126% for potatoes, 138% for fodder, 125% for vegetables and fruits.

3.2.5 Irrigation Development Plan

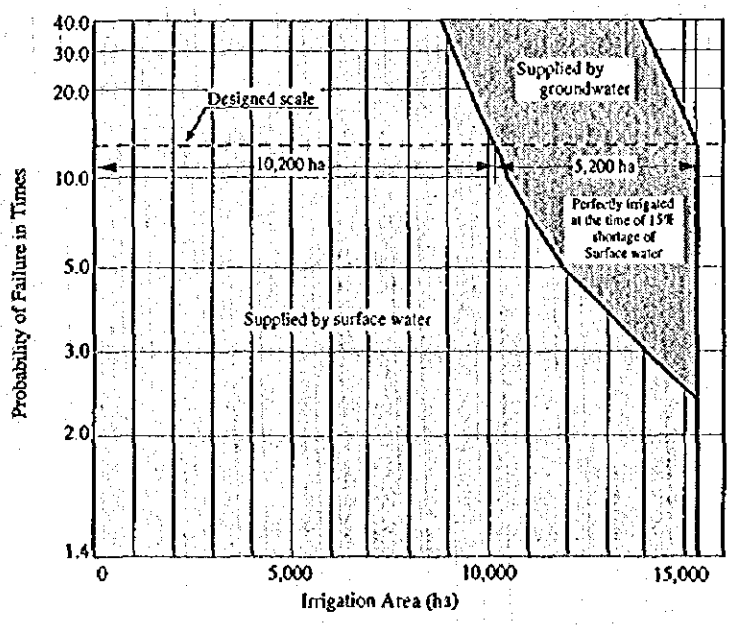
(1) Basic Concept for Irrigation Development

The aim of the Project is to promote agricultural development in the Beydağ and Ödemiş areas by providing irrigation water from two water sources: one is groundwater to be developed within the allowable range from the viewpoint of sustainable groundwater use in the Project Area, and the other is surface water to be developed by construction of the Beydağ dam. As formulated in Section 2.2.4, the proposed command area of the Project is 15,400 ha in net, of which 10,200 ha will be irrigated by surface water and the remaining 5,200 ha will be by groundwater.

For the Project, the main concept for irrigation development is focused on an effective use of surface water and groundwater to maintain a sustainable irrigation development. Under the Project, the farmers will not be specified for the use of water source, and therefore they can use either surface water through the new irrigation system or groundwater using their own existing wells, though it is expected that the farmers, particularly in the highland area, may preferably select the new surface water supply. In the lowland area, however, the groundwater source in the Project Area is still expected to be used continuously for supplementary purposes within the permitted quantity of water in future. The command areas of the existing irrigation cooperatives will also be provided with surface water through the new irrigation canal system in addition to the groundwater supply being practiced at present.

(2) Irrigation Areas To Be Covered by Respective Water Sources

The following figure shows the relation between the probability of the occurrence of drought (probability of failure in times) and the irrigable area of the proposed Baydağ reservoir.



According to this figure, the whole irrigation area of the Project can be covered by surface water from the Beydağ reservoir when the drought with a return period of smaller than 2.5 times occurs. This means that the whole area can be covered by surface water for 60% of all operation term. When drought with a return period of more than 2.5 times occurs, the groundwater will be supplementary used for the irrigation of 5,200 ha at maximum.

From the above study, it is concluded that surface water from the Beydağ reservoir is a substantial water source for the Project, and can cover the whole irrigation area in the normal years, while groundwater is required only for supplementary use for the severe drought years. In this manner, the groundwater source is understood to be for isolated spot use and therefore a physical irrigation system for conjunctive use of surface water and groundwater is not considered for the Project. The farmers having their own wells will use groundwater, when needed, under the guidance of the proposed O&M Division of the Project Office. The existing private wells will be continuously operated and maintained for the purpose of domestic water supply, besides such irrigation water supply as mentioned above.

(3) Proposed Irrigation Method

Modern irrigation methods such as sprinkler and drip irrigation methods are planned to be positively introduced to the Project Area. According to the result of the irrigation experiment done by DSİ-II in collaboration with the Study Team, the drip irrigation method was proved to be applicable in the Project Area, and the sprinkler irrigation method is also recommendable in the area, except for the farmland having very small infiltration characteristics. Furrow irrigation method is also applicable, though depending upon crops, as long as the irrigation is carefully practiced. Border irrigation is permitted mainly for tree crops only in a limited area.

In the irrigation practices, farmers should carefully irrigate the crops without wasting water, after knowing the soil moisture condition. For this, tensiometers are recommended to be installed in order to know the soil moisture condition for the application of every irrigation method.

(4) Irrigation Water Requirements

The irrigation water requirements in the Project Area were calculated based on the cropping pattern proposed in Paragraph 3.2.4-(4), the present soil and land use conditions, and other conditions for the calculations mentioned in Paragraph 2.2.6-(3). Thus, the annual average irrigation requirements were obtained to be 617.8 mm as detailed in Annex H and the average monthly apportionments are as follows:

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
0.2	0.3	2.1	10.9	67.8	113.6	122.4	163.6	97.8	34.0	4.9	0.3	617.8

Note: An overall irrigation efficiency of 0.78 is applied, assuming that the three irrigation methods of surface irrigation, sprinkler irrigation and drip irrigation will cover the irrigation areas depending on the proposed cropping pattern. The irrigation efficiencies are 0.58, 0.78 and 0.98 respectively.

According to the result of water requirement calculations, the peak irrigation water

requirement of 166.1 mm/month/ha, equivalent to 0.62 lit/sec/ha, frequently appears in August when there is no rainfall. Then, this peak requirement is taken to be the basic unit requirement for the calculation of the unit design discharge of the canal. The unit design discharge is obtained by the basic unit requirement by the flexibility factor following the Turkish irrigation criteria. The unit design discharge thus obtained is shown in the following table.

(unit: lit/sec/ha)

Canal	Basic Unit Requirement	Flexibility Factor*	Unit Design Discharge	Remarks
Main Canal	0.62	-	0.62	No excessive factor is considered.
Secondary Canal	0.62	1.44	0.89	Command area is assumed to be 600 ha
Tertiary Canal	0.62	2.02	1.25	Command area is assumed to be 100 ha

(Note) *: This factor is taken from "Fleksibilite katsayıları K" of the Turkish irrigation criteria

(5) Proposed Irrigation System and Facilities

(a) Irrigation Canal System

The layout plan of the irrigation canal system was prepared based on the topographic map on a scale of 1:25,000 and referring to the layout plan prepared by DSİ-II in the feasibility study for the Beydağ Dam Project. According to the plan thus prepared, the canal system will consist of a headrace, two main canals: Right Main Canal and Left Main Canal , 16 secondary canals, and 267 tertiary canals as shown in Figure 3.2.4. The functions and salient features of these canals are mentioned below.

(i) Headrace

A headrace with a length of 1.0 km will be constructed to convey irrigation water of 9.55 m^3/sec from the intake facility newly proposed at the outlet of the diversion tunnel of the Beydağ dam to the bifurcation point of the Right and Left Main Canals. The canal will be of a closed conduit type, as concluded in the comparative study made in the following Sub-paragraph (ii). The steel lining PC pipe with a diameter of 2,200mm will be used for the construction of the canal. The water level at the head of the canal is set at EL. 173.50 m and the hydraulic gradient in the canal is 1/550.

(ii) Main canals

Two main canals are required to deliver irrigation water from the headrace to the respective secondary canals. The Right and Left Main Canals will bifurcate at the tail of the headrace. The Right Main Canal with a length of 30.5 km will be constructed in the right bank area of the Küçük Menderes river to irrigate 9,550 ha of farmlands. The water level at the head of the canal will be EL. 169.40 m, and the canal is designed with a design discharge of 5.92 m^3/sec at its head and a hydraulic gradient of 1/1,300. While, the Left Main Canal will run for 28.5 km in the left bank area to irrigate 5,850 ha of farmlands. The water level at the head of the canal will be EL. 169.4 m, and the canal is designed with a design discharge of 3.63 m^3/sec at its head and a hydraulic gradient of 1/3,230. Due to a hydraulic limit and topographic condition in the area, both main canals will convey irrigation water by the gravity system.

For conveying irrigation water by the main canals, including the headrace portion, two types of canal are conceivable: open channel type and closed conduit type. Since there would be no technical difficulty in construction of both systems, the comparative study is made mainly from the economical viewpoint to select the canal type between them. In this comparative study, the cost estimate is made for the total length of the main canals. The former has a concrete-lined trapezoidal section with a bottom width of 2.0~3.0 m, while the latter is composed of steel lining PC pipes with a diameter of 2,200 mm. The estimated construction costs for both types are detailed in Annex H and summarized below.

(Unit: TL million)

Work Items	Open channel type	Closed conduit type
Earth work:	169,130	121,128
Concrete or pipe:	253,855	522,297
Related structures:	387,511	261,853
Sub-total	810,496	905,278
Land acquisition:	158,737	61,103
Total	969,233	966,381

According to the above table, there is no remarkable difference of cost between two types of canal, and it is difficult to judge economically which is more advantageous for the Project. However, if the following matters are taken into consideration, the closed conduit type would be justifiable.

1) The conveyance loss is less in case of the closed conduit type than the open channel type.

2) The canal water can be kept clean in case of the closed conduit type, because there will be less chance for trash and sediment to flow into the canal.

3) The open channel type would be dangerous particularly in village area, because there will be many chances for children to fall into the canal.

