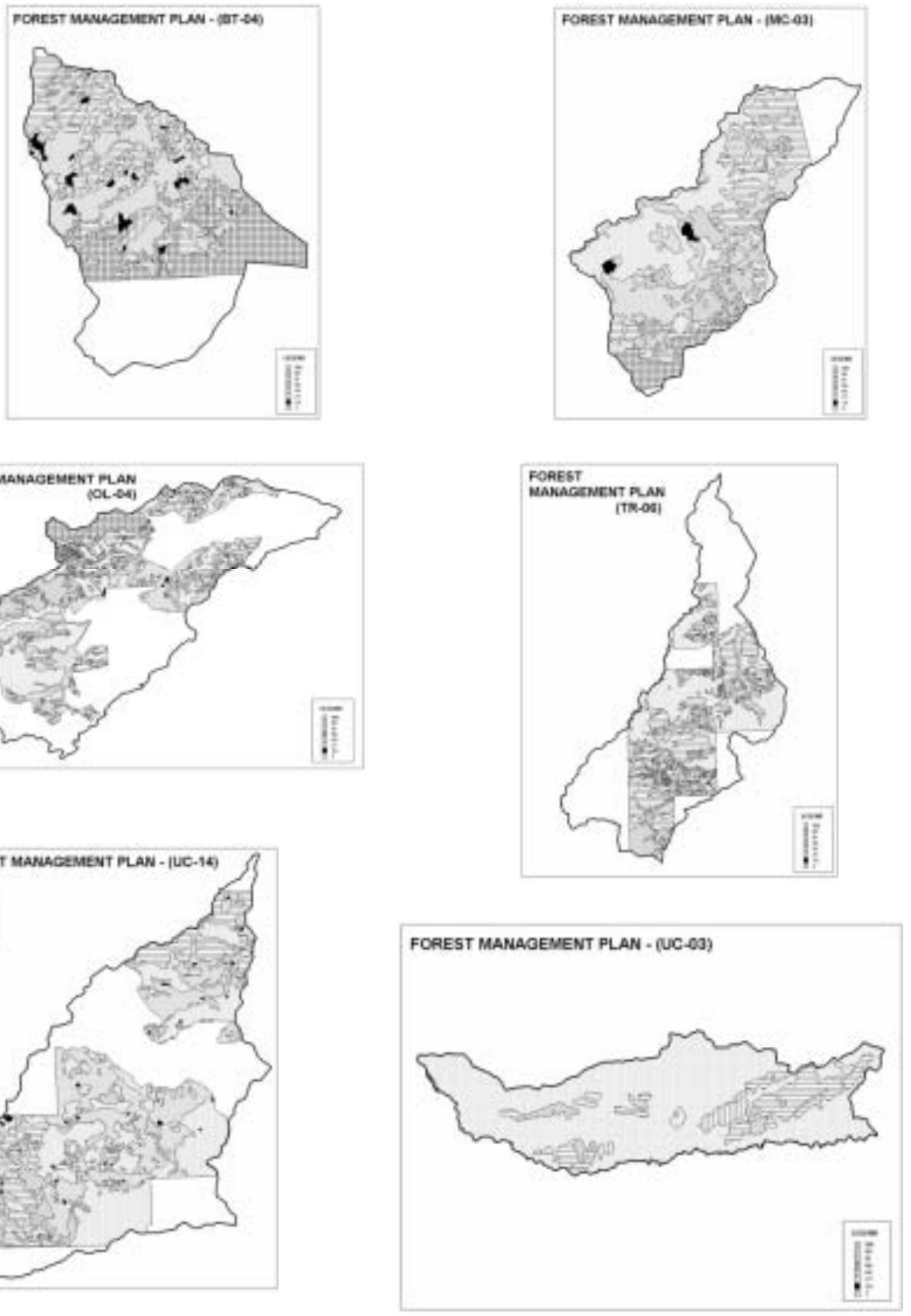


Figure H.2-24 Forest Management Plan Maps of 6MCs

I. Project Monitoring and Evaluation

CONTENTS

I.1 Analysis of the Projects Planned in the SIX Model MCs

I.1.1 Concept of Analysis

The project analysis aims at evaluating inputs efficiency of a given project. Basic data for the evaluation are selected from standpoint of business entity concerned. Therefore, direct expenditure and direct revenue of the business entity are selected as the basic data. Internal Rate of Return (IRR, % per annum) which is an index of the financial investment efficiency, is calculated based on the estimated costs and expected benefit born from the proposed projects, and the calculated IRR is compared with a criterion value (usually an average profit ratio of industries before tax in country concerned).

In the current Study, project costs of natural resources rehabilitation and management projects, livelihood improvement projects and human resources development projects are candidates of the project costs, which are taken into consideration in the financial analysis. On the other hand, farmers' net income, stock raisers' net income and apiculturists' net income are candidates of the benefits of the projects. The value of 10% per annum is adopted as the criterion value of IRR in this analysis. Hereinafter, are explained each item of both costs and benefits, and IRRs and evaluation on them in each of the six Model Micro-Catchments (MCs).

I.1.2 Benefits

I.1.2.1 Farmers' net income model

Outline of the model with estimated results are explained below. The model are applied for estimating the farmers' net income which would be brought about by agriculture improvement projects in the six Model MCs. Origin of the projects is in the irrigation development plans.

(1) Premise on the estimation and calculation steps

Premise

The following premises on the estimation is introduced in the model:

Premise 1: Rehabilitation of irrigation facilities is surely realized with the expansion of irrigation area.

The premise implies that agricultural products will increase in proportion to the expansion of irrigation area, and that production of non-irrigated agricultural products will not change.

Calculation steps

The calculation steps by the final results (farmers' net income) are as follows:

Step 1: Expansion of irrigation area,
Step 2: Estimation of agricultural production, sales amount and production costs by the products, and
Step 3: Estimation of the farmers' net income.

Irrigation area is extrapolated from the original five selected villages to the whole area of each MC based on the share of the area of the five villages in the whole MC. Extrapolation scales for the irrigation area from the five selected village level to the MC level are shown as follow.

$$c_i = A_i^M / A_i^M$$

c_i : The extrapolation scale applied to the MC_i

A_i^M : Total area (ha) of the MC_i

A_i^M : Total area (ha) of the five selected villages in the MC_i

MC	Extrapolation scale
BT-04	1.85
MC-03	1.11
TR-06	1.44
UC-14	2.14
UC-03	1.13
OL-04	1.93

(2) Expansion of irrigation area

In Table 1.1, annual expansion of irrigation area by crop categories in each MC is summarized. It is estimated that the irrigation development project in each MC will bring about the irrigation rate of 55%. In other word, 55% of the cultivated land in each MC will be irrigated after the irrigation projects are completed. Expansion of irrigation area by crops is presented in Appendix 1.

Table I.1.1 Summary of Irrigation Area Expansion by Crop Categories and MCs

Unit: ha

Model MC		Project Year						
	Crop category	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-25
BT-04	Cereals	109.9	120.6	129.2	139.4	147.1	155.4	155.4
	Fodder crops	288.2	400.5	499.8	599.7	683.1	765.1	765.1
	Vegetables	39.2	47.0	53.9	62.6	68.3	74.0	74.0
	Fruits	158.2	204.6	244.8	285.5	319.2	353.8	353.8
	Sub-total	595.3	772.6	927.6	1,087.2	1,218.0	1,348.3	1,348.3
MC-03	Cereals	179.5	188.2	195.3	205.0	211.2	218.4	218.4
	Fodder crops	489.7	582.0	663.6	749.7	818.8	888.9	888.9
	Vegetables	52.3	60.4	66.5	74.2	79.2	85.3	85.3
	Fruits	266.1	302.6	334.0	368.1	395.1	422.7	422.7
	Sub-total	985.5	1,133,3	1,259.4	1,397.1	1,504.4	1,615.3	1,615.3
TR-06	Cereals	187.2	239.3	284.6	331.2	369.4	407.8	407.8
	Fodder crops	384.1	586.0	764.6	941.2	1.091.6	1,238.4	1,238.4
	Vegetables	54.4	70.6	84.8	99.5	111.4	123.3	123.3
	Fruits	180.8	250.4	311.6	373.6	425.0	475.6	475.6
	Sub-total	806.5	1,146.2	1,445.6	1,745.5	1,997.4	2,245.2	2,245.2
UC-14	Cereals	109.6	139.1	164.7	191.2	212.8	234.5	234.5
	Fodder crops	255.3	376.1	482.3	588.1	676.4	765.2	765.2
	Vegetables	80.3	87.7	94.2	101.6	107.1	113.0	113.0
	Fruits	169.4	211.4	247.5	286.1	316.3	347.6	347.6
	Sub-total	614.4	814.2	988.6	1,167.0	1,312,6	1,460.3	1,460.3
UC-03	Cereals	46.6	57.5	67.0	77.0	85.0	93.1	93.1
	Fodder crops	243.3	350.4	445.1	539.5	618.9	697.0	697.0
	Vegetables	28.7	36.8	43.3	50.8	56.4	62.3	62.3
	Fruits	97.5	125.6	149.1	174.5	194.4	215.1	215.1
	Sub-total	416.1	570.5	704.6	841.9	954.6	1,067.6	1,067.6
OL-04	Cereals	212.3	213.8	213.8	217.9	219.1	220.8	220.8
	Fodder crops	392.7	436.7	475.1	518.6	551.5	585.2	585.2
	Vegetables	62.4	69.8	77.2	83.5	88.7	95.7	95.7
	Fruits	163.7	185.6	203.8	224.5	240.0	257.9	257.9
	Sub-total	831.1	905.7	969.8	1,044.7	1,099.5	1,159.5	1,159.5

Source: JICA Study Team

(3) Agricultural production, gross income and production costs by crops in each MC

On estimating the production by crops, maximum utilization ratios of the irrigated land are taken into consideration along with crop yield. The ratios reflect collection and transportation possibility of the crops concerned. The ratios are set to be 1.0 for cereals and fodder crops because the former is for own consumption and because the latter is consumed by the livestock raisers in the Area or exported to other areas like Black Sea Region, while 0.9 for vegetables and fruits. Growth period of the products between the plantation year and harvesting year by crops are taken into account in estimating the production.

The sales amounts by crops is calculated based on the production and market prices of crops, and the production costs are decided from viewpoints of cultivation methods of the crops concerned. In Table 1.2, estimated production, sales amount and production costs at year 10, are presented by MC. Ratios of the production cost to the sales amount vary from 75% to 87% among MCs. Estimated yield, production cost and farm gate prices by crops shouws Appendix 2. Estimated agricultural production, farmers' gross income (sales amount), and production costs are presented by crops and MCs in Appendix 3 and 4, respectively.

Table I.1.2 Estimated Production, Sales Amount (Farmers' Gross Income) and Production Costs at Project Year 10 by MCs

Model MC	Crop Ctegory	Production (ton)	Gross Income (BTL)	Production Cost (BTL)
BT-04	Cereales	310.8	21.8	72.0
	Fodder crops	3,597.9	460.8	458.0
	Vegetables	1,297.5	327.6	314.2
	Fruits	2,516.1	817.4	514.8
	Sub-total	7,722.3	1,627.6	1,359.0
MC-03	Cereales	436.9	33.2	73.7
	Fodder crops	4,168.9	386.2	383.9
	Vegetables	1,434.1	304.0	292.0
	Fruits	2,996.3	635.8	406.0
	Sub-total	9,036.2	1,359.2	1,155.6
TR-06	Cereales	815.6	105.8	349.3
	Fodder crops	5,818.0	824.6	819.7
	Vegetables	2,697.6	745.5	714.3
	Fruits	3,495.9	1,179.5	726.6
	Sub-total	12,827.1	2,855.4	2,609.9
UC-14	Cereales	469.1	59.9	197.8
	Fodder crops	3,620.2	489.2	486.4
	Vegetables	2,024.5	300.9	289.3
	Fruits	2,553.1	704.5	447.1
	Sub-total	8,666.9	1,554.5	1,420.6
UC-03	Cereales	186.2	22.3	73.7
	Fodder crops	3,328.1	444.4	441.7
	Vegetables	1,553.2	307.7	296.8
	Fruits	1,498.6	389.6	284.7
	Sub-total	6,566.1	1,164.0	1,096.9
OL-04	Cereales	441.6	4.0	13.4
	Fodder crops	2,772.8	185.7	184.6
	Vegetables	1,961.3	333.6	321.4
	Fruits	1,839.9	403.7	243.1
	Sub-total	7,015.6	927.0	762.5

(4) Farmers' net income in MCs

Based on the above-mentioned figures, farmers' net income, i.e., an additional income which would be brought about by the irrigation project, is calculated for each MC. The result by crops is shown in Appendix 5, and the summary is presented in Table 1.3.

Table I.1.3 Farmers' Net Income by MCs

Unit: BTL

Year	BT-04	MC-03	TR-06	UC-14	UC-03	OL-04
Year 0	0	0	0	0	0	0
Year 1	0	0	0	0	0	0
Year 2	-8.3	-5.5	-48.9	-29.4	-8.7	1.3
Year 3	-14.5	-10.3	--91.6	-54.5	-16.6	4.0
Year 4	-21.7	-17.0	-135.2	-80.6	-24.5	2.1
Year 5	44.5	32.2	-64.1	-40.9	-6.2	41.1
Year 6	100.3	73.0	-6.8	-11.2	8.2	73.4
Year 7	162.7	123.0	89.0	45.6	31.0	107.7
Year 8	215.5	162.6	167.3	88.7	48.8	134.1
Year 9	268.5	203.4	245.6	133.9	67.2	164.5
Year 10-25	268.5	203.4	245.6	133.9	67.2	164.5

Source: JICA Study Team

I.1.2.2 Livestock breeders' net income

In this model, live heads to be sold to fatteners and butchers, raw milk and homemade cheese are supposed as the livestock products. The homemade cheese is an unintended product for the stock breeders. It can be supposed that the collection network of the raw milk which is expected to be enhanced as a result of the livestock improvement projects be unable to collect entire raw milk produced in the Area due to its harsh geographical condition. The situation would force the stock breeders to produce homemade cheese. Based on the above-mentioned stock breeders' net income, i.e. an incremental benefit to be brought about by the Project, is calculated are shown in Table 1.4.

Table I.1.4 Stock Breeders' Net Income by MCs

unit: TL. million

	BT-04	MC-03	TR-06	UC-14	UC-03	OL-04
Year 0						
Year 1						
Year 2	-41,048	-3,403	-73,789	-43,980	-39,430	-15,077
Year 3	-54,702	-4,458	-98,365	-58,582	-52,318	-16,267
Year 4	4,088	9,446	19,679	115,067	10,983	44,022
Year 5	176,273	33,872	72,938	430,643	39,473	200,348
Year 6	280,732	58,887	125,846	744,395	68,887	355,018
Year 7	371,727	77,543	166,049	982,182	89,928	481,060
Year 8	456,000	96,297	203,693	982,705	119,740	594,721
Year 9	492,400	103,580	220,165	982,062	119,730	661,966
Year 10-25	492,400	103,580	220,165	982,062	119,730	661,966

Source: JICA Study Team

I.1.2.3 Apiculturists' net income model

(1) Apiculture development plan

The development plan of apiculture is formulated based on the condition of vegetation in each MC, and shown in the following.

unit: 20 beehives

MC	Project Year					
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5-25
BT-04	-	-	67	68	135	135
MC-03	-	-	56	56	112	112
TR-06	-	-	-	-	-	-
UC-14	-	-	24	25	49	49
UC-03	-	-	50	51	101	101
OL-04	-	-	9	10	19	19

Source: JICA Study Team

(2) Honey production

The plan will be realized in two years: year 2 and year 3. It is assumed that one beehive will produce 15 kg of honey in the first year and 30 kg in the subsequent years.

(3) Sales amounts, production costs and apiculture net income

Price of honey is set at TL.5 million per kg, and production costs including maintenance cost are set at 30% of the sales amount.
Gross income, production costs and net income in the apiculture development are presented in Table 1.5.

Table I.1.5 Gross Income, Production Costs and Net Income of Apiculturists by MCs

MC	Item	Project Year					
		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5-25
BT-04	Gross income	-	-	5,025	15,150	20,250	20,250
	Production cost	-	-	1,508	4,545	6,075	6,075
	Net income	-	-	3,517	10,605	14,175	14,175
MC-03	Gross income	-	-	4,200	12,600	16,800	16,800
	Production cost	-	-	1,260	3,780	5.040	5.040
	Net income	-	-	2,940	8.820	11,760	11,760
TR-06	Gross income	-	-	-	-	-	-
	Production cost	-	-	-	-	-	-
	Net income	-	-	-	-	-	-
UC-14	Gross income	-	-	1,800	5,475	7,350	7,350
	Production cost	-	-	540	1,643	2,205	2,205
	Net income	-	-	1,260	3,822	5,145	5,145
UC-03	Gross income	-	-	3,750	11,325	15,150	15,150
	Production cost	-	-	1,125	3,398	4,545	4,545
	Net income	-	-	2,625	7,927	10,605	10,605
OL-04	Gross income	-	-	675	2,100	2,850	2,850
	Production cost	-	-	203	630	855	855
	Net income	-	-	472	1,470	1,995	1,995

Source: JICA Study Team

I.1.3 Project Costs

I.1.3.1 Composition of the project costs

The overall project consists of:

- Natural resource rehabilitation and management projects,
- Livelihood improvement projects, and
- Human resource development projects.

The natural resources rehabilitation and management projects form the fundamental part of the entire project by ensuring the sustainability of the natural environment. Livelihood

improvement projects construct the solid base for socio-economy in the Area, while human resources development projects enhance the possibility of the success of the above-mentioned two project. The project costs are estimated in each activity of the above projects. The cost items to be estimated as initial investment costs in each project are shown below.

Project category	Sub-project	Activities
Natural resources rehabilitation and management		• Soil conservation • Afforestation • Rehabilitation of high forest • Rehabilitation of coppice forest • Energy forest plantation • Rangeland rehabilitation • Riverside plantation
Livelihood improvement	(1) Agricultural development	• Irrigation rehabilitation • Greenhouse construction • Agricultural land rehabilitation • Fodder production enhancement • Fruit orchard rehabilitation • Agricultural mechanization • Marketing improvement (collect and shipment facility)
	(2) Livestock improvement	• Local breed to pure breed
	(3) Apiculture enhancement	• Apiculture production facility construction
Human resources development		• Training • Awareness creation • Research • Demonstration • Technical assistance

I.1.3.2 Project costs

The project costs to be spent in each year is presented by MCs in Table 1.6. Details of the project costs are shown in Appendix 6, 7 and 8.

Table I.1.6 Facility Construction Costs by Project Categories and MCs

Unit: TL. billion at 2003 price

MC	Project Category	Year 1	Year 2	Year 3	Year 4	Year 5	Total
BT-04	Natural resources rehabilitation	741	1,157	52	43	43	2,038
	Livelihood improvement	491	1,255	1,268	428	387	3,829
	Human resources development	219	119	75	43	43	499
	Total	1,451	2,531	1,395	514	473	6,366
MC-03	Natural resources rehabilitation	248	248	248	248	248	1,238
	Livelihood improvement	330	607	184	71	67	1,261
	Human resources development	174	74	57	25	25	355
	Total	752	929	489	344	340	2,854
TR-06	Natural resources rehabilitation	397	287	281	281	281	1,528
	Livelihood improvement	871	1,186	360	197	174	2,790
	Human resources development	174	74	57	25	25	355
	Total	1,442	1,547	698	503	480	4,673
UC-14	Natural resources rehabilitation	1,264	1,341	536	368	368	3,877
	Livelihood improvement	359	937	565	185	41	2,089
	Human resources development	189	89	63	31	31	403
	Total	1,812	2,362	957	825	441	6,349
UC-03	Natural resources rehabilitation	217	208	207	207	207	1,047
	Livelihood improvement	136	376	108	55	55	732
	Human resources development	174	74	57	25	25	355
	Total	527	658	372	287	287	2,134
OL-04	Natural resources rehabilitation	1,243	1,455	1,448	1,243	1,243	6,630
	Livelihood improvement	305	859	206	161	121	1,655
	Human resources development	219	119	75	43	43	499
	Total	1,767	2,433	1,729	1,447	1,407	8,784

Source: JICA Study Team

I.1.4 Evaluation of the Projects by MCs

The results of the evaluation of IRR are presented in Appendixes 9 and summarized in Table 1.7.

Table I.1.7 Internal Rate of Return of the Projects by MCs

MC	BT-04	MC-03	TR-06	UC-14	UC-03	OL-04
IRR(%)	11.5	11.6	7.1	15.5	9.8	16.2

Source: JICA Study Team

(1) BT-04

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

(2) MC-03

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

(3) TR-06

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

(4) UC-14

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

(5) UC-03

For the results of the project evaluation, the IRR shows 9.8%. This figure indicates the validity of this project. Livestock improvement projects particularly contribute to the benefit in this MC. Although the initial investment for livestock in this MC is higher than the other MCs, livestock production is expected to stably bare large benefits from the sixth year.

(6) OL-04

For the results of the project evaluation, the IRR shows 16.2%. This figure indicates the validity of this project. The relatively high IRR is due to the high benefit derived from livestock production which is improved by increasing fodder crop production and conversion of local breed to pure breed.

I.2 Economic Analysis on the Projects Planned in the Master Plan

I.2.1 Concept of "Economic Analysis"

(1) Cost and benefit items of the projects

The following cost and benefit items are adopted for calculation of EIRR.

	Items
Project costs	• Costs for natural resources rehabilitation and management projects, • Costs for livelihood improvement projects, and • Costs for human resources development projects.
Project benefit	• Increase in agricultural net income; • Increase in livestock net income; and • Increase in apicultural net income.

(2) Conversion of the financial values of the project costs and benefits to economic values

The economic project costs are estimated through the following modifications. First, the market prices are divided into two: (i) raw materials and equipment costs; and (ii) labor costs. Second, the value added tax (18% of the market prices) is subtracted from the raw material and equipment costs at financial prices, and social insurance, etc. (30% of wage) is subtracted from the labor cost at market prices. The values of the benefits have already been expressed at economic prices because they are expressed at production spot prices.

(3) Criterion value

The social discount rate of 10% per annum in Turkey is adopted as the criterion value for the economic evaluation of the projects.

I.2.2 Extrapolation Method of Values at MC Level to the Entire Catchment Level

The Master Plan Area comprises 63 micro-catchments, which are classified into six groups according to the natural conditions and socio-economic characteristics of the MCs. The six Model MC are selected from each of the six grouped areas. The values at the grouped area level are estimated based on the values at the MC level, and the number of forest villages, etc., in the grouped areas concerned, and then the values at Master Plan Area level can be calculated by summing up the values at the grouped area level.

I.2.3 Economic Evaluation (EIRR)

The EIRR calculated from all projects costs and tangible benefits at economical prices is 6.7%. This figure below the social discount rate (10%) and thus the projects are judged to be economically invalid. However, in addition to livelihood improvement projects, activities for natural resource rehabilitation area indispensable for watershed rehabilitation in Coruh River. The livelihood improvement projects will also play important roles as incentives in promoting natural resource rehabilitation. Considering that natural resource rehabilitation projects will also strongly contribute to sustainable environmental conservation, it may be concluded that the projects are worthy of implementation.

In Appendix 10 basic data relating to the economic analysis are presented.