4) There would be a more quick and fair response to the water demand in case of the closed conduit type than the open channel type.

5) The maintenance cost is cheaper in case of the closed conduit type than the open channel type.

The alignment of the canal will be made alongside the existing roads and therefore any new service road will not be required along the canals. The pipes for canals will be buried under the ground throughout the length to save the cultivation area from the occupation by the canals and to minimize the land acquisition cost.

(iii) Secondary canals

All the secondary canals will be branched off from the above mentioned main canals to distribute water to the secondary units, of which size will be 960 ha on average with a

variation from 380 ha to 1,760 ha depending on the topography. In the right bank area, nine secondary canals with a total length of 44.4 km will be constructed to cover an irrigation area of 9,550 ha, while in the left bank area, seven secondary canals will be required for an irrigation of 5,850 ha. All these canals will be of conduit type composed of PVC pipes and buried under the ground. Since the alignment of the canals will be made alongside the existing roads, no service road will newly be required along the canals, but gravel metalling will be needed on the roads for the width of 4.0 m, because almost all the existing roads are of earthen type.

The following table shows the salient features of the secondary canals:

Name of Canal	Irrigation Area (ha)	Design Length (m)	Design Discharge (m^3/sec)	Pipe Diameter (mm)
Right Bank				
SR 1	380	3,000	0.34	600
SR 2	450	2,000	0.40	600
SR 3	730	3,000	0.65	600
SR 4	880	4,200	0.78	600
SR 5	1,180	3,200	1.05	800
SR 6	1,760	7,600	1.57	800
SR 7	1,320	7,700	1.17	800
SR 8	1,440	7,800	1.28	800
SR 9	1,410	5,900	1.25	800
Sub-total	9,550	44,400	-	-
Left Bank				
SL 1	640	8,000	0.57	600
SL 2	630	3,700	0.56	600
SL 3	620	3,500	0.55	600
SL 4	1,020	4,000	0.91	800
SL 5	1,270	4,350	1.13	800
SL 6	740	1,300	0.66	600
SL 7	930	3,300	0.83	800
Sub-total	5,850	28,150	-	-
	Total	15,400	72,550	-

(iv) Tertiary canals

In order to distribute irrigation water to all tertiary blocks equally, about 267 tertiary canals with a total length of 347.2 km will be constructed in the Project Area. All these tertiary canals will be branched off directly from the secondary canals and aligned at an interval of 400 m between them, on average, considering the size of an on-farm development block suitable for mechanized farming and organizing the tertiary group of the water users' association in the future. All the canals will be of conduit type, composed of PVC pipes buried under the ground, and will have enough water head required for the operation of all types of the irrigation methods proposed under the Project, for which booster pumps will be required in case that the water head is not enough due to topographic condition.

The following table shows the required lengths of the tertiary canals in the command areas of the respective secondary canals.

(Unit: km)

Right Bank Area		Left Bank Area	
Secondary Canal Group	Length of Tertiary Canal	Secondary Canal Group	Length of Tertiary Canal
SR 1	2,050	SL 1	4,250
SR 2	9,050	SL 2	13,750
SR 3	15,750	SL 3	13,100
SR 4	23,250	SL 4	22,600
SR 5	28,600	SL 5	33,150
SR 6	46,450	SL 6	13,250
SR 7	35,550	SL 7	20,400
SR 8	35,950		
SR 9	30,050		
Sub-Total	226,700		120,500
Total		347,200	

(b) Related Facilities of Irrigation Canals

In order to operate the canal system in a proper and secure manner, the following related facilities need to be installed in the canal system:

(i) Intake facility

An intake facility will be constructed immediately downstream of the outlet of the diversion tunnel to control the discharge to the headrace. The facility will be composed of a concrete box with a height of 13.70 m, width of 6.00 m and length of 16.00 m and equipped with a jet flow gate at the outlet as shown in Volume III "Drawings".

(ii) Bifurcation structure

A bifurcation structure will be provided at the tail of the headrace to divert water to the Right and Left Main Canals correctly at the designed proportion of discharge to each canal. The structure will be equipped with a butterfly valve at the head of each main canal.

(iii) Siphons

Siphon structures will be constructed where the canals will cross the Küçük Menderes river and its tributaries. The typical design of the structure is shown in Volume III "Drawings".

(iv) Cross drains

A cross drain will be provided at a crossing point of the drain with a road. A box type of cross drain will be constructed for the secondary drain and the pipe type for the tertiary drain.

(v) Turnouts

Turnout structures will be provided at the heads of the secondary and tertiary canals to divert irrigation water from the main canal to the secondary canal and the secondary canal to the tertiary canal in a proper way. The butterfly valves will be installed on all

the turnout structures.

(vi) Check valves

Check valves will be installed at every 1 - 3 km on all the main, secondary and tertiary canals to check discharge in the conduits.

(vii) Air valves

All the canals will be equipped with air valves at hill portions and immediately downstream of the check valves to release air in the pipes.

(viii) Blowoff valves

Blowoff valves will be installed on all the main, secondary and tertiary canals at the lowest points of the respective canals to drain off water and sediments in the pipes.

(ix) Measuring devices

A measuring device will be installed at each turnout point to measure the discharge precisely and to use the measured records for the water charge collection. The electromagnetic type of current meter is proposed to be installed at the head of all the secondary canals and the propeller type of current meter at the head of tertiary canals.

(c) On-farm Development

An on-farm development block is defined as a command area of a tertiary canal (tertiary block) in this Study. The typical layout of the on-farm development block is as shown in Figure 3.2.5. According to this figure, one on-farm block will cover about 60 ha (400 m x 1,500 m) on an average, in which about 35 farm households will be included. Six turnouts will be provided on the tertiary canal for the convenience of 6 or 12 days rotation irrigation. Each turnout covers around 10 ha, which consists of 10 farm plots, assuming that one farm plot has 1.0 ha which is the same as the average size of a farm plot in the sampled areas. The irrigation water released from the turnout will be conveyed to the 10-ha plots through the quaternary canals, which will be composed of PVC pipes buried under the ground, and then to each farm plot through the sprinkler sets, drip sets, or furrows depending on the crops cultivated in the field. The total length of the quaternary canals will be about 1,590 km; 103 m/ha.

3.2.6 Drainage Development

(1) Basic Concept for Drainage Development

In the Project Area, there exists a natural drainage system consisting of the Küçük Menderes river which is a major flood course, and its tributaries which exist at an interval of 3~5 km along the Küçük Menderes river. Among them, the Küçük Menderes river will not require any river training or improvement work because of no serious drainage or flooding problems along the river. However, some tributaries will need to be improved so as to have a flow capacity against the flood with a 5-year return period, especially in the sections where

existing roads are functioning like drains for spilled water from the tributaries.

Tertiary drains will be needed in order to evacuate surplus water from farmlands. These tertiary drains will be designed so as to have a flow capacity against the discharge calculated for the 2.33 year return period. These drains will connect to secondary drains, most of which are existing tributaries. The mal-drainage area partly extending along the Küçük Menderes river will mainly be improved by the construction of these tertiary drains. No sub-surface drain is required in any farmlands in the Project Area, because of the low groundwater table throughout the year: more than 10.0 meters below the ground surface, and moderate water quality of less than 600 μS.

(2) Drainage Module

(a) Secondary Drains

The existing tributaries of the Küçük Menderes river will be improved and used as the secondary drains of the proposed drainage system. Number of tributaries to be used as the secondary drains is 18 in the right bank area, and 12 in the left bank area. The Canal system of the tributaries is shown in Figure3.2.6.

The drainage module of each tributary concerned is estimated by the Mc. Math method, which is popularly applied to the drainage projects in Turkey. Runoff coefficient and topographic parameters applied in the method are decided in consideration of topographic, soil and vegetation conditions of the catchment area. The design rainfall intensity is derived from the rainfall intensity curve in a 5-year return period of Ödemiş in the "MAKSİMUM YAĞIŞLARIN FREKANS ATLASI". The drainage module calculated for each secondary drain is as shown in Table 3.2.3.

(b) Tertiary Drains

Drainage module of proposed tertiary drains is typically estimated applying the Mc. Math method for an ideal tertiary command area of 60 ha. Runoff coefficient and topographic parameters applied in the method are decided in consideration of topography, soil, and vegetation conditions of the typical catchment area. Design rainfall intensity is derived from the rainfall intensity curve in a 2.33-year return period of Ödemiş in the "MAKSİMUM YAĞIŞLARIN FREKANS ATLASI". Thus, the drainage module of the tertiary drain is obtained to be 9.6 lit/sec/ha.

(3) Drainage Method

Surplus water in the field will be removed to tertiary canals by bedding, on which the dead furrows run parallel to the prevailing land slope. If the drains are spaced further apart, a parallel field ditch system will be applied. Any sub-surface drain is not required, due to the low groundwater table in the Project Area. However, tertiary drains need to be excavated deeper than 1.0 m in order to remove the conditional surplus water in the surface soil layer.

In case of vegetable cropping, the inundation period should be shorter than 8 hours, according to the drainage criteria in Turkey. As the inundation period of more than 8 hours will

not be assumed to occur owing to the provision of drainage systems under the Project, no pump drain will be required in the Project Area.

(4) Drainage System and Facilities

The proposed drainage system of the Project is composed of the Küçük Menderes river as a main drain, secondary drains, and tertiary drains. The proposed drainage system is shown in Figure 3.2.4.

Some portions of all the 30 existing tributaries of the Küçük Menderes river to be used as secondary drains have smaller flowing capacities than the design drainage modules. Such portions of the tributaries will be improved so that flood water will smoothly be carried through the drains to the Küçük Menderes river. Taking into account the present conditions, about 30% of the total length (90.1 km) will be enlarged and improved for their cross sections.

All the 30 secondary drains will be provided with service roads along either the right or left bank of the drains.

About 270 tertiary drains with a total length of 350.0 km will newly be constructed along the tertiary irrigation canals. All the tertiary drains are of earth type, having a trapezoidal cross section with a side slope of 1:1.5. The dimension of the cross section is decided so as to flow the design discharge with a velocity of less than 1.5 m/sec. A junction structure will be provided at each confluence with the secondary canal.

The following table shows the required lengths of the tertiary drains in the command areas of the respective secondary canals.

(Unit: km)

Right Bank Area		Left Bank Area	
Secondary Canal Group	Length of Tertiary Drain	Secondary Canal Group	Length of Tertiary Drain
SR 1	3,400	SL1	3,300
SR 2	9,950	SL2	13,550
SR 3	14,650	SL3	15,350
SR 4	24,400	SL4	23,550
SR 5	23,000	SL5	32,050
SR 6	47,350	SL6	11,900
SR 7	40,600	SL7	21,200
SR 8	32,650		
SR 9	31,350		
Sub-Total	227,3500		120,900
Total		348,250	

3.3 Project Work

3.3.1 Project Facilities

(1) Irrigation Facilities

In order to attain the final target of the Project, the modernized irrigation system is one of the major components. The irrigation system will comprise the intake facility, headrace, two main canals, 16 secondary canals, 267 tertiary canals and on-farm development facilities. All the irrigation facilities to be implemented under the Project are listed below.

Facilities	Right Bank Area	Left Bank Area	Total
1. Headrace			
- Canal length (km)	-	-	1.00
- Related structure (nos.)			
intake facility	-	-	1
bifurcation structure			1
2. Main canals			
- Canal length (km)	30.50	28.50	59.00
- Related structures (nos.)			
siphon	12	19	31
turnout	9	7	16
check valve	11	10	21
air valve	15	8	23
blowoff valve	14	9	23
measuring device	2	1	3
3. Secondary canals			
- Canal length (km)	44.40	28.15	72.55
- Related structures (nos.)			
siphon	44	28	72
turnout	179	88	267
check valve	41	31	72
air valve	149	83	232
blowoff valve	88	57	145
measuring device	9	16	25
4. Tertiary canals			
- Canal length (km)	226.70	120.50	347.20
- Related structures (nos.)			
turnout	2,308	1,228	3,536
check valve	456	241	697
air valve	769	413	1,182
blowoff valve	769	413	1,182
measuring device	179	97	276
5. On-farm facilities (set) *	180	90	270

(Note) *: Consisting of quaternary canals (ϕ100 mm PVC pipes), drainage ditches, and sprinkler, drip and furrow sets.

(2) Drainage Facilities

Taking into consideration the present flow capacities of the rivers and topography in the Project Area, enlargement and improvement of 30 tributaries and new construction of about 270 tertiary drains will newly be required for beneficial farming in the Project. The following table shows the drainage works to be implemented under the Project:

Facilities	Right Bank Area	Left Bank Area	Total
1. Secondary drain			
- Length to be improved (km)	17.0	10.0	27.0
- Related structure (nos.)			
cross drain	18	13	31
drop structure	89	43	132
2. Tertiary drain			
- length (km)	227.35	120.90	348.25
- Related structures (nos.)			
Junction structure	184	88	272

(3) Service Road

In order to inspect, operate and repair the canals, service roads will be required along either the right or left bank of the canals, particularly for the headrace, main canals, secondary canals, tertiary canals and secondary drains. Among these canals, the headrace and main canals will be aligned alongside the existing paved national or provincial roads for their full length and therefore, new service roads will not be required under the Project. The secondary canals will also be aligned along existing roads for their full lengths. In this case, however, almost all the roads need to be paved with gravel, because they are non-paved village roads or farm roads. These roads will be paved with gravel for a width of 4.0 m and a thickness of 20 cm. The service roads along the tertiary canals and the secondary drains will newly be constructed under the Project. The roads will also be paved with gravel for a width of 4.0 m and a thickness of 20 cm, in case of the roads along the tertiary canals, and a width of 2.5 m and a thickness of 15 cm in case of the roads along the secondary drains.

(4) O&M and Office Equipment

The Project Office will procure the minimum required heavy equipment and vehicles for the use of O&M purposes, office equipment, and aquifer testing equipment. The required number of the respective equipment is detailed in Annex J.

3.3.2 Project Services

(1) Training

(a) Training to Farmers

In order to develop farmers' skill and capacity to manage the irrigation system, training will be organized for target groups of water users' association (WUA) members. Trainees would be recommended by WUAs. Training would be provided in the fields of: (i) operation and maintenance; (ii) agricultural extension; (iii) cooperative and marketing; and (iv) water management. The training would be organized by the Agricultural Division in collaboration with the O&M Division of the Project Office proposed in Section 3.4.2.

Agriculture extension and water management training to farmers would include special short training at the Konakli Demonstration Farm, organizing meetings with farmers of WUAs, farm walks to demonstrate practices on existing irrigation projects to the farmers, and field demonstration in farmer's land.

There would be two types of training within a period of 3 years.

(i) The first type of training would deal with orientation. This would also include the training on the attitudinal/behavior change of the farmers.

(ii) The second type of training would include the formal, in depth training which would provide the main theoretical aspect of the operation and maintenance of groundwater wells and pipe irrigation system, water management, agricultural extension, and marketing. It would also provide them with practical training, such as farmers-to-farmers training on the transfer of technical skills and management skills.

The role of trainers of the Project Office would assist WUA in identifying and selecting trainees. Local consultants will organize and conduct the training with assistance from the foreign consultants. The trainers of the Project Office would provide day-to-day specific problem solving training to WUA members.

(b) Training of Project Office Staff

The Project Office will also organize training/seminars for its staff to develop their project implementation capacity. The staff training/seminars will basically focus on: (i) orienting the staff towards the objectives and process of the Project to enable them to efficiently implement the Project; (ii) building a team approach among the staff to skillfully handle their team relations; (iii) reviewing project outcomes and suggesting improvement measures to collectively promote their project implementation capability. In the early stage of the Project, the Project Office will focus on (i) and (ii) types of training/seminars. In the subsequent year of the Project, the Project Office will focus on (iii) type of training/seminars. Local consultants, with assistance from foreign consultants, will conduct the training/seminars in close collaboration with the Project Office trainers. The Project Office trainers will prepare and organize the training/seminars with the help of the project consultants.

(2) Agricultural Strengthening Support

Under the agricultural strengthening program, the Project Office is proposed to provide the agricultural support fund under a technical assistance arrangement. The fund will be utilized by the District Branch Offices of MARA. The Project Office will be in charge of coordinating and monitoring the agricultural activities of the District Branch Offices of MARA with an assistance of the project consultants. The District Branch Offices of MARA will prepare an action plan in collaboration with the project consultants to utilize the agricultural support fund.

The activities planned to be undertaken with the fund include:

(a) Training Program

(i) Village level agricultural assistant program

During the project implementation period, several hundreds of progressive farmers will be selected from the Project Area, and they will be given agriculture training at the District Branch Office of MARA. The duration of the training will be about a month, and the training program will cover all aspects of improved farming practices of major crops considered in the proposed cropping pattern. The participants in the training will be selected on the recommendation of WUAs.

(ii) Refresher training program

A periodical refresher training will also be organized for village group technicians (VGTs) and some of the farmers who already finished the village level agriculture assistant training, to update their technological ability. The program will be a short training (two days) course.

(b) Extension Activities

Extension activities are the main tools to disseminate agricultural technologies to the farmers. The main extension activities in the Project Area will be:

- result demonstration,
- method demonstration,
- farmers' field trial,
- production demonstration,
- block demonstration program,
- mini-kit distribution,
- farmers' visit to research station,
- farmers' visit to demonstration farm, and
- crop competition program.

These activities will be carried out for major crops and vegetables.

(3) Establishment of Demonstration Farm

In order to exhibit the results of agricultural research made by GDAR and GDRS and to demonstrate efficient irrigation farming to the farmers, it is proposed to establish a demonstration farm in the Project Area. The site of the demonstration farm is proposed to be selected at the irrigation experimental field which was established by DSİ-II at Konaklı for the JICA Study in 1995, where farmland of 1.5 ha is available and equipped with sprinkler, drip and surface irrigation facilities and meteorological observation equipment.

The roles of this demonstration farm would be:

- to confirm optimum irrigation farming,
- to establish optimum irrigation methods by crops,
- to evaluate the suitability of new irrigation facilities to be introduced,

- to exhibit efficient crop production under the irrigated condition,
- to train the farmers for the new irrigation technologies, and
- to collect meteorological data.

In order to disseminate efficiently the irrigated farming techniques confirmed in this demonstration farm to the farmers in the Project Area, the demonstration plot will be arranged in the farmland of advanced farmers in each command area of the proposed secondary canal of the Project.

This demonstration farm will be managed by an agronomist and an agricultural engineer to be dispatched from the Agricultural Division of the Project Office and some workers.

(4) Technical Supports

(a) Consulting Services

Consulting services will be required to advise and assist the Project Office in: (i) designing irrigation canal system and associated works of drainage system and on-farm works; (ii) preparing bid documents and bid evaluation; (iii) providing construction techniques; (iv) providing construction quality control; (v) monitoring of progress of work; (vi) establishing operation and maintenance, and water management criteria, and training the farmers in the field applying these criteria; (vii) providing agricultural and farmers organization support; (viii) operating the demonstration farm; (ix) monitoring and evaluating the groundwater resources and surface water including reservoir operation; (x) planning work programs and budgets; and (xi) designing the project training program.