Appendix I.1 Irrigation Expansion and Rehabilitation Plan by MCs(1/3)

BT-04 (Unit: ha)

Product	Project Year						
	0	1	2	3	4	5	6-25
Cereal							
Wheat	109.9	120.6	129.2	139.4	147.1	155.4	155.4
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder							
Alfalfa (dr	196.3	273.1	341.0	409.3	466.3	522.4	522.4
Cayil (dry)	91.9	127.4	158.8	190.4	216.8	242.7	242.7
Vegetables							
Cucumber	5.4	6.5	7.5	8.7	9.5	10.4	10.4
Tomato	7.0	8.3	9.7	11.3	12.4	13.3	13.3
Potato	10.9	13.4	15.2	17.4	18.9	20.7	20.7
Strawberry	6.3	7.4	8.5	10.1	11.1	11.8	11.8
Dry Beans	9.6	11.4	13.0	15.1	16.4	17.8	17.8
Fruits							
Walnut	28.9	37.1	44.3	51.5	57.6	63.6	63.6
Peach	13.5	17.8	21.3	24.9	27.9	31.1	31.1
Olive	4.1	5.1	6.0	7.4	8.1	8.9	8.9
Apricot	9.1	11.8	14.3	16.6	18.7	20.7	20.7
Apple	27.9	36.2	43.0	50.4	56.0	62.2	62.2
Pear	15.7	20.4	24.6	28.5	32.1	35.5	35.5
Sour Cher	27.8	36.0	43.0	50.2	56.0	62.2	62.2
Cherry	31.1	40.2	48.3	56.0	62.8	69.6	69.6
Total	595.3	772.6	927.6	1,087.2	1,218.0	1,348.3	1,348.3

MC-03 (Unit: ha)

Product	Project Year						
	0	1	2	3	4	5	6-25
Cereal							
Wheat	138.5	145.5	151.1	158.9	163.8	169.6	169.6
Rice	41.0	42.7	44.2	46.1	47.4	48.8	48.8
Fodder							
Alfalfa (dr	331.7	395.0	450.0	508.2	554.8	602.1	602.1
Cayil (dry)	156.0	187.0	213.6	241.5	264.0	286.8	286.8
Vegetables							
Cucumber	6.5	7.6	8.3	9.3	9.9	10.7	10.7
Tomato	8.8	10.1	11.1	12.4	13.2	14.2	14.2
Potato	15.1	17.5	19.4	21.6	23.2	24.9	24.9
Strawberry	8.1	9.4	10.3	11.6	12.3	13.3	13.3
Dry Beans	13.8	15.8	17.4	19.3	20.6	22.2	22.2
Fruits							
Walnut	54.1	59.5	64.0	69.1	73.1	77.3	77.3
Peach	22.5	25.8	28.5	31.5	33.9	36.4	36.4
Olive	8.2	9.2	10.0	11.0	11.7	12.4	12.4
Apricot	11.4	13.7	15.8	17.9	19.6	21.3	21.3
Apple	46.2	52.7	58.4	64.8	69.7	74.6	74.6
Pear	24.8	28.7	31.9	35.3	38.0	40.8	40.8
Sour Cher	47.4	54.1	60.0	66.2	71.3	76.4	76.4
Cherry	51.5	58.9	65.4	72.3	77.8	83.5	83.5
Total	985.5	1,133.3	1,259.4	1,397.1	1,504.4	1,615.3	1,615.3

Appendix I.1 Irrigation Expansion and Rehabilitation Plan by MCs(2/3)

TR-06 (Unit: ha)

Product	Project Year						
	0	1	2	3	4	5	6-25
Cereal							
Wheat	187.2	239.3	284.6	331.2	369.4	407.8	407.8
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder							
Alfalfa (dr	261.4	398.9	520.6	641.2	743.3	843.3	843.3
Cayil (dry)	122.7	187.1	244.0	300.0	348.3	395.1	395.1
Vegetables							
Cucumber	11.7	14.9	17.6	20.7	22.9	25.3	25.3
Tomato	13.8	17.9	21.4	25.2	28.1	31.1	31.1
Potato	14.0	18.2	22.2	25.8	29.2	32.3	32.3
Strawberry	10.9	14.1	16.7	19.7	21.9	24.2	24.2
Dry Beans	4.0	5.5	6.9	8.1	9.3	10.4	10.4
Fruits							
Walnut	28.2	37.9	46.3	55.0	62.0	69.1	69.1
Peach	15.6	22.8	29.0	35.6	40.8	46.1	46.1
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	7.5	11.8	15.4	19.2	22.2	25.3	25.3
Apple	36.0	50.1	62.5	74.9	85.3	95.6	95.6
Pear	12.2	15.9	19.1	22.3	25.0	27.6	27.6
Sour Cher	37.4	51.6	64.3	76.9	87.6	97.9	97.9
Cherry	43.9	60.3	75.0	89.7	102.1	114.0	114.0
Total	806.5	1,146.2	1,445.6	1,745.5	1,997.4	2,245.2	2,245.2

UC-14 (Unit: ha)

Product	Project Year						
	0	1	2	3	4	5	6-25
Cereal							
Wheat	109.6	139.1	164.7	191.2	212.8	234.5	234.5
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder							
Alfalfa (dr	193.2	273.4	344.2	414.4	473.9	532.4	532.4
Cayil (dry)	62.1	102.7	138.1	173.7	202.5	232.8	232.8
Vegetables							
Cucumber	12.0	12.2	12.7	13.0	13.3	13.7	13.7
Tomato	16.3	17.5	18.9	20.1	21.3	22.3	22.3
Potato	19.7	22.4	24.5	27.0	28.8	30.8	30.8
Strawberry	15.0	16.3	17.3	18.6	19.5	20.5	20.5
Dry Beans	17.3	19.3	20.8	22.9	24.2	25.7	25.7
Fruits							
Walnut	30.4	37.0	42.6	48.6	53.3	58.2	58.2
Peach	23.5	26.4	28.7	31.8	33.7	36.0	36.0
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	0.9	2.6	4.2	6.0	7.3	8.6	8.6
Apple	31.7	40.1	47.2	54.6	60.6	66.8	66.8
Pear	17.8	21.5	25.0	28.5	31.4	34.2	34.2
Sour Cher	31.5	40.3	47.8	55.7	62.0	68.5	68.5
Cherry	33.6	43.5	52.0	60.9	68.0	75.3	75.3
Total	614.4	814.2	988.6	1,167.0	1,312.6	1,460.3	1,460.3

Appendix I.1 Irrigation Expansion and Rehabilitation Plan by MCs(3/3)

UC-03 (Unit: ha)

	Project Year						
Product	0	1	2	3	4	5	6-25
Cereal							
Wheat	46.6	57.5	67.0	77.0	85.0	93.1	93.1
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder							
Alfalfa (dr	171.8	249.1	317.3	385.4	442.7	499.0	499.0
Cayil (dry)	71.5	101.3	127.7	154.1	176.2	198.0	198.0
Vegetables							
Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tomato	4.9	6.3	7.4	8.8	9.8	10.8	10.8
Potato	11.6	14.9	17.6	20.6	22.9	25.3	25.3
Strawberry	4.9	6.3	7.4	8.8	9.8	10.8	10.8
Dry Beans	7.3	9.3	10.9	12.6	13.9	15.4	15.4
Fruits							
Walnut	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peach	6.8	7.7	8.5	9.4	10.1	10.8	10.8
Olive	0.1	0.3	0.5	0.6	0.8	0.9	0.9
Apricot	10.5	12.7	14.5	16.7	18.3	19.9	19.9
Apple	21.8	28.2	33.8	39.4	44.1	48.8	48.8
Pear	16.3	21.5	25.7	30.6	34.1	38.0	38.0
Sour Cher	21.0	27.3	32.4	38.0	42.4	47.0	47.0
Cherry	21.0	27.9	33.7	39.8	44.6	49.7	49.7
Total	416.1	570.5	704.6	841.9	954.6	1,067.6	1,067.6

OL-04 (Unit: ha)

	Project Year						
Product	0	1	2	3	4	5	6-25
Cereal							
Wheat	212.3	213.8	213.8	217.9	219.1	220.8	220.8
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder							
Alfalfa (dr	278.1	308.2	333.9	364.0	386.2	409.2	409.2
Cayil (dry)	114.6	128.5	141.2	154.6	165.3	176.0	176.0
Vegetables							
Cucumber	12.0	13.4	14.8	15.8	17.1	18.5	18.5
Tomato	11.4	12.7	13.7	14.9	15.7	17.0	17.0
Potato	24.3	26.8	29.4	31.7	33.3	35.5	35.5
Strawberry	11.4	12.5	13.9	14.9	15.7	17.0	17.0
Dry Beans	3.3	4.4	5.4	6.2	6.9	7.7	7.7
Fruits							
Walnut	34.2	38.9	42.6	47.0	50.3	54.0	54.0
Peach	4.2	6.6	8.5	10.4	12.0	13.9	13.9
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	1.2	2.4	3.5	4.4	5.3	6.2	6.2
Apple	28.6	32.3	35.4	39.0	41.8	44.8	44.8
Pear	26.4	27.5	28.5	30.2	31.2	32.4	32.4
Sour Cher	33.2	37.4	40.8	44.8	47.7	51.0	51.0
Cherry	35.9	40.5	44.5	48.7	51.7	55.6	55.6
Total	831.1	905.7	969.8	1,044.7	1,099.5	1,159.5	1,159.5

Appendix I.2 Estimated Yields, Production Costs and Farmgate Prices by Crops

Product	Yield (t/ha)[a] Ave.	Production cost ($TL10^6$/ha)[b]	Farmgatee ($TL10^6$/t)[a]
Cereal			
Wheat	2.0	1,583.4	240
Rice	2.0	3,119.3	1,160
Fodder			
Alfalfa (dry)	5.4	1,071.7	200
Cayil (dry)	3.2	719.7	225
Vegetables			
Cucumber	33.0	10,474.6	333
Tomato	29.0	7,465.7	300
Potato	14.8	5,834.8	396
Strawberry	31.5	29,645.0	950
Dry Beans	1.9	3,463.5	2,000
Fruits			
Walnut	5.0	4,055.8	1,600
Peach	10.0	2,914.5	640
Olive	3.0	4,348.2	1,700
Apricot	7.0	3,157.5 [c]	800
Apple	10.0	3,276.0	360
Pear	9.0	3,689.3	400
Sour Cherry	8.0	2,467.8	400
Cherry	8.0	1,350.7	400

Notes: [a] Artvin & Erzurum MARA regional office data, 2002.

[b] Field survey based on Artvin & Erzurum MARA regional office data, 2003.

[c] Average of production costs of other fruits.

Appendix 1.3 Estimated Agricultural Production (1/3)

BT-04

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	219.8	219.8	241.1	258.4	278.8	294.2	310.8	310.8	310.8	310.8	310.8
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder											
Alfalfa(dry	1,059.9	1,059.9	1,474.8	1,841.4	2,210.2	2,518.2	2,821.2	2,821.2	2,821.2	2,821.2	2,821.2
Cayil(dry)	294.2	294.2	407.7	508.3	609.3	693.8	776.7	776.7	776.7	776.7	776.7
Vegetables											
Cucumber	159.3	159.3	193.1	222.5	258.1	282.7	307.7	307.7	307.7	307.7	307.7
Tomato	183.5	183.5	215.6	252.0	294.1	324.6	347.7	347.7	347.7	347.7	347.7
Potato	145.4	145.4	177.9	201.8	231.5	251.6	276.0	276.0	276.0	276.0	276.0
Strawberry	178.3	178.3	209.3	240.7	287.5	313.4	335.7	335.7	335.7	335.7	335.7
Dry Beans	16.5	16.5	19.5	22.2	25.9	28.1	30.4	30.4	30.4	30.4	30.4
Fruits											
Walnut	129.9	129.9	129.9	129.9	129.9	166.9	199.3	231.8	259.1	286.4	286.4
Peach	121.5	121.5	121.5	121.5	121.5	159.8	191.8	224.5	251.5	279.7	279.7
Olive	11.0	11.0	11.0	11.0	11.0	13.8	16.2	20.0	22.0	24.0	24.0
Apricot	57.1	57.1	57.1	57.1	57.1	74.2	90.2	104.4	118.0	130.5	130.5
Apple	251.4	251.4	251.4	251.4	251.4	325.8	386.6	453.4	504.4	559.4	559.4
Pear	127.4	127.4	127.4	127.4	127.4	165.1	199.6	230.8	259.9	287.7	287.7
Sour Cher	199.8	199.8	199.8	199.8	199.8	259.4	309.3	361.6	403.5	447.6	447.6
Cherry	223.8	223.8	223.8	223.8	223.8	289.8	347.7	403.3	452.2	500.8	500.8

MC-03

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	277.1	277.1	291.0	302.3	317.7	327.6	339.2	339.2	339.2	339.2	339.2
Rice	81.9	81.9	85.4	88.3	92.1	94.7	97.7	97.7	97.7	97.7	97.7
Fodder											
Alfalfa(dry	1,791.0	1,791.0	2,133.1	2,430.3	2,744.5	2,996.0	3,251.1	3,251.1	3,251.1	3,251.1	3,251.1
Cayil(dry)	499.1	499.1	598.3	683.5	772.9	844.9	917.8	917.8	917.8	917.8	917.8
Vegetables											
Cucumber	194.5	194.5	225.5	246.3	275.3	292.8	316.5	316.5	316.5	316.5	316.5
Tomato	228.9	228.9	264.2	289.4	322.6	343.9	370.8	370.8	370.8	370.8	370.8
Potato	201.1	201.1	233.2	258.1	288.1	309.2	331.2	331.2	331.2	331.2	331.2
Strawberry	229.7	229.7	266.1	291.7	328.5	350.0	377.6	377.6	377.6	377.6	377.6
Dry Beans	23.5	23.5	27.0	29.7	33.0	35.3	38.0	38.0	38.0	38.0	38.0
Fruits											
Walnut	243.3	243.3	243.3	243.3	243.3	267.6	288.2	311.1	328.8	347.7	347.7
Peach	202.8	202.8	202.8	202.8	202.8	232.5	256.2	283.3	305.1	327.7	327.7
Olive	22.2	22.2	22.2	22.2	22.2	24.8	27.0	29.7	31.6	33.6	33.6
Apricot	72.0	72.0	72.0	72.0	72.0	86.4	99.4	112.6	123.6	134.3	134.3
Apple	415.6	415.6	415.6	415.6	415.6	474.5	526.0	583.2	626.9	671.3	671.3
Pear	200.5	200.5	200.5	200.5	200.5	232.3	258.1	286.3	308.2	330.9	330.9
Sour Cher	341.3	341.3	341.3	341.3	341.3	389.5	432.3	477.0	513.4	549.8	549.8
Cherry	370.8	370.8	370.8	370.8	370.8	424.4	471.1	520.8	560.5	601.0	601.0

Appendix 1.3 Estimated Agricultural Production (2/3)

TR-06

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	374.4	374.4	478.5	569.2	662.5	738.9	815.6	815.6	815.6	815.6	815.6
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder											
Alfalfa(dry	1,411.3	1,411.3	2,154.1	2,811.3	3,462.4	4,013.8	4,553.6	4,553.6	4,553.6	4,553.6	4,553.6
Cayil(dry)	392.6	392.6	598.9	780.9	960.1	1,114.5	1,264.4	1,264.4	1,264.4	1,264.4	1,264.4
Vegetables											
Cucumber	346.4	346.4	442.9	523.5	613.9	681.6	752.7	752.7	752.7	752.7	752.7
Tomato	360.8	360.8	467.7	558.1	657.2	733.1	811.8	811.8	811.8	811.8	811.8
Potato	186.1	186.1	242.3	295.2	343.8	388.4	429.6	429.6	429.6	429.6	429.6
Strawberry	310.3	310.3	399.5	474.0	557.6	620.1	685.8	685.8	685.8	685.8	685.8
Dry Beans	6.9	6.9	9.4	11.7	13.9	15.9	17.7	17.7	17.7	17.7	17.7
Fruits											
Walnut	127.0	127.0	127.0	127.0	127.0	170.5	208.2	247.5	279.1	311.0	311.0
Peach	140.0	140.0	140.0	140.0	140.0	205.6	261.3	320.2	366.8	414.7	414.7
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	47.2	47.2	47.2	47.2	47.2	74.1	97.2	120.8	140.1	159.7	159.7
Apple	324.0	324.0	324.0	324.0	324.0	450.6	562.2	674.3	768.0	860.5	860.5
Pear	99.1	99.1	99.1	99.1	99.1	128.5	154.3	180.6	202.3	223.9	223.9
Sour Cher	269.6	269.6	269.6	269.6	269.6	371.3	462.8	553.8	630.8	705.0	705.0
Cherry	316.2	316.2	316.2	316.2	316.2	434.4	540.3	645.8	734.9	821.1	821.1

UC-14

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	219.1	219.1	278.1	329.3	382.4	425.6	469.1	469.1	469.1	469.1	469.1
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder											
Alfalfa(dry	1,043.5	1,043.5	1,476.6	1,858.6	2,238.0	2,559.0	2,875.1	2,875.1	2,875.1	2,875.1	2,875.1
Cayil(dry)	198.6	198.6	328.5	441.9	555.9	648.0	745.1	745.1	745.1	745.1	745.1
Vegetables											
Cucumber	355.9	355.9	362.3	377.5	387.1	395.6	406.8	406.8	406.8	406.8	406.8
Tomato	424.5	424.5	456.3	492.6	524.8	556.3	580.9	580.9	580.9	580.9	580.9
Potato	262.2	262.2	297.9	325.8	359.6	383.3	410.5	410.5	410.5	410.5	410.5
Strawberry	424.7	424.7	461.1	491.4	527.8	553.9	582.4	582.4	582.4	582.4	582.4
Dry Beans	29.6	29.6	33.0	35.6	39.2	41.3	43.9	43.9	43.9	43.9	43.9
Fruits											
Walnut	136.7	136.7	136.7	136.7	136.7	166.5	191.5	218.7	239.8	261.9	261.9
Peach	211.9	211.9	211.9	211.9	211.9	237.9	258.3	286.5	303.7	323.6	323.6
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	5.4	5.4	5.4	5.4	5.4	16.7	26.7	37.5	45.9	53.9	53.9
Apple	285.0	285.0	285.0	285.0	285.0	360.5	424.7	491.0	545.1	600.9	600.9
Pear	143.9	143.9	143.9	143.9	143.9	174.6	202.8	230.7	254.7	277.3	277.3
Sour Cher	226.5	226.5	226.5	226.5	226.5	289.8	343.9	400.8	446.3	493.1	493.1
Cherry	241.9	241.9	241.9	241.9	241.9	313.2	374.4	438.3	489.8	542.4	542.4

Appendix 1.3 Estimated Agricultural Production (3/3)

UC-03

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	93.1	93.1	115.1	134.0	154.0	169.9	186.2	186.2	186.2	186.2	186.2
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder											
Alfalfa(dry	927.5	927.5	1,344.9	1,713.4	2,081.0	2,390.5	2,694.6	2,694.6	2,694.6	2,694.6	2,694.6
Cayil(dry)	228.9	228.9	324.3	408.8	493.0	563.9	633.5	633.5	633.5	633.5	633.5
Vegetables											
Cucumber	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tomato	139.9	139.9	182.4	213.8	254.8	280.9	312.4	312.4	312.4	312.4	312.4
Potato	303.8	303.8	389.5	459.2	538.8	597.3	660.6	660.6	660.6	660.6	660.6
Strawberry	64.7	64.7	84.4	98.9	117.9	129.9	144.5	144.5	144.5	144.5	144.5
Dry Beans	208.2	208.2	264.8	308.5	356.7	393.5	435.7	435.7	435.7	435.7	435.7
Fruits											
Walnut	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Peach	30.5	30.5	30.5	30.5	30.5	34.8	38.4	42.5	45.6	48.8	48.8
Olive	1.0	1.0	1.0	1.0	1.0	2.9	4.6	5.3	6.8	8.1	8.1
Apricot	28.4	28.4	28.4	28.4	28.4	34.2	39.3	45.1	49.4	53.7	53.7
Apple	137.4	137.4	137.4	137.4	137.4	177.9	212.7	248.4	277.7	307.5	307.5
Pear	146.4	146.4	146.4	146.4	146.4	193.2	231.6	275.2	307.3	341.7	341.7
Sour Cher	170.2	170.2	170.2	170.2	170.2	220.9	262.8	308.2	343.4	380.8	380.8
Cherry	151.3	151.3	151.3	151.3	151.3	201.0	242.4	286.7	321.4	358.0	358.0

OL-04

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal											
Wheat	424.6	424.6	427.6	427.6	435.9	438.3	441.6	441.6	441.6	441.6	441.6
Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fodder											
Alfalfa(dry	1,501.8	1,501.8	1,664.3	1,802.8	1,965.8	2,085.6	2,209.5	2,209.5	2,209.5	2,209.5	2,209.5
Cayil(dry)	366.9	366.9	411.3	451.9	494.9	529.0	563.3	563.3	563.3	563.3	563.3
Vegetables											
Cucumber	355.4	355.4	397.5	438.5	468.8	509.1	550.3	550.3	550.3	550.3	550.3
Tomato	297.2	297.2	330.2	358.2	390.0	409.7	443.3	443.3	443.3	443.3	443.3
Potato	323.9	323.9	356.6	391.0	422.7	443.8	473.0	473.0	473.0	473.0	473.0
Strawberry	322.8	322.8	353.5	394.0	423.7	445.1	481.5	481.5	481.5	481.5	481.5
Dry Beans	5.6	5.6	7.5	9.2	10.6	11.8	13.2	13.2	13.2	13.2	13.2
Fruits											
Walnut	153.7	153.7	153.7	153.7	153.7	174.9	191.5	211.6	226.3	243.2	243.2
Peach	38.2	38.2	38.2	38.2	38.2	59.4	76.6	93.7	108.1	125.1	125.1
Olive	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Apricot	7.3	7.3	7.3	7.3	7.3	15.0	21.9	27.5	33.3	38.9	38.9
Apple	257.1	257.1	257.1	257.1	257.1	290.4	318.9	350.6	376.3	403.0	403.0
Pear	214.2	214.2	214.2	214.2	214.2	222.8	230.7	244.8	253.0	262.6	262.6
Sour Cher	239.0	239.0	239.0	239.0	239.0	269.3	293.9	322.8	343.7	366.9	366.9
Cherry	258.5	258.5	258.5	258.5	258.5	291.7	320.2	350.6	372.5	400.2	400.2

Appendix I.4 Agricultural Gross Income and Production Cost(1/6)

BT-04

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			5,124	9,271	14,156	17,861	21,845	21,845	21,845	21,845	21,845
Wheat	0	0	5,124	9,271	14,156	17,861	21,845	21,845	21,845	21,845	21,845
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			108,518	204,449	300,942	381,555	460,805	460,805	460,805	460,805	460,805
Alfalfa(dry	0	0	82,977	156,284	230,052	291,650	352,247	352,247	352,247	352,247	352,247
Cayil(dry)	0	0	25,541	48,165	70,890	89,905	108,558	108,558	108,558	108,558	108,558
Vegetables			69,332	134,764	222,712	277,123	327,685	327,685	327,685	327,685	327,685
Cucumber	0	0	11,252	21,041	32,897	41,094	49,401	49,401	49,401	49,401	49,401
Tomato	0	0	9,633	20,569	33,172	42,341	49,251	49,251	49,251	49,251	49,251
Potato	0	0	12,881	22,346	34,115	42,048	51,719	51,719	51,719	51,719	51,719
Strawberry	0	0	29,397	59,292	103,686	128,350	149,475	149,475	149,475	149,475	149,475
Dry Beans	0	0	6,169	11,515	18,842	23,290	27,839	27,839	27,839	27,839	27,839
Fruits					0	194,176	362,277	532,680	674,332	817,415	817,415
Walnut					0	59,207	111,089	163,037	206,793	250,416	250,416
Peach					0	24,456	44,968	65,907	83,181	101,232	101,232
Olive					0	4,713	8,831	15,302	18,673	22,078	22,078
Apricot					0	13,660	26,480	37,865	48,727	58,741	58,741
Apple					0	26,793	48,671	72,713	91,079	110,889	110,889
Pear					0	15,105	28,891	41,353	53,029	64,136	64,136
Sour Cherry					0	23,843	43,796	64,703	81,492	99,101	99,101
Cherry					0	26,400	49,550	71,800	91,359	110,822	110,822
Total			182,974	348,483	537,810	870,715	1,172,612	1,343,015	1,484,667	1,627,750	1,627,750

Production Cost (TL. Million)

Product		Project Year									
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			16,902	30,582	46,699	58,920	72,061	72,061	72,061	72,061	72,061
Wheat	0	0	16,902	30,582	46,699	58,920	72,061	72,061	72,061	72,061	72,061
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			107,870	203,228	299,145	379,276	458,053	458,053	458,053	458,053	458,053
Alfalfa(dry	0	0	82,339	155,082	228,284	289,409	349,540	349,540	349,540	349,540	349,540
Cayil(dry)	0	0	25,530	48,145	70,861	89,867	108,513	108,513	108,513	108,513	108,513
Vegetables			66,560	129,187	213,676	265,742	314,291	314,291	314,291	314,291	314,291
Cucumber	0	0	10,726	20,056	31,357	39,171	47,089	47,089	47,089	47,089	47,089
Tomato	0	0	8,266	17,651	28,466	36,334	42,263	42,263	42,263	42,263	42,263
Potato	0	0	12,824	22,247	33,963	41,862	51,489	51,489	51,489	51,489	51,489
Strawberry	0	0	29,122	58,737	102,716	127,149	148,077	148,077	148,077	148,077	148,077
Dry Beans	0	0	5,623	10,495	17,173	21,227	25,374	25,374	25,374	25,374	25,374
Fruits					0	122,265	227,846	335,817	424,747	514,837	514,837
Walnut	0	0	0	0	0	30,017	56,319	82,656	104,839	126,955	126,955
Peach	0	0	0	0	0	11,137	20,478	30,014	37,880	46,100	46,100
Olive	0	0	0	0	0	4,018	7,529	13,046	15,920	18,823	18,823
Apricot	0	0	0	0	0	7,702	14,931	21,350	27,474	33,121	33,121
Apple	0	0	0	0	0	24,382	44,291	66,169	82,882	100,909	100,909
Pear	0	0	0	0	0	15,480	29,608	42,378	54,344	65,727	65,727
Sour Cher	0	0	0	0	0	18,387	33,775	49,898	62,845	76,425	76,425
Cherry	0	0	0	0	0	11,143	20,915	30,306	38,562	46,777	46,777