(b) Survey and Study

(i) Canal route survey

A canal route survey will be required for a length of about 920 km, consisting of 480 km for the irrigation canal system, and 440 km for the drainage system. This canal route survey will be conducted by local survey companies under the supervision of the project consultants.

(ii) Groundwater simulation

The groundwater simulation study made under this study shows that about 160 MCM of groundwater can annually be developed in the whole basin without giving any adverse effects to the hydrogeological system in the basin. Through the above-mentioned simulation study, however, it is understood that the availability of groundwater potential should be confirmed based on another simulation study to be made based on the further detailed hydrogeological data which will be collected in the project design stage.

3.3.3 Implementation Schedule

(1) General

The time required for the implementation of the Project is estimated to be 10 years, including 2 years of survey and design, 1 year of preparatory work, 5 years of construction, and 4 years of project services, of which 2 years will be overlapped with the construction period. A tentative implementation schedule is prepared and graphically shown in Figure 3.3.1. The main construction season is from May to October. Provided that the financial arrangement for the Project is concluded by the end of 1996, the construction of the project work would be completed by the end of 2004 and the project services would be completed by the end of 2006.

(2) Survey and Design

Immediately after the start of the Project, irrigation planning and the field survey, including geotechnical survey, topographical survey and hydrogeological survey will commence simultaneously. The operation of the proposed demonstration farm will also commence as soon as the Project is started. Following the completion of the survey work, the detailed design of the irrigation and drainage facilities, except the Beydağ dam, which the design has been completed by DSİ, and the preparation of the tender documents will be started and completed by the end of the second project year after spending 22 months.

(3) Construction

(a) Beydağ Dam

The construction of the Beydağ dam has been started by a local contractor in 1994, but its progress is not satisfactory. Based on the past performance of the contractor and the work volume so far remained, the construction of the dam is expected to be completed by the end of the fifth project year, if enough budget is allotted to this construction work by the Government.

(b) Irrigation and Drainage Facilities

The construction work will be divided into two contract packages: Package-I for the right bank area, and Package-II for the left bank area. After one year of the preparatory period in the third project year, in which the tender and award to the Package-I contractor will be made, the Package-I work will be started and completed by the end of the seventh project year. The Package-II work will be started one-year later from the start of the Package-I work and completed in the eighth year. The Construction Division of the Project Office will supervise the construction work under the advice and assistance of the project consultants.

(c) On-farm Development Work

All the on-farm works will be constructed by the water users' associations themselves under the guidance of GDRS. The construction work will be started one-year later from the start of the construction work of the above-mentioned irrigation and drainage facilities. All these works will be completed by the end of the eighth project year.

(d) Procurement of O&M and Office Equipment

For the use of field survey, construction supervision, and other movement of the Project Office staff and the project consultants, vehicles and office equipment will be needed from the commencement of the Project. For this immediate use, the procurement of these vehicles and office equipment will be completed before start of the construction work at the latest. The remaining O&M equipment will be procured by the end of the eighth project year.

(e) Operation of the Demonstration Farm

The operation of the demonstration farm to be established at Konaklı will be started immediately after completion of the field office building and quarters, and repair of the existing irrigation facilities which were used in the JICA study period. The Agricultural Division of the Project Office will have direct responsibility for the operation of this farm under the advice and assistance of the project consultants.

(f) Technical Supports

Consultant services and training will be required throughout the project year. The hydrogeological data required for the groundwater simulation and optimization study, which will be conducted by the project consultant specialist at the end of the survey and design stage of the Project, will be collected by the Survey and Design Division of the Project Office.

3.3.4 Project Cost

(1) Basic Considerations and Assumptions for Cost Estimates

The costs for the project works and their relevant work and services, except the Beydağ dam which is now under construction by DSİ, are estimated based on the following conditions and assumptions:

(i) Conversion rate among Turkish Lira (TL), US dollar ($) and Japanese yen (¥) is assumed to be US$1.0 = TL50,000 = ¥100.0, referring to the current exchange rate as of October 1995.

(ii) All the costs are estimated based on the unit prices in October 1995. These unit prices comprise the foreign currency and local currency portions. The ratios of local currency and foreign currency portions of the construction materials used in the unit price estimation are taken from the several latest projects and investigated through market survey in Turkey and are shown below.

Items	Local C. (%)	Foreign C. (%)
Cement	95	5
Timber	100	0
Steel bar	100	0
Fuel	10	90
Aggregate(sand, stone)	100	0
Steel lining PC pipe	90	10
PVC pipe	90	10
Steel goods	100	0

(iii) All the construction works for the irrigation and drainage canal systems will be executed by the contractors selected through the international competitive bidding (ICB) under the responsibility of DSİ, while the on-farm development works will be constructed under the responsibility of the respective WUAs under the guidance of GDRS.

(iv) Machinery and equipment required for construction work would be provided by the contractors themselves. The depreciation costs of machinery and equipment, therefore, will be counted in the unit prices of the construction works instead of the procurement cost.

(v) The O&M equipment will be procured through ICB, while the office equipment and the aquifer testing equipment will be procured through local competitive bidding (LCB).

(vi) The project administration cost will include: (i) salary for the staff of the Project Office, (ii) running cost of the Project Office, (iii) cost for training of farmers, (iv) cost for agricultural strengthening support, (v) cost for establishment and running of the demonstration farm including the office and quarters, and (vi) cost for improvement and expansion of the existing DSİ' office at Ödemiş.

(vii) The cost for the technical supports will include the cost for the consulting services and the cost for survey and study.

(viii) A physical contingency of 10 % will be included in the project cost in view of the preliminary nature of the cost estimate.

(ix) The price contingencies are estimated on the basis of 4.0% per annum for the local currency portion, after conversion to the US dollar, and 2.0% per annum for the foreign currency portion.

As for the Beydağ dam, the direct construction cost and land acquisition cost are obtained by converting those estimated by DSİ in 1993 to the 1995 price level using the DSİ's conversion table, and other costs such as administration cost, physical contingency and price contingency are estimated in the same manner as that employed in the cost estimate for the irrigation and drainage systems.

(2) Project Cost

The project cost broadly comprises: (i) direct construction cost for the irrigation and drainage systems, (ii) on-farm development cost, (iii) cost for procurement of O&M and office equipment, (iv) land acquisition cost, (v) project administration cost, (vi) cost for technical supports, and (vii) physical and price contingencies.

The total project cost, excluding the cost for the Beydağ dam, is estimated at US$162.1 million, comprising TL5,345 billion which is equivalent to US$106.9 million for the local currency portion and US$55.2 million for the foreign currency portion. If the cost for the Beydağ dam is included in the above-mentioned project cost, the total cost required for the

project implementation will be US$237.3 million, comprising TL7,799 billion which is equivalent to US$156.0 million for the local currency portion, and US$81.3 million for the foreign currency portion as shown in Table 3.3.1 and summarized below (Annex J).

Work Items	Local Currency		Foreign Currency	Total
	(TL billion)	(US$ thousand)	(US$ thousand)	(US$ thousand)
A. Irrigation and Drainage Systems				
A-1. Direct Construction Cost				
(1) Irrigation and Drainage Facilities	1,981.5	39,633.0	5,004.0	44,637.0
(2) On-farm Development Work	1,023.5	20,470.0	25,907.0	46,377.0
Sub-total (A-1)	3,005.0	60,103.0	30,911.0	91,014.0
A-2. O&M and Office Equipment	4.1	82.0	1,558.0	1,640.0
A-3. Land Acquisition	61.1	1,222.0	0.0	1,222.0
A-4. Project Administration	455.1	9,101.0	0.0	9,101.0
A-5. Technical Supports	214.4	4,288.0	11,134.0	15,422.0
Sub-total (A-1 - A-5)	3,739.7	74,796.0	43,603.0	118,399.0
A-6. Physical Contingency	374.0	7,480.0	4,360.0	11,840.0
A-7. Price Contingency	1,231.3	24,625.0	7,195.0	31,820.0
Sub-total (A)	5,345.0	106,901.0	55,158.0	162,059.0
B. Beyada Dam				
B-1. Direct Construction Cost	1,049.7	20,995.0	21,776.0	42,771.0
B-2. Land Acquisition	637.0	12,740.0	0.0	12,740.0
B-3. Project Administration	213.9	4,277.0	0.0	4,277.0
Sub-total (B-1 - B-3)	1,900.6	38,012.0	21,776.0	59,788.0
B-4. Physical Contingency	190.1	3,801.0	2,178.0	5,979.0
B-5. Price Contingency	363.5	7,270.0	2,189.0	9,459.0
Total (B)	2,454.2	49,083.0	26,143.0	75,226.0
Total Project Cost	7,799.2	155,984.0	81,301.0	237,285.0

(3) Annual Disbursement Schedule

The annual disbursement schedule is worked out based on the project implementation schedule shown in Figure 3.3.1. The result is detailed in Annex-J and summarized below.