Appendix I.4 Agricultural Gross Income and Production Cost(2/6)

MC-03

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			7,413	13,475	21,602	26,972	33,202	33,202	33,202	33,202	33,202
Wheat	0	0	3,357	6,058	9,758	12,134	14,918	14,918	14,918	14,918	14,918
Rice	0	0	4,056	7,417	11,843	14,838	18,284	18,284	18,284	18,284	18,284
Fodder			90,741	169,346	252,314	318,814	386,253	386,253	386,253	386,253	386,253
Alfalfa(dry	0	0	68,416	127,852	190,706	240,990	292,028	292,028	292,028	292,028	292,028
Cayil(dry)	0	0	22,326	41,494	61,608	77,824	94,226	94,226	94,226	94,226	94,226
Vegetables			75,180	129,269	202,369	247,821	304,087	304,087	304,087	304,087	304,087
Cucumber	0	0	10,319	17,235	26,918	32,725	40,619	40,619	40,619	40,619	40,619
Tomato	0	0	10,603	18,165	28,125	34,496	42,587	42,587	42,587	42,587	42,587
Potato	0	0	12,705	22,600	34,474	42,835	51,523	51,523	51,523	51,523	51,523
Strawberry	0	0	34,529	58,893	93,871	114,259	140,507	140,507	140,507	140,507	140,507
Dry Beans	0	0	7,023	12,376	18,981	23,506	28,851	28,851	28,851	28,851	28,851
Fruits					0	148,575	275,460	414,344	523,475	635,824	635,824
Walnut					0	39,001	71,848	108,627	136,815	167,033	167,033
Peach					0	19,021	34,206	51,545	65,496	79,920	79,920
Olive					0	4,407	8,152	12,829	16,003	19,361	19,361
Anzu					0	11,469	21,930	32,420	41,281	49,790	49,790
Apple					0	21,219	39,740	60,337	76,057	92,068	92,068
Pear					0	12,731	23,053	34,317	43,081	52,148	52,148
Sour Cherry					0	19,293	36,412	54,288	68,865	83,436	83,436
Cherry					0	21,435	40,120	59,982	75,876	92,068	92,068
Total			173,333	312,090	476,284	742,183	999,003	1,137,887	1,247,018	1,359,367	1,359,367

Production Cost (TL. Million)

Product		Project Year									
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			16,526	29,955	48,114	59,977	73,795	73,795	73,795	73,795	73,795
Wheat	0	0	11,073	19,984	32,190	40,027	49,212	49,212	49,212	49,212	49,212
Rice	0	0	5,453	9,972	15,924	19,950	24,583	24,583	24,583	24,583	24,583
Fodder			90,206	168,347	250,823	316,930	383,970	383,970	383,970	383,970	383,970
Alfalfa(dry	0	0	67,890	126,869	189,241	239,138	289,783	289,783	289,783	289,783	289,783
Cayil(dry)	0	0	22,316	41,477	61,582	77,792	94,186	94,186	94,186	94,186	94,186
Vegetables			72,191	124,138	194,406	238,054	292,046	292,046	292,046	292,046	292,046
Cucumber	0	0	9,836	16,429	25,658	31,194	38,717	38,717	38,717	38,717	38,717
Tomato	0	0	9,099	15,588	24,135	29,602	36,545	36,545	36,545	36,545	36,545
Potato	0	0	12,649	22,500	34,321	42,645	51,295	51,295	51,295	51,295	51,295
Strawberry	0	0	34,206	58,342	92,992	113,190	139,192	139,192	139,192	139,192	139,192
Dry Beans	0	0	6,401	11,280	17,300	21,425	26,296	26,296	26,296	26,296	26,296
Fruits					0	94,940	176,120	265,020	334,605	406,086	406,086
Walnut	0	0	0	0	0	19,773	36,425	55,071	69,362	84,681	84,681
Peach	0	0	0	0	0	8,662	15,577	23,473	29,826	36,395	36,395
Olive	0	0	0	0	0	3,757	6,950	10,938	13,644	16,507	16,507
Apricot	0	0	0	0	0	6,466	12,365	18,279	23,276	28,074	28,074
Apple	0	0	0	0	0	19,309	36,164	54,906	69,212	83,782	83,782
Pear	0	0	0	0	0	13,047	23,625	35,168	44,150	53,441	53,441
Sour Cher	0	0	0	0	0	14,878	28,080	41,866	53,108	64,345	64,345
Cherry	0	0	0	0	0	9,047	16,934	25,318	32,027	38,861	38,861

Appendix I.4 Agricultural Gross Income and Production Cost(3/6)

TR-06

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			24,990	46,753	69,139	87,473	105,892	105,892	105,892	105,892	105,892
Wheat	0	0	24,990	46,753	69,139	87,473	105,892	105,892	105,892	105,892	105,892
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			194,960	367,354	537,906	682,917	824,619	824,619	824,619	824,619	824,619
Alfalfa(dry	0	0	148,553	279,983	410,209	520,490	628,456	628,456	628,456	628,456	628,456
Cayil(dry)	0	0	46,407	87,371	127,697	162,427	196,163	196,163	196,163	196,163	196,163
Vegetables			176,151	326,595	489,506	615,844	745,534	745,534	745,534	745,534	745,534
Cucumber	0	0	32,115	58,961	89,082	111,598	135,297	135,297	135,297	135,297	135,297
Tomato	0	0	32,078	59,195	88,928	111,681	135,302	135,302	135,302	135,302	135,302
Potato	0	0	22,293	43,219	62,451	80,149	96,464	96,464	96,464	96,464	96,464
Strawberry	0	0	84,740	155,519	234,985	294,323	356,802	356,802	356,802	356,802	356,802
Dry Beans	0	0	4,925	9,702	14,060	18,094	21,669	21,669	21,669	21,669	21,669
Fruits					0	278,490	522,283	771,239	975,976	1,179,516	1,179,516
Walnut	0	0	0	0	0	69,621	129,911	192,772	243,410	294,451	294,451
Peach	0	0	0	0	0	42,011	77,636	115,359	145,177	175,841	175,841
Olive	0	0	0	0	0	0	0	0	0	0	0
Apricot	0	0	0	0	0	21,555	39,989	58,866	74,303	89,994	89,994
Apple	0	0	0	0	0	45,583	85,754	126,093	159,853	193,156	193,156
Pear	0	0	0	0	0	11,757	22,068	32,594	41,277	49,922	49,922
Sour Cher	0	0	0	0	0	40,705	77,304	113,708	144,484	174,182	174,182
Cherry	0	0	0	0	0	47,257	89,621	131,848	167,472	201,969	201,969
Total	0	0	396,102	740,702	1,096,552	1,664,724	2,198,327	2,447,284	2,652,020	2,855,560	2,855,560

Production Cost (TL. Million)

Product		Project Year									
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			82,437	154,226	228,073	288,553	349,311	349,311	349,311	349,311	349,311
Wheat	0	0	82,437	154,226	228,073	288,553	349,311	349,311	349,311	349,311	349,311
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			193,799	365,166	534,701	678,849	819,707	819,707	819,707	819,707	819,707
Alfalfa(dry	0	0	147,411	277,831	407,056	516,490	623,627	623,627	623,627	623,627	623,627
Cayil(dry)	0	0	46,388	87,335	127,644	162,359	196,081	196,081	196,081	196,081	196,081
Vegetables			168,769	312,931	468,999	590,064	714,320	714,320	714,320	714,320	714,320
Cucumber	0	0	30,612	56,201	84,912	106,374	128,963	128,963	128,963	128,963	128,963
Tomato	0	0	27,527	50,797	76,311	95,836	116,107	116,107	116,107	116,107	116,107
Potato	0	0	22,194	43,027	62,174	79,793	96,036	96,036	96,036	96,036	96,036
Strawberry	0	0	83,948	154,064	232,786	291,569	353,463	353,463	353,463	353,463	353,463
Dry Beans	0	0	4,489	8,843	12,815	16,491	19,750	19,750	19,750	19,750	19,750
Fruits					0	171,449	321,860	474,944	601,290	726,607	726,607
Walnut	0	0	0	0	0	35,296	65,862	97,731	123,403	149,279	149,279
Peach	0	0	0	0	0	19,131	35,355	52,533	66,112	80,076	80,076
Olive	0	0	0	0	0	0	0	0	0	0	0
Apricot	0	0	0	0	0	12,154	22,548	33,191	41,895	50,742	50,742
Apple	0	0	0	0	0	41,480	78,036	114,744	145,466	175,772	175,772
Pear	0	0	0	0	0	12,049	22,616	33,402	42,300	51,160	51,160
Sour Cher	0	0	0	0	0	31,391	59,616	87,690	111,424	134,327	134,327
Cherry	0	0	0	0	0	19,947	37,828	55,652	70,689	85,250	85,250

Appendix I.4 Agricultural Gross Income and Production Cost(4/6)

UC-14

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			14,155	26,450	39,187	49,546	59,988	59,988	59,988	59,988	59,988
Wheat	0	0	14,155	26,450	39,187	49,546	59,988	59,988	59,988	59,988	59,988
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			115,849	217,754	319,275	404,207	489,281	489,281	489,281	489,281	489,281
Alfalfa(dry	0	0	86,612	163,009	238,890	303,100	366,325	366,325	366,325	366,325	366,325
Cayil(dry)	0	0	29,237	54,745	80,385	101,107	122,956	122,956	122,956	122,956	122,956
Vegetables			67,129	128,066	196,030	246,797	300,942	300,942	300,942	300,942	300,942
Cucumber	0	0	2,116	7,196	10,371	13,228	16,932	16,932	16,932	16,932	16,932
Tomato	0	0	9,551	20,443	30,094	39,545	46,917	46,917	46,917	46,917	46,917
Potato	0	0	14,110	25,172	38,548	47,928	58,697	58,697	58,697	58,697	58,697
Strawberry	0	0	34,581	63,399	97,980	122,764	149,852	149,852	149,852	149,852	149,852
Dry Beans	0	0	6,770	11,856	19,036	23,332	28,543	28,543	28,543	28,543	28,543
Fruits					0	166,541	308,229	461,748	581,079	704,531	704,531
Walnut					0	47,611	87,672	131,076	164,866	200,304	200,304
Peach					0	16,641	29,707	47,789	58,797	71,493	71,493
Olive					0	0	0	0	0	0	0
Apricot					0	9,006	17,041	25,713	32,389	38,828	38,828
Apple					0	27,145	50,269	74,127	93,624	113,711	113,711
Pear					0	12,272	23,574	34,744	44,313	53,389	53,389
Sour Cherry					0	25,331	46,964	69,724	87,930	106,623	106,623
Cherry					0	28,536	53,004	78,575	99,160	120,182	120,182
Total			197,132	372,270	554,492	867,092	1,158,441	1,311,960	1,431,290	1,554,742	1,554,742

Production Cost (TL. Million)

Product		Project Year									
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			46,693	87,253	129,267	163,440	197,887	197,887	197,887	197,887	197,887
Wheat	0	0	46,693	87,253	129,267	163,440	197,887	197,887	197,887	197,887	197,887
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			115,171	216,478	317,406	401,836	486,415	486,415	486,415	486,415	486,415
Alfalfa(dry	0	0	85,947	161,756	237,054	300,771	363,510	363,510	363,510	363,510	363,510
Cayil(dry)	0	0	29,224	54,722	80,352	101,065	122,905	122,905	122,905	122,905	122,905
Vegetables			64,689	123,074	188,501	237,140	289,303	289,303	289,303	289,303	289,303
Cucumber	0	0	2,017	6,859	9,885	12,609	16,139	16,139	16,139	16,139	16,139
Tomato	0	0	8,196	17,542	25,825	33,934	40,261	40,261	40,261	40,261	40,261
Potato	0	0	14,047	25,060	38,377	47,716	58,437	58,437	58,437	58,437	58,437
Strawberry	0	0	34,258	62,806	97,064	121,615	148,450	148,450	148,450	148,450	148,450
Dry Beans	0	0	6,170	10,807	17,350	21,266	26,016	26,016	26,016	26,016	26,016
Fruits					0	105,652	196,078	292,711	368,896	447,144	447,144
Walnut	0	0	0	0	0	24,137	44,447	66,452	83,583	101,549	101,549
Peach	0	0	0	0	0	7,578	13,528	21,763	26,776	32,557	32,557
Olive	0	0	0	0	0	0	0	0	0	0	0
Apricot	0	0	0	0	0	5,078	9,609	14,498	18,262	21,893	21,893
Apple	0	0	0	0	0	24,702	45,744	67,456	85,198	103,477	103,477
Pear	0	0	0	0	0	12,577	24,159	35,606	45,412	54,713	54,713
Sour Cher	0	0	0	0	0	19,535	36,218	53,770	67,811	82,227	82,227
Cherry	0	0	0	0	0	12,045	22,372	33,166	41,855	50,728	50,728

Appendix I.4 Agricultural Gross Income and Production Cost(5/6)

UC-03

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			5,272	9,823	14,602	18,441	22,347	22,347	22,347	22,347	22,347
Wheat	0	0	5,272	9,823	14,602	18,441	22,347	22,347	22,347	22,347	22,347
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			104,938	197,656	290,121	367,989	444,470	444,470	444,470	444,470	444,470
Alfalfa(dry	0	0	83,475	157,188	230,704	292,603	353,428	353,428	353,428	353,428	353,428
Cayil(dry)	0	0	21,463	40,468	59,416	75,386	91,042	91,042	91,042	91,042	91,042
Vegetables			75,399	132,677	204,085	251,839	307,753	307,753	307,753	307,753	307,753
Cucumber	0	0	0	0	0	0	0	0	0	0	0
Tomato	0	0	11,547	20,085	31,233	38,329	46,894	46,894	46,894	46,894	46,894
Potato	0	0	17,315	31,411	47,505	59,318	72,121	72,121	72,121	72,121	72,121
Strawberry	0	0	39,716	69,085	107,431	131,839	161,299	161,299	161,299	161,299	161,299
Dry Beans	0	0	6,821	12,096	17,916	22,353	27,439	27,439	27,439	27,439	27,439
Fruits					0	92,809	170,999	255,349	321,085	389,643	389,643
Walnut					0	0	0	0	0	0	0
Peach					0	5,467	10,154	15,309	19,292	23,432	23,432
Olive					0	960	1,815	2,189	2,925	3,631	3,631
Apricot					0	10,878	20,332	31,267	39,211	47,270	47,270
Apple					0	20,814	38,735	57,067	72,162	87,503	87,503
Pear					0	16,842	30,644	46,340	57,891	70,295	70,295
Sour Cherry					0	17,997	32,902	49,041	61,560	74,851	74,851
Cherry					0	19,852	36,417	54,137	68,043	82,662	82,662
Total			185,609	340,156	508,808	731,077	945,568	1,029,918	1,095,654	1,164,212	1,164,212

Production Cost (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			17,391	32,403	48,168	60,831	73,717	73,717	73,717	73,717	73,717
Wheat	0	0	17,391	32,403	48,168	60,831	73,717	73,717	73,717	73,717	73,717
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			104,288	196,431	288,323	365,709	441,716	441,716	441,716	441,716	441,716
Alfalfa(dry	0	0	82,834	155,980	228,931	290,354	350,712	350,712	350,712	350,712	350,712
Cayil(dry)	0	0	21,454	40,452	59,392	75,354	91,004	91,004	91,004	91,004	91,004
Vegetables			72,708	127,971	196,851	242,925	296,841	296,841	296,841	296,841	296,841
Cucumber	0	0	0	0	0	0	0	0	0	0	0
Tomato	0	0	9,908	17,235	26,802	32,891	40,241	40,241	40,241	40,241	40,241
Potato	0	0	17,238	31,272	47,294	59,055	71,801	71,801	71,801	71,801	71,801
Strawberry	0	0	39,344	68,438	106,426	130,605	159,790	159,790	159,790	159,790	159,790
Dry Beans	0	0	6,217	11,025	16,330	20,373	25,009	25,009	25,009	25,009	25,009
Fruits					0	67,899	125,034	186,558	234,578	284,700	284,700
Walnut	0	0	0	0	0	0	0	0	0	0	0
Peach	0	0	0	0	0	2,490	4,624	6,971	8,785	10,671	10,671
Olive	0	0	0	0	0	818	1,548	1,866	2,494	3,095	3,095
Apricot	0	0	0	0	0	6,133	11,464	17,629	22,109	26,653	26,653
Apple	0	0	0	0	0	18,941	35,249	51,931	65,668	79,627	79,627
Pear	0	0	0	0	0	17,259	31,404	47,489	59,327	72,039	72,039
Sour Cher	0	0	0	0	0	13,879	25,374	37,819	47,474	57,724	57,724
Cherry	0	0	0	0	0	8,379	15,371	22,851	28,721	34,891	34,891

Appendix I.4 Agricultural Gross Income and Production Cost(6/6)

OL-04

Gross Income (TL. Million)

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			713	732	2,711	3,283	4,076	4,076	4,076	4,076	4,076
Wheat	0	0	713	732	2,711	3,283	4,076	4,076	4,076	4,076	4,076
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			42,504	79,332	121,591	153,239	185,720	185,720	185,720	185,720	185,720
Alfalfa(dry	0	0	32,506	60,197	92,789	116,753	141,531	141,531	141,531	141,531	141,531
Cayil(dry)	0	0	9,998	19,135	28,802	36,485	44,189	44,189	44,189	44,189	44,189
Vegetables			69,794	147,301	210,555	260,874	333,691	333,691	333,691	333,691	333,691
Cucumber	0	0	14,030	27,677	37,756	51,175	64,899	64,899	64,899	64,899	64,899
Tomato	0	0	9,898	18,285	27,851	33,760	43,825	43,825	43,825	43,825	43,825
Potato	0	0	12,929	26,570	39,123	47,480	59,045	59,045	59,045	59,045	59,045
Strawberry	0	0	29,109	67,574	95,799	116,123	150,741	150,741	150,741	150,741	150,741
Dry Beans	0	0	3,828	7,195	10,026	12,337	15,181	15,181	15,181	15,181	15,181
Fruits					0	94,521	172,213	260,508	327,711	403,748	403,748
Walnut					0	33,906	60,448	92,547	116,198	143,129	143,129
Peach					0	13,562	24,568	35,507	44,745	55,584	55,584
Olive					0	0	0	0	0	0	0
Apricot					0	6,177	11,673	16,167	20,806	25,291	25,291
Apple					0	12,006	22,261	33,667	42,916	52,527	52,527
Pear					0	3,439	6,628	12,256	15,539	19,385	19,385
Sour Cherry					0	12,117	21,956	33,512	41,877	51,137	51,137
Cherry					0	13,312	24,679	36,852	45,629	56,696	56,696
Total			113,011	227,366	334,857	511,917	695,700	783,996	851,198	927,236	927,236

Production Cost (TL. Million)

Product		Project Year									
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			2,353	2,414	8,942	10,830	13,446	13,446	13,446	13,446	13,446
Wheat	0	0	2,353	2,414	8,942	10,830	13,446	13,446	13,446	13,446	13,446
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			42,250	78,862	120,866	152,326	184,614	184,614	184,614	184,614	184,614
Alfalfa(dry	0	0	32,256	59,735	92,076	115,856	140,443	140,443	140,443	140,443	140,443
Cayil(dry)	0	0	9,994	19,127	28,790	36,470	44,171	44,171	44,171	44,171	44,171
Vegetables			67,064	142,024	202,878	251,300	321,419	321,419	321,419	321,419	321,419
Cucumber	0	0	13,373	26,382	35,988	48,779	61,861	61,861	61,861	61,861	61,861
Tomato	0	0	8,494	15,691	23,900	28,970	37,607	37,607	37,607	37,607	37,607
Potato	0	0	12,872	26,452	38,949	47,270	58,783	58,783	58,783	58,783	58,783
Strawberry	0	0	28,836	66,941	94,902	115,036	149,331	149,331	149,331	149,331	149,331
Dry Beans	0	0	3,489	6,558	9,138	11,244	13,837	13,837	13,837	13,837	13,837
Fruits					0	56,263	102,815	156,800	197,550	243,168	243,168
Walnut	0	0	0	0	0	17,190	30,645	46,919	58,910	72,563	72,563
Peach	0	0	0	0	0	6,176	11,188	16,170	20,377	25,312	25,312
Olive	0	0	0	0	0	0	0	0	0	0	0
Apricot	0	0	0	0	0	3,483	6,581	9,115	11,732	14,260	14,260
Apple	0	0	0	0	0	10,926	20,258	30,637	39,053	47,799	47,799
Pear	0	0	0	0	0	3,525	6,793	12,560	15,925	19,866	19,866
Sour Cher	0	0	0	0	0	9,345	16,932	25,844	32,295	39,436	39,436
Cherry	0	0	0	0	0	5,619	10,417	15,555	19,260	23,931	23,931

Appendix I.5 Agricultural Net Income(1/3)

BT-04

unit: TL million

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-11,778	-21,311	-32,542	-41,059	-50,216	-50,216	-50,216	-50,216	-50,216
Wheat	0	0	-11,778	-21,311	-32,542	-41,059	-50,216	-50,216	-50,216	-50,216	-50,216
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			648	1,221	1,798	2,279	2,752	2,752	2,752	2,752	2,752
Alfalfa(dry)	0	0	638	1,201	1,768	2,241	2,707	2,707	2,707	2,707	2,707
Cayil(dry)	0	0	11	20	30	37	45	45	45	45	45
Vegetables			2,772	5,577	9,036	11,381	13,393	13,393	13,393	13,393	13,393
Cucumber	0	0	527	985	1,540	1,924	2,312	2,312	2,312	2,312	2,312
Tomato	0	0	1,367	2,918	4,706	6,007	6,987	6,987	6,987	6,987	6,987
Potato	0	0	57	99	151	187	229	229	229	229	229
Strawberry	0	0	275	555	970	1,201	1,399	1,399	1,399	1,399	1,399
Dry Beans	0	0	546	1,020	1,668	2,062	2,465	2,465	2,465	2,465	2,465
Fruits					0	71,911	134,431	196,863	249,586	302,578	302,578
Walnut			0	0	0	29,191	54,770	80,381	101,954	123,461	123,461
Peach			0	0	0	13,319	24,490	35,894	45,301	55,132	55,132
Olive			0	0	0	695	1,302	2,256	2,753	3,255	3,255
Anzu			0	0	0	5,958	11,550	16,515	21,253	25,621	25,621
Apple			0	0	0	2,411	4,380	6,544	8,197	9,980	9,980
Pear			0	0	0	-375	-717	-1,026	-1,315	-1,591	-1,591
Sour Cherry			0	0	0	5,456	10,021	14,805	18,646	22,676	22,676
Cherry			0	0	0	15,257	28,635	41,494	52,797	64,045	64,045
Total			-8,358	-14,513	-21,709	44,512	100,361	162,792	215,515	268,508	268,508

MC-03

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-9,113	-16,481	-26,512	-33,005	-40,593	-40,593	-40,593	-40,593	-40,593
Wheat	0	0	-7,716	-13,926	-22,432	-27,893	-34,294	-34,294	-34,294	-34,294	-34,294
Rice	0	0	-1,397	-2,555	-4,080	-5,112	-6,299	-6,299	-6,299	-6,299	-6,299
Fodder			535	1,000	1,491	1,884	2,284	2,284	2,284	2,284	2,284
Alfalfa(dry)	0	0	526	983	1,466	1,852	2,244	2,244	2,244	2,244	2,244
Cayil(dry)	0	0	9	17	26	32	39	39	39	39	39
Vegetables			2,989	5,131	7,962	9,767	12,041	12,041	12,041	12,041	12,041
Cucumber	0	0	483	807	1,260	1,532	1,901	1,901	1,901	1,901	1,901
Tomato	0	0	1,504	2,577	3,990	4,894	6,042	6,042	6,042	6,042	6,042
Potato	0	0	56	100	153	190	229	229	229	229	229
Strawberry	0	0	323	551	878	1,069	1,315	1,315	1,315	1,315	1,315
Dry Beans	0	0	622	1,096	1,681	2,082	2,555	2,555	2,555	2,555	2,555
Fruits					0	53,635	99,340	149,324	188,870	229,737	229,737
Walnut			0	0	0	19,228	35,423	53,556	67,453	82,351	82,351
Peach			0	0	0	10,359	18,629	28,072	35,670	43,525	43,525
Olive			0	0	0	650	1,202	1,891	2,359	2,854	2,854
Anzu			0	0	0	5,002	9,565	14,140	18,005	21,717	21,717
Apple			0	0	0	1,910	3,577	5,430	6,845	8,286	8,286
Pear			0	0	0	-316	-572	-851	-1,069	-1,294	-1,294
Sour Cherry			0	0	0	4,414	8,331	12,422	15,757	19,091	19,091
Cherry			0	0	0	12,387	23,186	34,664	43,849	53,207	53,207
Total			-5,590	-10,350	-17,058	32,281	73,072	123,056	162,602	203,470	203,470