(Unit: US$ thousand)

Year	Local Currency	Foreign Currency	Total
1997	10,591	3,858	14,449
1998	12,085	5,843	17,928
1999	12,935	6,622	19,557
2000	23,146	8,873	32,019
2001	32,637	17,748	50,385
2002	31,190	15,250	46,440
2003	22,733	14,457	37,190
2004	7,485	6,042	13,527
2005	1,581	1,291	2,872
2006	1,601	1,317	2,918
Total	155,984	81,301	237,285

(4) Annual Operation and Maintenance Cost

The annual operation and maintenance cost of the project facilities includes the salaries of the staff for the Project Office, staff of the WUAs, the materials and labor costs for repair and maintenance of the project facilities, the cost for operation, repair and maintenance of O&M equipment, and the running cost of the pumps. The estimated cost is TL 74.6 billion per annum for the total Project Area, which corresponds to US$ 97.0/ha per annum (Annex J).

(5) Replacement Cost

Some project facilities, especially mechanical and electrical works, have a shorter economic life time than the project life, and will require replacement during the proposed 50 years of the project life. The following table shows the economic life times and replacement costs of the works to be replaced.

(Unit: US$ thousand)

Items	Economic Life Time	Replacement Cost
- O&M equipment	10 years	1,640
- Pump for irrigation use	10 years	295
- All kinds of valves	25 years	6,852
- Sprinkler set	10 years	19,806
- Drip set	5 years	13,204

3.4 Organization and Management

3.4.1 Existing Organization Related to Project Implementation and O&M

The government agencies responsible for irrigation development are the General Directorate of State Hydraulic Works (DSİ), which is responsible for irrigation development outside the farmgate, the General Directorate of Rural Services (GDRS), which is responsible for small-scale irrigation schemes supplying less than 500 lit/sec of irrigation water or irrigation less than 1,000 ha, and on-farm development and the Ministry of Agriculture and Rural Affairs (MARA). These agencies have their respective regional directorates at İzmir: DSİ Second Regional Office (DSİ-II), GDRS 16th Regional Directorate (GDRS-XVI) and the Provincial Office of MARA as shown in Figures 1.2.2, 1.2.4 and 1.2.6 respectively.

In addition to these development works, DSİ is also responsible for O&M of these irrigation projects, while GDRS has not legally given a responsibility for O&M. Therefore, the irrigation projects developed by GDRS are not officially handed over to farmers and are not operated and maintained by GDRS.

3.4.2 Project Office and Management

(1) Office Organization

For the successful implementation and O&M of the Project, it is proposed to establish a Project Office at the existing DSİ compound in Ödemiş. The Project Office will mainly function as a construction office during the construction period of the project works, and as an O&M office after completion of the construction work. The Project Office, being coordinated to GDRS and MARA through the proposed Project Coordination Committee, will consist of the following one unit and six divisions (Figure 3.4.1), and those respective functions and roles are mentioned in Annex I.

- Survey and Design Division
- Construction Division
- O&M Division
- Agricultural Division
- Administration Division
- Finance Division
- Monitoring and Evaluation Unit

Among this unit and divisions, the Survey and Design Division, Construction Division and the Land Acquisition Section of the Administration Division will be phased out by the completion of the construction work. Instead, the O&M Division will be established two years before the completion of the construction works, so that this division will fully function from the start of the O&M period of the Project.

(2) Project Management

The chief executive officer for the Beydağ Irrigation Project would be the Project Manager, who will be responsible for day-to-day project administration and management, work

programming and supervision, budgeting, and financial control. He would be appointed by DSİ and would be based at the Project Office in Ödemiş. He would: (i) ensure the design and implementation of the Project in accordance with the time schedule; (ii) prepare annual implementation programs and progress reports; (iii) prepare the project's annual budget proposal; (iv) manage all project staff and consultants; (v) supervise preparation of tender documents, issuance of calls for tender, and evaluation of bids for procurement of works, goods, and services; and (vi) ensure coordination of all project activities at the project and district levels. The Project Manager would be assisted in these functions by the project consultants.

(3) Staffing

The number of key staff, including Project Manager, engineers, administrators, accountants, technicians and assistant officers, who will be required to implement and to operate and maintain the project is detailed in Annex I and summarized below.

Construction Stage								O&M
1st year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	Stage
45	45	40	56	56	53	58	59	47

3.4.3 Water Users' Organization

An essential prerequisite for successful O&M of the irrigation and drainage systems in terminal units would be to organize the Tertiary Group (TG) which will cover 60 ha on an average and be headed by a Gate Operator. About 10 ~30 TGs will form an Irrigators' Group (IG) which will basically be organized for each secondary canal, which will cover about 960 ha of net irrigation area on average. To be successful, IGs should be as cohesive as possible. Therefore, as far as the topography allows, their areas of activity would coincide with the boundaries of the villages. Each IG will have a leader selected in the village concerned, preferably the muhtar or leader farmer.

The IGs included in the command area of a main canal will form a Water Users' Association (WUA) as shown in Figure 3.4.2. The WUA will have an Association Council as an executive body, which will be staffed by the presidents of municipalities or muhtars concerned, the presidents of Farmers' Possessions Protections Organizations, the presidents of Chambers of Agriculture, and two members selected from each village concerned. Under the Association Council, an Association Committee will be organized, which will be staffed by a President, a General Secretary, a Treasurer and four members. Since there will be two main canals in the project area, two WUAs, Right Bank WUA and Left Bank WUA, will be established in the Project Area.

The above-mentioned two WUAs will form a Water Users' Union (WUU) which will have the function of coordinating two WUAs for an equitable water distribution to the two main canals and maintenance work. In addition to this function, WUU will have a function as a contact point with the O&M Division of the Project Office for preparing the operation program of the dam reservoir and the dam intake, and assisting and advising WUAs in preparing a maintenance and repairing program. The WUU will be staffed by the chief of the district or the

mayor of the municipality concerned as a chairman, two Presidents of the Association Committee and a secretary to be appointed exclusively for WUU.

The main objectives of the water users' organization are to: (i) deliver water in a timely and equitable manner in the project area so as to ensure fair distribution of the limited water resource; (ii) deliver water to each farmer at a flow rate that enables efficient on-farm irrigation; (iii) notify farmers of the time they receive their water allocations before the onset of the irrigation season, by preparing operation schedules which take account of the physical constraints of the network and expected water supplies at the head of main canals; and (iv) adapt as much as possible the delivery schedules to the crop requirements. To achieve these objectives, it would be necessary to make the water management body fully conversant with its task by providing full and thorough training to all pertinent staff and farmers .

3.5 Project Evaluation

3.5.1 General

The project evaluation is made from the economic and financial viewpoints. The economic evaluation is made in terms of economic internal rate of return (EIRR), net present value (NPV) and benefit-cost ratio (B/C). In the economic evaluation, sensitivity analysis is also made for the cases of (i) increase of construction cost, (ii) decrease of benefit, and (iii) delay of construction work from the implementation schedule. On the other hand, the financial evaluation is made on the project level and farmers' level. In addition, the indirect and intangible benefits of the project and environmental aspects are examined on a preliminary basis.

3.5.2 Economic Evaluation

(1) Basic Consideration

The economic evaluation is made on the basis of the following basic assumption:

(i) The economic useful life of the Project is 50 years from the start of the Project.

(ii) All prices are expressed in mid 1995 constant prices with an exchange rate of US$ 1.0 = TL 50,000 = Japanese ¥ 100.

(iii) The project period is 10 years from the detailed design to the O&M stages as mentioned in Section 3.3.3.

(iv) A standard conversion factor (SCF) is applied to the estimation of the economic values in order to adjust the foreign exchange premium or trade distortion. The SCF is calculated to be 0.91 on the basis of trade statistics, export subsidy and import tax during the period from 1987 to 1991.

(v) Such transfer payment as tax, subsidy and interest of loan are omitted in the estimation of economic values.

(vi) Shadow wage rates are applied to estimate the labor cost for construction work and crop production. The conversion factors to shadow wage rates are 0.4 for labor, 0.9 for technician, 0.6 for administration staff of the Project Office and 0.5 for farming practices.

(vii) For the agricultural inputs and outputs, the farmgate prices of the traded commodities are estimated in terms of their export or import parity prices, based on the world market prices forecasted by the World Bank for a long term or past trade records of Turkey. For non-traded commodities, the economic prices are obtained from the financial prices using the above SCF of 0.91. These economic prices are listed in Table 3.5.1 together with the financial prices.

(viii) The economic cost for land acquisition in the Beydağ reservoir and canal routes is estimated as the land value and public assets.

(ix) The loss of the present crop production in the Beydağ reservoir area is counted as a negative benefit, which is estimated at US$ 269 thousand per annum.

(x) The build-up period from the beginning of irrigation to the attainment of full cropping intensity and yield projected is assumed to be five years. The irrigation benefit is presumed to increase year by year and reach its full value in the 8th year after the start of irrigation.

(2) Economic Cost

The total initial investment costs in economic value are estimated at US$ 159.5 million, composed of US$ 110.5 million for the irrigation and drainage systems, and US$ 48.9 million for Beydağ dam as shown below (Annex K).