Appendix I.5 Agricultural Net Income(2/3)

TR-06

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-57,447	-107,473	-158,934	-201,080	-243,419	-243,419	-243,419	-243,419	-243,419
Wheat	0	0	-57,447	-107,473	-158,934	-201,080	-243,419	-243,419	-243,419	-243,419	-243,419
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			1,161	2,188	3,206	4,068	4,912	4,912	4,912	4,912	4,912
Alfalfa(dry)	0	0	1,142	2,152	3,153	4,000	4,830	4,830	4,830	4,830	4,830
Cayil(dry)	0	0	19	36	53	68	82	82	82	82	82
Vegetables			7,382	13,664	20,507	25,780	31,214	31,214	31,214	31,214	31,214
Cucumber	0	0	1,503	2,760	4,170	5,224	6,333	6,333	6,333	6,333	6,333
Tomato	0	0	4,551	8,398	12,616	15,845	19,196	19,196	19,196	19,196	19,196
Potato	0	0	99	192	277	356	428	428	428	428	428
Strawberry	0	0	793	1,455	2,199	2,754	3,338	3,338	3,338	3,338	3,338
Dry Beans	0	0	436	859	1,245	1,602	1,919	1,919	1,919	1,919	1,919
Fruits					0	107,041	200,423	296,295	374,686	452,908	452,908
Walnut			0	0	0	34,325	64,049	95,042	120,007	145,172	145,172
Peach			0	0	0	22,880	42,281	62,825	79,065	95,765	95,765
Olive			0	0	0	0	0	0	0	0	0
Anzu			0	0	0	9,401	17,442	25,675	32,408	39,252	39,252
Apple			0	0	0	4,102	7,718	11,348	14,387	17,384	17,384
Pear			0	0	0	-292	-547	-809	-1,024	-1,238	-1,238
Sour Cherry			0	0	0	9,314	17,688	26,018	33,060	39,855	39,855
Cherry			0	0	0	27,310	51,793	76,196	96,783	116,719	116,719
Total			-48,903	-91,621	-135,221	-64,191	-6,870	89,002	167,393	245,615	245,615

UC-14

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-32,538	-60,803	-90,080	-113,894	-137,899	-137,899	-137,899	-137,899	-137,899
Wheat	0	0	-32,538	-60,803	-90,080	-113,894	-137,899	-137,899	-137,899	-137,899	-137,899
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			678	1,276	1,869	2,372	2,867	2,867	2,867	2,867	2,867
Alfalfa(dry)	0	0	666	1,253	1,836	2,329	2,815	2,815	2,815	2,815	2,815
Cayil(dry)	0	0	12	23	33	42	51	51	51	51	51
Vegetables			2,440	4,992	7,529	9,657	11,639	11,639	11,639	11,639	11,639
Cucumber	0	0	99	337	485	619	793	793	793	793	793
Tomato	0	0	1,355	2,900	4,270	5,610	6,656	6,656	6,656	6,656	6,656
Potato	0	0	63	112	171	213	260	260	260	260	260
Strawberry	0	0	324	593	917	1,149	1,402	1,402	1,402	1,402	1,402
Dry Beans	0	0	599	1,050	1,686	2,066	2,528	2,528	2,528	2,528	2,528
Fruits					0	60,890	112,152	169,037	212,183	257,387	257,387
Walnut			0	0	0	23,473	43,224	64,624	81,283	98,755	98,755
Peach			0	0	0	9,063	16,179	26,027	32,021	38,936	38,936
Olive			0	0	0	0	0	0	0	0	0
Anzu			0	0	0	3,928	7,433	11,215	14,127	16,935	16,935
Apple			0	0	0	2,443	4,524	6,671	8,426	10,234	10,234
Pear			0	0	0	-304	-585	-862	-1,099	-1,324	-1,324
Sour Cherry			0	0	0	5,796	10,746	15,954	20,120	24,397	24,397
Cherry			0	0	0	16,491	30,631	45,409	57,305	69,454	69,454
Total			-29,421	-54,535	-80,682	-40,976	-11,241	45,644	88,790	133,994	133,994

Appendix I.5 Agricultural Net Income(3/3)

UC-03

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-12,119	-22,580	-33,566	-42,390	-51,370	-51,370	-51,370	-51,370	-51,370
Wheat	0	0	-12,119	-22,580	-33,566	-42,390	-51,370	-51,370	-51,370	-51,370	-51,370
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			650	1,225	1,798	2,280	2,754	2,754	2,754	2,754	2,754
Alfalfa(dry)	0	0	642	1,208	1,773	2,249	2,716	2,716	2,716	2,716	2,716
Cayil(dry)	0	0	9	17	25	31	38	38	38	38	38
Vegetables			2,691	4,706	7,234	8,914	10,912	10,912	10,912	10,912	10,912
Cucumber	0	0	0	0	0	0	0	0	0	0	0
Tomato	0	0	1,638	2,849	4,431	5,438	6,653	6,653	6,653	6,653	6,653
Potato	0	0	77	139	211	263	320	320	320	320	320
Strawberry	0	0	372	646	1,005	1,234	1,509	1,509	1,509	1,509	1,509
Dry Beans	0	0	604	1,071	1,587	1,979	2,430	2,430	2,430	2,430	2,430
Fruits					0	24,909	45,965	68,791	86,507	104,943	104,943
Walnut			0	0	0	0	0	0	0	0	0
Peach			0	0	0	2,978	5,530	8,337	10,507	12,761	12,761
Olive			0	0	0	141	268	323	431	535	535
Anzu			0	0	0	4,744	8,868	13,637	17,102	20,617	20,617
Apple			0	0	0	1,873	3,486	5,136	6,495	7,875	7,875
Pear			0	0	0	-418	-760	-1,149	-1,436	-1,744	-1,744
Sour Cherry			0	0	0	4,118	7,528	11,221	14,086	17,127	17,127
Cherry			0	0	0	11,473	21,045	31,286	39,322	47,771	47,771
Total			-8,778	-16,649	-24,535	-6,287	8,261	31,087	48,803	67,239	67,239

OL-04

unit:BTL

Product	Project Year										
	Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10～25
Cereal			-1,640	-1,682	-6,231	-7,547	-9,370	-9,370	-9,370	-9,370	-9,370
Wheat	0	0	-1,640	-1,682	-6,231	-7,547	-9,370	-9,370	-9,370	-9,370	-9,370
Rice	0	0	0	0	0	0	0	0	0	0	0
Fodder			254	471	725	912	1,106	1,106	1,106	1,106	1,106
Alfalfa(dry)	0	0	250	463	713	897	1,088	1,088	1,088	1,088	1,088
Cayil(dry)	0	0	4	8	12	15	18	18	18	18	18
Vegetables			2,730	5,277	7,676	9,575	12,272	12,272	12,272	12,272	12,272
Cucumber	0	0	657	1,296	1,767	2,396	3,038	3,038	3,038	3,038	3,038
Tomato	0	0	1,404	2,594	3,951	4,790	6,218	6,218	6,218	6,218	6,218
Potato	0	0	57	118	174	211	262	262	262	262	262
Strawberry	0	0	272	632	896	1,087	1,410	1,410	1,410	1,410	1,410
Dry Beans	0	0	339	637	888	1,092	1,344	1,344	1,344	1,344	1,344
Fruits					0	38,258	69,399	103,708	130,160	160,581	160,581
Walnut			0	0	0	16,717	29,802	45,628	57,289	70,566	70,566
Peach			0	0	0	7,386	13,380	19,337	24,369	30,272	30,272
Olive			0	0	0	0	0	0	0	0	0
Anzu			0	0	0	2,694	5,091	7,051	9,075	11,031	11,031
Apple			0	0	0	1,081	2,004	3,030	3,862	4,727	4,727
Pear			0	0	0	-85	-164	-304	-385	-481	-481
Sour Cherry			0	0	0	2,773	5,024	7,668	9,582	11,701	11,701
Cherry			0	0	0	7,693	14,262	21,297	26,369	32,765	32,765
Total			1,344	4,065	2,171	41,198	73,407	107,716	134,169	164,589	164,589

Appendix I.6 Costs in the Natural Resources Rehabilitation and Management Project by Activities and MCs

(Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
BT-04						
Soil conservation						0
Afforestation		415,000				415,000
Rehabilitation of high forest						0
Rehabilitati	148,000	148,000				296,000
Energy fore	550,000	551,000				1,101,000
Rangeland r	43,400	43,400	43,400	43,400	43,400	217,000
Riverside plantation			9,000			9,000
Total	741,400	1,157,400	52,400	43,400	43,400	2,038,000
MC-03						
Soil conserv	140,800	140,800	140,800	140,800	140,800	704,000
Afforestation						0
Rehabilitati	68,400	68,400	68,400	68,400	68,400	342,000
Rehabilitation of copse forest						0
Energy forest plantation						0
Rangeland r	38,400	38,400	38,400	38,400	38,400	192,000
Riverside plantation						0
Total	247,600	247,600	247,600	247,600	247,600	1,238,000
TR-06						
Soil conserv	245,800	245,800	245,800	245,800	245,800	1,229,000
Afforestation						0
Rehabilitati	116,000					116,000
Rehabilitation of copse forest						0
Energy forest plantation						0
Rangeland r	35,400	35,400	35,400	35,400	35,400	177,000
Riverside plantation		6,000				6,000
Total	397,200	287,200	281,200	281,200	281,200	1,528,000
UC-14						
Soil conserv	266,800	266,800	266,800	266,800	266,800	1,334,000
Afforestation		168,000	168,000			336,000
Rehabilitati	92,000					92,000
Rehabilitati	52,000	53,000				105,000
Energy fore	752,500	752,500				1,505,000
Rangeland r	101,000	101,000	101,000	101,000	101,000	505,000
Riverside plantation						0
Total	1,264,300	1,341,300	535,800	367,800	367,800	3,877,000
UC-03						
Soil conserv	207,200	207,200	207,200	207,200	207,200	1,036,000
Afforestation		1,000				1,000
Rehabilitation of high forest						0
Rehabilitation of copse forest						0
Energy forest plantation						0
Rangeland rehabilitation						0
Riverside pl	10,000					10,000
Total	217,200	208,200	207,200	207,200	207,200	1,047,000
OL-04						
Soil conserv	516,600	516,600	516,600	516,600	516,600	2,583,000
Afforestation		204,000	205,000			409,000
Rehabilitati	362,000	362,000	362,000	362,000	362,000	1,810,000
Rehabilitation of copse forest						0
Energy forest plantation						0
Rangeland r	364,000	364,000	364,000	364,000	364,000	1,820,000
Riverside plantation		8,000				8,000
Total	1,242,600	1,454,600	1,447,600	1,242,600	1,242,600	6,630,000

Appendix I.7 Facility Construction Costs in the Livelihood Improvement Project by Activities and MCs Management Project by Activities and MCs

(Unit: TL10[b] at 2003 prices)

Component \ Project year		Year 1	Year 2	Year 3	Year 4	Year 5	Total
BT-04							
Irrigation Improvement		236,000	591,000	118,000	118,000	118,000	1,181,000
Greenhouse construction							
Livestock improvement		137,000					137,000
Fodder production improvement		118,000	294,000	59,000	59,000	59,000	589,000
Fruit orchards rehabilitation			160,000				160,000
Agricultural mechanization				840,000			840,000
Apiculture				41,000	41,000		82,000
Marketing improvement			210,000	210,000	210,000	210,000	840,000
	Total	491,000	1,255,000	1,268,000	428,000	387,000	3,829,000
MC-03							
Irrigation Improvement		81,000	202,000	40,300	40,300	40,300	403,900
Greenhouse construction							
Livestock improvement		202,400	202,400	101,200			506,000
Fodder production improvement		46,600	116,500	23,000	23,000	23,000	232,100
Fruit orchards rehabilitation			79,000				79,000
Agricultural mechanization							
Apiculture			8,000	20,000	8,000	4,000	40,000
Marketing improvement							
Total		330,000	607,900	184,500	71,300	67,300	1,261,000
TR-06							
Irrigation Improvement		88,600	221,500	44,300	44,300	44,300	443,000
Greenhouse construction		260,400	651,000	130,200	130,200	130,200	1,302,000
Livestock improvement		212,000	127,200	84,800			424,000
Fodder production improvement		126,500	75,900	23,300	23,300		249,000
Fruit orchards rehabilitation		34,000	20,400	13,600			68,000
Agricultural mechanization							
Apiculture							
Marketing improvement		150,000	90,000	64,000			304,000
	Total	871,500	1,186,000	360,200	197,800	174,500	2,790,000
UC-14							
Irrigation Improvement		83,800	209,500	41,900	41,900	41,900	419,000
Greenhouse construction							
Livestock improvement		241,200	603,000	241,200	120,600		1,206,000
Fodder production improvement		34,000	85,000	34,000	17,000		170,000
Fruit orchards rehabilitation			26,000				26,000
Agricultural mechanization				240,000			240,000
Apiculture			14,000	8,400	5,600		28,000
Marketing improvement							
	Total	359,000	937,500	565,500	185,100	41,900	2,089,000
UC-03							
Irrigation Improvement		30,200	75,500	45,300			151,000
Greenhouse construction							
Livestock improvement		41,800	104,500	20,900	20,900	20,900	209,000
Fodder production improvement		34,600	86,500	17,400	17,400	17,400	173,300
Fruit orchards rehabilitation			31,000				31,000
Agricultural mechanization		30,000	75,000	15,500	15,500	15,500	151,500
Apiculture			3,800	9,500	2,000	2,000	17,300
Marketing improvement							
	Total	136,600	376,300	108,600	55,800	55,800	733,100
OL-04							
Irrigation Improvement		224,600	571,500	121,000	121,000	121,500	1,159,600
Greenhouse construction							
Livestock improvement		32,400	81,000	32,400	16,200		162,000
Fodder production improvement		48,800	122,000	48,000	24,400		243,200
Fruit orchards rehabilitation			79,000				79,000
Agricultural mechanization							
Apiculture			5,500	5,500			11,000
Marketing improvement							0
	Total	305,800	859,000	206,900	161,600	121,500	1,654,800

Appendix I.8 Costs for Human Resources Development Projects by Activities and MCs

BT-04 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	42,000	42,000				84,000
Research	34,000	34,000	32,000			100,000
Demonstration	28,000	28,000	28,000	28,000	28,000	140,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	219,000	119,000	75,000	43,000	43,000	499,000

MC-03 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	15,000	15,000				30,000
Research	34,000	34,000	32,000			100,000
Demonstration	10,000	10,000	10,000	10,000	10,000	50,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	174,000	74,000	57,000	25,000	25,000	355,000

TR-06 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	15,000	15,000				30,000
Research	34,000	34,000	32,000			100,000
Demonstration	10,000	10,000	10,000	10,000	10,000	50,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	174,000	74,000	57,000	25,000	25,000	355,000

UC-14 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	24,000	24,000				48,000
Research	34,000	34,000	32,000			100,000
Demonstration	16,000	16,000	16,000	16,000	16,000	80,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	189,000	89,000	63,000	31,000	31,000	403,000

UC-03 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	15,000	15,000				30,000
Research	34,000	34,000	32,000			100,000
Demonstration	10,000	10,000	10,000	10,000	10,000	50,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	174,000	74,000	57,000	25,000	25,000	355,000

OL-04 (Unit: $TL10^6$ at 2003 prices)

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Training	100,000					100,000
Awareness promotion	42,000	42,000				84,000
Research	34,000	34,000	32,000			100,000
Demonstration	28,000	28,000	28,000	28,000	28,000	140,000
Technical assistance	15,000	15,000	15,000	15,000	15,000	75,000
Total	219,000	119,000	75,000	43,000	43,000	499,000

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (1/6)

BT-04 Savsat

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	354	137	0	219	710	0	0	0	0	-710
2	1,045		0	119	1,164	-8	-41	3	-46	-1,210
3	1,227		41	75	1,343	-14	-54	10	-58	-1,401
4	597		41	43	681	-21	4.4	14	-3	-684
5	387		0	43	430	44	220	14	278	-152
6						100	351	14	465	465
7						162	371.2	14	547	547
8						215	456	14	685	685
9						268	492.4	14	774	774
10						268	492.4	14	774	774
11						268	492.4	14	774	774
12						268	492.4	14	774	774
13						268	492.4	14	774	774
14						268	492.4	14	774	774
15						268	492.4	14	774	774
16						268	492.4	14	774	774
17						268	492.4	14	774	774
18						268	492.4	14	774	774
19						268	492.4	14	774	774
20						268	492.4	14	774	774
21						268	492.4	14	774	774
22						268	492.4	14	774	774
23						268	492.4	14	774	774
24						268	492.4	14	774	774
25						268	492.4	14	774	774

IRR 11.53% (annual)

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (2/6)

MC-03 Yusufeli

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	127	202	0	174	504	0	0	0	0	-504
2	397	202	8	74	681	-5	-3	2	-6	-687
3	64	101	20	57	242	-10	-4	8	-6	-248
4	64		8	25	97	-17	-9	11	-15	-112
5	64		4	25	93	32	33	11	76	-17
6						73	78	11	162	162
7						123	88	11	222	222
8						162	99	11	272	272
9						203	103	11	317	317
10						203	103	11	317	317
11						203	103	11	317	317
12						203	103	11	317	317
13						203	103	11	317	317
14						203	103	11	317	317
15						203	103	11	317	317
16						203	103	11	317	317
17						203	103	11	317	317
18						203	103	11	317	317
19						203	103	11	317	317
20						203	103	11	317	317
21						203	103	11	317	317
22						203	103	11	317	317
23						203	103	11	317	317
24						203	103	11	317	317
25						203	103	11	317	317

IRR 11.57% (annual)

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (3/6)

TR-06 Uzundere

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	660	212		174	1,046	0	0	0	0	-1,046
2	1,059	127		74	1,260	-48	-74	0	-122	-1,382
3	271	85		57	413	-91	-98	0	-189	-602
4	198			25	223	-135	19	0	-116	-339
5	175			25	200	-64	72	0	8	-192
6						-7	125	0	118	118
7						89	166	0	255	255
8						167	203	0	370	370
9						245	220	0	465	465
10						245	220	0	465	465
11						245	220	0	465	465
12						245	220	0	465	465
13						245	220	0	465	465
14						245	220	0	465	465
15						245	220	0	465	465
16						245	220	0	465	465
17						245	220	0	465	465
18						245	220	0	465	465
19						245	220	0	465	465
20						245	220	0	465	465
21						245	220	0	465	465
22						245	220	0	465	465
23						245	220	0	465	465
24						245	220	0	465	465
25						245	220	0	465	465

IRR 7.07% (annual)

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (4/6)

UC-14 Ispir

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	118	241	0	189	548	0	0	0	0	-548
2	321	603	14	89	1,027	-29	-43	1	-71	-1,098
3	2,476	241	8	63	2,789	-54	-58	5	-107	-2,896
4	59	121	6	31	216	-80	115	5	40	-176
5	42			31	73	-40	430	5	395	322
6						-11	744	5	738	738
7						45	982	5	1,032	1,032
8						88	982	5	1,075	1,075
9						133	982	5	1,120	1,120
10						133	982	5	1,120	1,120
11						133	982	5	1,120	1,120
12						133	982	5	1,120	1,120
13						133	982	5	1,120	1,120
14						133	982	5	1,120	1,120
15						133	982	5	1,120	1,120
16						133	982	5	1,120	1,120
17						133	982	5	1,120	1,120
18						133	982	5	1,120	1,120
19						133	982	5	1,120	1,120
20						133	982	5	1,120	1,120
21						133	982	5	1,120	1,120
22						133	982	5	1,120	1,120
23						133	982	5	1,120	1,120
24						133	982	5	1,120	1,120
25						133	982	5	1,120	1,120

IRR 15.47% (annual)

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (5/6)

UC-03 Bayburt

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	95	42	4	174	314	0	0	0	0	-314
2	268	105	10	74	456	-8	-39	2	-45	-501
3	78	21	2	57	157	-16	-52	7	-61	-218
4	32	21	2	25	80	-24	10	10	-4	-84
5	32	21	2	25	80	-6	39	10	43	-37
6						8	68	10	86	86
7						31	89	10	130	130
8						48	110	10	168	168
9						67	119	10	196	196
10						67	119	10	196	196
11						67	119	10	196	196
12						67	119	10	196	196
13						67	119	10	196	196
14						67	119	10	196	196
15						67	119	10	196	196
16						67	119	10	196	196
17						67	119	10	196	196
18						67	119	10	196	196
19						67	119	10	196	196
20						67	119	10	196	196
21						67	119	10	196	196
22						67	119	10	196	196
23						67	119	10	196	196
24						67	119	10	196	196
25						67	119	10	196	196

IRR 9.82% (annual)

Appendix I. 9 IRR of the Agriculture Improvement Project by MCs (6/6)

OL-04 Oltu

	Production Cost					Benfit				
Year	Agriculture Project	Livestock Projects	Apiculture Projects	Human Developmen	Total Cost	Agriculture Net Income	Livestock Net Income	Apiculture Net Income	Total	Net Benefit
1	273	32	0	219	525	0	0	0	0	-525
2	763	81	0	119	963	1	-16	1	-14	-977
3	161	32	6	75	274	4	-21	2	-15	-289
4	137	16	6	43	201	2	40	2	44	-157
5	112			43	155	41	147	2	190	35
6						73	270	2	345	345
7						107	372	2	481	481
8						134	396	2	532	532
9						164	396	2	562	562
10						164	396	2	562	562
11						164	396	2	562	562
12						164	396	2	562	562
13						164	396	2	562	562
14						164	396	2	562	562
15						164	396	2	562	562
16						164	396	2	562	562
17						164	396	2	562	562
18						164	396	2	562	562
19						164	396	2	562	562
20						164	396	2	562	562
21						164	396	2	562	562
22						164	396	2	562	562
23						164	396	2	562	562
24						164	396	2	562	562
25						164	396	2	562	562

IRR 16.21% (annual)

Appendix I. 10 Economic Internal Rtae of Return (EIRR)

Year	Project Cost											Benefit				
	Ntural Reosurces	Agriculture Projects	Livestock Projects	Apiculture Projects	Huamn Developme	Cross Catchment	Direct Cost	Engineering Service	Sub-Total Cost	Contingency	Total Cost	Agricultur net income	Livestock net inocme	Apiculture net income	Total	Net Benefit
1	4,110	1,299	779	4	1,149	799	7,340	619	7,959	1,592	9,551	0	0	0	0	**-9,551**
2	4,710	3,081	1,061	22	549	400	9,423	887	10,310	2,062	12,372	-97	-216	8	-305	**-12,677**
3	2,808	2,206	431	59	384	799	5,888	550	6,438	1,288	7,726	-181	-287	31	-437	**-8,163**
4	2,434	866	141	67	192	799	3,700	351	4,051	810	4,861	-275	179	42	-54	**-4,915**
5	2,295	652	19	13	192	400	3,171	298	3,468	694	4,162	78	907	42	1,027	**-3,135**
6						400						236	1,556	42	1,834	**1,834**
7						200						557	2,057	42	2,656	**2,656**
8						200						814	2,305	42	3,161	**3,161**
9												1,080	2,411	42	3,533	**3,533**
10												1,080	2,411	42	3,533	**3,533**
11												1,080	2,411	42	3,533	**3,533**
12												1,080	2,411	42	3,533	**3,533**
13												1,080	2,411	42	3,533	**3,533**
14												1,080	2,411	42	3,533	**3,533**
15												1,080	2,411	42	3,533	**3,533**
16												1,080	2,411	42	3,533	**3,533**
17												1,080	2,411	42	3,533	**3,533**
18												1,080	2,411	42	3,533	**3,533**
19												1,080	2,411	42	3,533	**3,533**
20												1,080	2,411	42	3,533	**3,533**
21												1,080	2,411	42	3,533	**3,533**
22												1,080	2,411	42	3,533	**3,533**
23												1,080	2,411	42	3,533	**3,533**
24												1,080	2,411	42	3,533	**3,533**
25												1,080	2,411	42	3,533	**3,533**

EIRR 4.53% (%/annual)