(Unit: US$ 1,000)

Items	Financial Cost	Economic Cost
A. Irrigation and Drainage Systems		
A-1 Direct Construction Cost		
(1) Irrigation and Drainage Facilities	44,637	35,363
(2) On-farm development Work	46,377	41,414
Sub-total (A-1)	91,014	76,777
A-2 O&M and Office Equipment	1,640	1,492
A-3 Land Acquisition	1,221	489
A-4 Project Administration	9,101	7,678
A-5 Technical Supports	15,422	14,034
Sub-total (A-1 - A-5)	118,399	100,470
A-6 Physical Contingency	11,840	10,047
A-7 Price Contingency	31,820	0
Total (A)	162,059	110,517
B. Beydağ Dam		
B-1 Direct Construction Cost	42,771	35,812
B-2 Land Acquisition	12,740	5,096
B-3 Project Administration	4,277	3,581
Sub-total (B-1 - B-3)	59,788	44,489
B-4 Physical Contingency	5,979	4,449
B-5 Price Contingency	9,459	0
Total (B)	75,226	48,938
C. Total (A + B)	237,285	159,455

The financial cost of O & M and replacement of facilities are also converted to the economic costs as shown in the following table:

(Unit: US$ 1,000)

Items		Financial Cost	Economic Cost
1. O & M Cost		1,494	1,359
2. Replacement Cost	Economic Life		
O&M equipment	10 years	1,640	1,492
Pumps for irrigation use	10 years	295	268
All kinds of valves	25 years	6,852	6,235
Sprinkler and drip set	5 to 10 years	33,010	29,481

(3) Economic Benefit

The irrigation benefit is defined as the difference in the net production values between the "future with project" and "future without project" conditions. In the process of the estimation of the benefit, the net production values per hectare are calculated in economic terms, as shown in Annex-F. In addition, under the "future without project" condition, the irrigated area is assumed to decrease to 64% of the present condition, taking into account the rechargeable volume of groundwater. The cropped area thus estimated is as shown in Annex-E. Based on the assumptions and the production values mentioned above, the economic benefit is calculated to be US$ 35.8 million per annum at the full development stage as detailed in Table 3.5.2.

(4) Economic Evaluation

On the basis of the project cost and benefits estimated above, the cost and benefit stream is prepared as shown in Table 3.5.3, and EIRR is calculated to be 13.9%. Further, using the discount rate of 5%, the B/C ratio and NPV are also calculated to be 2.26 and US$ 241.5 million respectively.

The sensitivity analysis is made in terms of EIRR for the cases of: (i) 10% and 20% increase of construction cost and (ii) 10% and 20% decrease of benefit, and the calculated results are shown in the following table.

Benefit	Cost Increase		
Decrease	0% increase	10% increase	20% increase
0% Decrease	13.9%	12.8%	12.0%
10% Decrease	12.5%	11.6%	10.8%
20% Decrease	11.1%	10.2%	9.5%

In addition, the sensitivity analysis is also made for the case of a 2 year delay of construction work from the implementation schedule, compounded with the case of a 20% increase of construction cost and a 20% decrease of benefit, and its EIRR is obtained to 9.5%.

The above results show that the project is economically viable, showing 13.9% of EIRR, and 2.26 of B/C, and US$ 241.5 million of NPV at the discount rate of 5%. The sensitivity analysis indicated that the project viability is insensitive to the adverse effects of cost increase, benefit decrease and delay of construction work.

3.5.3 Financial Analysis

(1) Farm Budget Analysis

The farm budget analysis is made for the typical farm size of 1.7 ha under the "future with project" condition as well as the "future without project" condition. After the implementation of the project, the gross and net farm income will increase by 70% and 65% from the present condition respectively. Adding the income from livestock and off-farm income, and deducting the living expense, the net reserve per household is obtained to be at TL

151 million under the "future with project" condition, which is compared to TL 38 million of the present level, as shown in the following table (Annex K):

(Unit TL million)

Item	Present Condition	with Project Condition	without Project Condition
A. Gross farm income from crop production	245.3	418.7	169.1
B. Crop production cost	71.8	131.5	52.2
C. Net farm income from crop production (A - B)	173.6	287.2	116.9
D. Income from livestock and off-farm income	32.9	32.9	32.9
E. Living expense	168.8	168.8	168.8
F. Net reserve (C + D - E)	37.7	151.3	-19.0

The above table also shows that in the case that the project will not be implemented in the near future ("future without project" condition), the farm income will decrease to about 70% of the present level, because the irrigated land would decrease to some extent as mentioned in Paragraph 2.2.5-(2) and the net reserve will be substantially reduced. In this case, it is expected that the living standard of farm households will be lowered and out-migration from the Project Area would be accelerated to seek better income.

(2) Cost Recovery

(a) O & M Cost

The operation and maintenance of the project facilities are planned to be transferred to farmers after the construction. Farmers will manage the facilities by themselves through WUAs. This participatory management approach is expected to increase the efficiency of water management, and at the same time reduce the burden of irrigation cost on the Government budget. For sustainable operation and maintenance, the water charge, which will cover at least the annual O&M costs, needs to be borne by farmers. The water charges are estimated at TL 8.25 million per household (equivalent to US$ 97/ha) in Section 3.3.4.

(b) Replacement of Cost for On-farm Facilities

Sprinkler and drip set will be periodically replaced by the farmers. The replacement cost is estimated at TL 64.3 million/ha every 10 years for sprinkler sets, and TL 42.9 million/ha every 5 years for drip sets. This cost is equivalent to TL 25.5 million/1.7 ha/year for both sets of sprinkler and drip, and this is 17% of the annual net reserve of the average farm household.

(c) Repayment of Capital Cost

It is assumed that 10% of the capital cost for irrigation and drainage systems and the Beydağ dam would be repaid by the beneficiary farmers within the repayment period of 30 years including a grace period of 5 years. The annual repayment by the average farm household is calculated at US$ 94.5/household (equivalent to TL 4.70 million) based on the direct cost of US$ 8,687/ha or TL 434.4 million/ha and taking an annual interest rate of 4.0% (price escalation in US$ term). This annual repayment amount thus estimated is 3.1% of the net reserve estimated above.

(d) Farmers' Capability for Cost Recovery

The annual cost recovery by the average farm household will amount to TL 38.4 million in total to recover the cost for O & M, replacement cost for sprinkler and drip equipment, and the repayment cost for initial investment. This amount is equivalent to 25% of the net reserve of the average farm household. From this estimate, it is assumed that the beneficiary farmers in the Project Area can afford to repay 10% of the initial investment in addition to the O & M cost, and the replacement cost for the sprinkler and drip sets without much difficulty.

(3) Repayment Capacity of the Project

Repayment capacity of the Project is analyzed by preparing a cash flow statement on the basis of the disbursement schedule of the project cost, fund requirement for the Project, and anticipated project revenue. It is assumed that the project is arranged under the following conditions:

(i) The direct construction cost, excluding the cost for the Beydağ dam, cost for the procurement of O & M and office equipment, technical support cost and contingency relevant to these costs, all of which cover 63% of the project cost, are financed by the international monetary organization with the annual interest rate of 2.5%, for the repayment period of 25 years, including a 7 year grace period.

(ii) The direct construction cost for the Beydağ dam, costs for the project administration and land acquisition, and the contingency related to these costs are arranged by the budget allocation of the Government.

In addition to this, the following conditions are taking into consideration for the preparation of the cash flow statement:

(i) The beneficiaries are expected to repay 10% of the capital cost, taking the duration of 30 years including a grace period of 5 years, and this repayment is included in the cash inflow in the statement.

(ii) The costs for O & M and replacement of the project facilities are collected from the beneficiaries.

(iii) The Government subsidy is assumed to be allocated at the income flow side in order to balance the outflow and inflow in the statement, and attain the repayment of the loan financed by the international organization.

On the basis of the above assumption, the financial cash flow statement of the executing agency is prepared as shown in Table 3.5.4. According to this table, the repayment and interest of foreign loans is estimated to be US$ 187.3 million in total, and 91% of this amount will be subsidized by the Government. After the repayment of the loan, however, any Government budget will not be required for the operation and maintenance of the project facilities, and the surplus revenue of US$ 5.45 million in total will be expected from the repayment of the project cost by the beneficiary farmers.

Another cash flow statement is prepared including the capital cost for the Beydağ dam, under the same assumptions and conditions as shown in Table 3.5.5 for reference. In this case, the budgetary requirement of the Government for the project cost will decrease from US$ 89.3 million to US$ 35.7 million.

3.5.4 Indirect and Intangible Benefits

In addition to the direct benefit counted in the economic and financial evaluations, various indirect and intangible benefits are expected from the project implementation.

(1) Improvement of Groundwater Condition

The groundwater level has been dropping from the excessive use for irrigation in the river basin. If this situation continues in the future, the groundwater balance will be destroyed. After the project implementation, however, the main water source for irrigation in the Project Area will be switched to surface water to be supplied from the Beydağ dam, though the groundwater will be used for the purpose of supplementary supply for irrigation and domestic use. This will reduce the groundwater to the sustainable level balanced with the recharging volume.

(2) Increase of Employment Opportunity

The Project will generate incremental annual farm employment of about two million man-days per year at the full development stage, due to increased farming activity and more intensive use of land. In addition, a large number of farmers will be involved in the construction works, though not permanently. The increased labor will reduce the unemployment and underemployment, and thereby intervene the out-migration from the Project Area.

(3) Enhancement of Living Condition

After the project implementation, income of 9,300 farm households in the Project Area is expected to increase as a direct result of an expansion of crop production. Such an increase in income would contribute to improvement of farmers' living standard. Moreover, it is expected that farmers' purchasing capacity would increase along with improvement of their living standard, and this increased purchasing capacity would accelerate the development of the regional economy of the river basin.

(4) Demonstration Effect of Modernized Irrigation

The modernized irrigation method introduced by the Project would be effective to increase farmers' income as well as saving irrigation water. The project implementation will demonstrate these effects to the farmers in the surrounding area, and then, the farmers will follow the same manner of the irrigation method to increase their income. Moreover, such extension of the modernized agriculture in the river basin will reduce the excessive use of groundwater, resulting in prevention of the lowering of the groundwater level.

(5) Foreign Currency Earnings

After the project implementation, the crop production will increase in the Project Area, particularly for fresh vegetables and fruits. These crops are currently exported to Europe and Gulf countries. Since their market demand to Turkey is expanding because of the geographical and climatic advantage to compete with other countries, and a large part of the increased production in the Project Area will be exported to these countries to meet their demand. This will bring about foreign currency earnings and contribute to improve the current deficit in the trade balance of Turkey.

3.5.5 Environmental Considerations

(1) Initial Environmental Examination (IEE)

The Initial Environmental Examination (IEE), which is a preliminary environmental review to assess whether or not the Environmental Impact Assessment (EIA) is necessary for the Project, was conducted for the present condition of the Project Area, taking 20 environmental items selected following the "Environmental Impact Assessment Guidelines for Water Development Projects in Turkey" prepared by USBR in 1994 in cooperation with DSİ. In this assessment, the area to be affected by the Project was broadly divided into the following four ecological regions:

Region I : Catchment area of Küçük Menderes river at the dam site except the Region II mentioned below

Region II : Reservoir area of Beydağ dam including dam site

Region III : Irrigation Area

Region IV : Area extending along the downstream reaches of the Küçük Menderes river from Beydağ dam site

The results of IEE are shown in Table 3.5.6. According to this table, the following environmental items are expected to have significant impact by the Project.

Environmental Items	Region I	Region II	Region III	Region IV
Sociological Impact to Dislocated People	-	o	-	-
Eutrophication of Dam Reservoir	-	o	-	-
Deterioration of Downstream Water Quality	-	-	o	o
Deterioration of Groundwater Quality	-	-	o	o

(2) Environmental Impact Assessment (EIA)

(a) Sociological Impact on People to be Dislocated from the Beydağ Reservoir Area

Due to construction of the Beydağ dam, around 1,500 persons living in the reservoir area have to be dislocated to other areas. For the preparation of plan and procedure for the land acquisition in the reservoir, the case of the Tahtalı Dam Project, which is located 80-km southwest of İzmir and under construction by DSİ-II, was examined for reference as mentioned in Annex L. According to this examined result, the procedure and measures taken by DSİ-II

for the dislocation of the people and compensation to them were judged to be properly done, and can be followed for the Beydağ Irrigation Project, but the following matters should be noted for the Project.

- To conduct a public consultation meeting before the implementation of the land acquisition in the proposed reservoir area, and
- To make the action plan for the support of the dislocated people and improvement of their life, if required, on the basis of the result of monitoring their living conditions in the new area.

(b) Eutrophication of the Beydağ Reservoir

The inflow of nutrients from the upstream area of the dam into the Küçük Menderes river would affect the water quality in the Beydağ reservoir. The possibility and the magnitude of the eutrophication is assessed following the Vollenweider Model as described in Annex L. As a result, the concentration of chlorophyll-a (indicator of the eutrophication) in the reservoir is estimated at 25.9 mg per one cubic meter of reservoir water in the future. According to the OECD guidelines for eutrophication in a lake or reservoir, the relationship between eutrophication and the concentration of chlorophyll-a is defined as shown below :

Eutrophication	Chlorophyll - a Concentration (mg/m^3)
Very Low Possibility	less than 1.0
Low Possibility	1.0 - 2.5
Normal Possibility	2.5 - 8.0
High Possibility	8.0 - 25.0
Very High Possibility	More than 25.0

According to the above-mentioned guidelines, the calculated result of the concentration of chlorophyll-a in the Beydağ reservoir water corresponds to the category of "very high possibility". Therefore, countermeasures should be taken in order to mitigate the magnitude of the eutrophication in the reservoir, based on the result of monitoring to be started after completion of the dam construction.

(c) Deterioration of Water Quality

The deterioration of the water quality in the surface and groundwater in the Project Area would be caused by the increased application of chemical fertilizers and agro-chemicals. The possibility and the degree of deterioration were examined based on the results of mass balance calculation of farm inputs between the present and the "future with project" conditions. The calculated result is as shown below.

(Unit: tons)

	Present	With Project	Balance
Nitrogen	1,390	2,110	720
Phosphorous	210	380	170
Agro-chemicals	70	110	40

The above-calculated result shows the increase of the load by 52% for nitrogen, 80% for phosphorus and 51% for agro-chemicals in the future, as compared with the present level in

the Project Area. Based on these calculated results, and the present quality of surface water, the future change of the surface water quality is assessed as shown in Annex L and summarized below:

	Present (ppm)	With Project (ppm)	Water Quality Class
Nitrogen	1.15	1.81	Class I
Phosphorous	0.05	0.07	Class I
Agro-chemicals	No data	>0.009	Class II

The above table shows that only a small impact is expected to the surface water quality in the downstream part of the Project Area under the "future with project" condition. As for the groundwater, it is difficult to assess the change of these concentrations in the water due to a lack of data concerning the present water quality, and the dispersion of nitrogen, phosphorous and agro-chemicals in the groundwater. However, judging from the result of the mass balance calculation and the mobility of nitrogen, it is cautioned that careful attention should be paid to the concentration of nitrogen also in the groundwater. On the other hand, the impact of phosphorous and agro-chemicals on groundwater may be small as compared with nitrogen.

(3) Environmental Conservation Plan

Based on the results of EIA, plans for environmental conservation and monitoring are prepared for future reference. In addition to the environmental items evaluated in EIA, the plan for watershed management of the Küçük Menderes river is also prepared, taking into account the present problems faced in the watershed management projects being carried out by the government agencies of DSİ, MOF, GDRS and MARA. The environmental conservation plans thus prepared are shown in Table 3.5.7 and summarized below.

(i) Sociological impact on people to be dislocated from Beydağ reservoir area

As evaluated in EIA, the procedure and measures taken by DSİ-II for the dislocation of the people and compensation to them were judged to be properly done. However, the following matters should additionally be taken into consideration for land acquisition in the Beydağ reservoir area:

Before implementation of compensation

- To conduct a public consultation meeting with dwellers in the reservoir area,
- To conduct a questionnaire survey of all dwellers in the reservoir area,
- To request the local government to conduct support service, and
- To decide the compensation amount by the proper method.

After implementation of compensation

- To monitor the socio-economic condition of the dislocated people,
- To make a supporting plan, and
- To request the local government to conduct the support service.

(ii) Eutrophication of Beydağ dam reservoir

Reduction of the nutrient loading, especially phosphorus, is the most effective measures to mitigate the eutrophication in the Beydağ reservoir. The methods of the reduction are summarized below:

- To remove the nutrients from domestic wastewater by a municipal sewage system,
- To decrease the nutrient runoff from agricultural lands by the proper farming system,
- To control the direct intrusion of the waste from livestock into the river, and
- To avoid fish culture or recreational use in the reservoir.

(iii) Deterioration of water quality

Control of chemical fertilizer and agro-chemicals is the most effective measure to mitigate the deterioration of water quality for both surface water and groundwater. The methods of the control are summarized below:

- To maintain the proposed crop rotation system,
- To apply chemical fertilizer at the proper timing and quantity,
- To check runoff of the chemical fertilizer from agricultural lands,
- To use manure or organic fertilizer instead of chemical fertilizer,
- To conduct Integrated Pest Management (IPM), which utilizes all kind of pest control under a proper pest forecasting system, and
- To establish the proper pest forecasting system.

(iv) Watershed management

At present, four government agencies, DSİ, MOF, GDRS and MARA, are responsible for watershed management. However, the current institutional arrangements are less effective for an integrated approach towards watershed management due to the shortage of communication among the above agencies. Furthermore, there is no mechanism for agricultural extension work in the sloped area. Therefore, the progress of the watershed management project is checked and discussed in the joint committee, which should be organized among the said government agencies. In addition, the joint

committee should request MARA to conduct the extension or demonstration program for soil conservation in the sloped area. These efforts would contribute to the extension of the useful life of the Beydağ dam due to the reduction of the sedimentation load.

(4) Environmental Monitoring Plan

The Monitoring and Evaluation (M&E) Unit is proposed to be established in the Project Office as mentioned in Section 3.4.2. The main duties concerning environmental monitoring of the M&E Unit are as follows:

- To prepare a concrete monitoring plan,
- To conduct and supervise the actual monitoring programs,
- To analyze the data obtained through the monitoring,
- To propose and evaluate the mitigation program, and
- To conduct a special study for the environment, if necessary.

The monitoring items include groundwater table, water quality of surface water and groundwater, the condition of farm input, socio-economic condition of dislocated people, and progress of the watershed management project. In addition, it is necessary to monitor the ecosystem condition including the wetland, local disease, and complaints of the local people at least once a year in order to check for unexpected environmental change caused by the Project. The summary of the environmental monitoring plan is as shown in Table 3.5.8.

3.5.6 Project Justification

Through the evaluation and examination made in the preceding sections, it is concluded that the Beydağ Irrigation Project is technically sound, economically feasible and finalcially viable. Furthermore, the the Project will bring about indirect and intangible benefits also as mentioned in the above section. After the implementation of the Project, however, some negative effects would be caused on the environment, if no consideration is paid to this matter. In this context, it should be necessary to conduct continuous minitoring and timely evaluation by the Project Office particularly for the items of the living conditions of the dislocated people from the Beydağ reservoir area, and water quality in the reservoir and in the development area both for surface water and groundwater.

TABLES

List of JICA Study Team Members and Turkish Counterparts

JICA STUDY TEAM		TURKISH COUNTERPARTS	
Name	Position	Name	Position
Yasuhiko KUNIHIRO	*Team Leader*	Mr. Hikmet ÖZGÖBEK *Dr. Ahmet ALPASLAN* Dr. İlker ATIŞ	Regional Director *Deputy Director* Planning Director
Toshihiro TOMITA	Co-Team Leader	Ditto	
Shuichi MATSUSHIMA	Irrigation and Water Managment Expert	Msc. Ali Fuat KÜÇÜKKARAKURT	Chief Engineer
Kunihiko OHNO	Agronomist / Agro-Processing /Farmers' Organization Expert	Mr. Ahmet TOMAR	Agronomist / Agro-economist
Naoto MORIOKA	Agro-Economist / Project Economist	Mr. Ahmet TOMAR	Agronomist / Agro-economist
Seyfettin AYDIN	Hydrologist /Meteorologist	Ms. Işık ERDEM	Meteorologist
Makoto SUGA	Geo-Hydrologist	Ms. Firuzan REGAY Dr. Hasan BAYKAL	Geological Engineer Geological Engineer
Hirohisa ISOGAI	Dam Planner	Ms. İnci GÜN	Civil Engineer
Tetsunari GEJO	Land Use Expert and Environmentalist	Msc. Ali Fuat KÜÇÜKKARAKURT Mr. Hasan MİRZA	Chief Engineer Soil Specialit
Masahiro OMIYA	Design Engineer/ Cost Estimator	Mr. Refik SAFA Mr. Esat SARAÇOĞLU	Project Department Director Civil Engineer

Governmental Budget for Investment Program

A. General Directorate of State Hydraulic Works (DSI) (Unit: TL.Billion)

Category of Budget	1990		1991		1992		1993		1994		1995	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Agriculture	1,350	49	-	-	3,630	48	7,050	53	13,290	55	12,857	57
Energy	1,190	43	-	-	3,249	43	5,200	39	9,137	37	7,058	31
Other Services (social)	200	7	-	-	704	9	1,155	9	1,953	8	2,628	12
Total	2,740	100	-	-	7,583	100	13,405	100	24,380	100	22,543	100
(US$ million equivalent)	1,051	-	-	-	1,105	-	1,222	-	822	-	526	-

B. General Directorate of Rural Services (GDRS)

Category of Budget	1990		1991		1992		1993		1994		1995	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Agriculture	435	38	-	-	1,350	34	2,071	30	3,950	30	2,200	28
Transport-Communication	519	45	-	-	1,763	45	3,400	50	6,600	50	3,963	50
Housing	0	0			5	0	10	0	15	0	40	1
Other Services (social)	197	17	-	-	810	21	1,343	20	2,584	20	1,721	22
Total	1,151	100	-	-	3,928	100	6,824	100	13,149	100	7,924	100
(US$ million equivalent)	442	-	-	-	572	-	622	-	443	-	185	-

C. Ministry of Agriculture and Rural Affairs (MARA)

Category of Budget	1990		1991		1992		1993		1994		1995	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Agriculture	190	95	-	-	420	88	640	89	1,100	89	1,595	87
Manufacture	5	3	-	-	16	3	27	4	40	3	73	4
Housing	1	0			15	3	15	2	25	2	25	1
Other Services (Economy)	1	1			9	2	6	1	10	1	30	2
Other Services (social)	3	1	-	-	20	4	31	4	62	5	112	6
Total	200	100	-	-	480	100	719	100	1,237	100	1,835	100
(US$ million equivalent)	77	-	-	-	70	-	66	-	42	-	43	-

Meteorological Data of Representative Stations in the River Basin

Station: Odemis

Items	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
TEMPERATURE														
Maximum values	°C	22.6	25.4	30.4	44.0	45.0	45.0	46.6	45.0	40.8	37.5	31.4	23.0	
Monthly mean	°C	6.9	7.9	10.6	14.8	20.7	24.6	26.1	27.6	22.5	16.7	12.1	8.7	
Minimum values	°C	-10.0	-9.1	-5.7	-1.4	1.7	5.6	10.2	8.0	4.9	-2.0	-7.0	-9.0	
RELATIVE HUMIDITY	%	73.0	72.0	70.0	67.0	60.0	53.0	50.0	52.0	58.0	66.0	73.0	76.0	64.0
EVAPORATION	mm	21.1	31.7	60.8	105.4	160.5	214.4	243.9	233.5	188.0	127.7	71.7	35.9	1494.6
PRECIPITATION														
Mean monthly	mm	107.0	86.9	69.9	49.3	35.0	17.2	6.1	2.7	14.3	39.3	79.4	130.2	637.3
WIND														
Direction		SSW	N	WSW	NW	NW	NE	NNW	ENE	NNE	N	NNW	WSW	
Maximum velocity	m/s	25.9	22.5	24.0	20.4	17.1	26.7	21.3	22.3	16.0	16.8	17.8	21.1	26.7

Station: Bayindir

Items	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
TEMPERATURE														
Maximum values	°C	23.5	24.6	31.5	34.0	38.5	40.6	43.4	41.0	39.2	37.2	28.0	24.0	
Monthly mean	°C	8.5	9.3	11.9	15.5	20.7	25.3	27.5	27.0	23.8	18.9	13.8	9.9	
Minimum values	°C	-8.5	-5.9	-3.4	1.0	6.5	11.0	13.5	13.5	8.5	0.5	-2.7	-5.5	
RELATIVE HUMIDITY	%	-	-	-	-	-	-	-	-	-	-	-	-	
EVAPOLATION	mm	31.4	41.1	70.1	114.6	169.5	224.1	250.1	244.5	202.9	146.6	88.9	46.4	1630.2
PRECIPITATION														
Mean monthly	mm	121.6	94.5	71.2	53.2	35.7	15.1	3.0	1.1	14.4	43.3	70.3	140.5	663.9
WIND														
Direction		-	-	-	-	-	-	-	-	-	-	-	-	
Maximum velocity	m/s	-	-	-	-	-	-	-	-	-	-	-	-	

Station: Tire

Items	Unit	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
TEMPERATURE														
Maximum values	°C	23.2	24.0	31.3	34.2	39.8	42.3	44.3	42.7	40.3	37.0	29.3	23.6	
Monthly mean	°C	7.4	8.4	11.0	15.1	20.0	24.9	27.3	26.6	22.7	17.4	12.0	8.8	
Minimum values	°C	-8.0	-6.8	-5.4	0.8	4.2	8.8	11.0	10.6	7.2	0.0	-3.8	-5.6	
RELATIVE HUMIDITY	%	68.0	65.0	65.0	61.0	57.0	49.0	47.0	48.0	53.0	60.0	66.0	70.0	59.0
EVAPOLATION	mm	26.9	36.3	65.0	109.5	167.3	216.3	249.2	237.8	192.3	137.6	75.4	40.8	1554.4
PRECIPITATION														
Mean monthly	mm	142.5	110.2	82.9	58.4	36.0	13.2	3.9	2.7	13.7	41.2	91.3	174.5	770.5
WIND														
Direction		SSW	SW	SE	SSW	WSW	WNW	NNE	WSW	ENE	ENE	NW	S	
Maximum velocity	m/s	6.6	6.9	8.6	6.0	4.8	5.0	5.1	4.4	5.8	5.8	13.5	7.4	13.5

Table 2.1.1

Table 2.1.2

Hydrological Properties of Küçük Menderes Tributaries

Name of Dam	Catchment Area	Monthly Mean Discharge (MCM)													Floods (m3/sec)				Sediment Load
	(km2)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave.	1/10	1/150	1/100	PMF	(m3/km2/y)
Uladi	66.0	0.52	0.93	2.57	3.47	2.63	2.41	1.45	0.90	0.51	0.37	0.35	0.38	1.37	39.8	71.1	86.3	392.0	150
Ergenli	98.0	0.78	1.38	3.82	5.15	3.91	3.57	2.15	1.34	0.75	0.55	0.51	0.56	2.04	52.8	97.7	119.7	633.0	200
Burgaz	91.2	0.73	1.29	3.56	4.80	3.64	3.33	2.00	1.25	0.70	0.51	0.48	0.52	1.90	53.3	90.2	107.5	552.0	200
Aktaş	58.7	0.18	0.50	2.23	3.29	2.28	2.05	1.17	0.57	0.23	0.12	0.09	0.10	1.07	51.4	91.5	111.0	370.0	200
Ödemiş	64.6	0.49	0.91	3.70	5.40	4.14	4.04	2.49	1.33	0.75	0.55	0.46	0.46	2.06	38.8	75.6	94.0	452.0	200
Birgi	12.6	0.11	0.21	0.85	1.24	0.95	0.93	0.57	0.30	0.17	0.13	0.11	0.11	0.47	15.3	28.2	34.4	130.0	100
Bucak	18.0	0.16	0.30	1.23	1.79	1.37	1.34	0.82	0.44	0.25	0.18	0.15	0.15	0.68	13.0	25.3	31.5	144.0	150
Beydağ	444.0	1.64	2.97	9.24	14.71	14.07	14.58	9.79	5.53	1.65	0.70	0.48	0.76	6.34	258.3	406.0	468.0	1,543.0	300
Pirinçci	51.3	0.22	0.61	2.17	4.29	3.84	3.90	2.26	1.13	0.38	0.12	0.10	0.09	1.59	36.1	62.6	75.0	366.0	150
Sarılar	30.9	0.13	0.37	1.30	2.57	2.30	2.34	1.36	0.68	0.23	0.07	0.06	0.06	0.96	21.8	38.0	46.0	247.0	100
Yenişehir	15.0	0.06	0.18	0.63	1.25	1.12	1.14	0.66	0.33	0.11	0.03	0.03	0.03	0.46	13.5	23.0	28.7	152.0	150
Eğridere	21.8	0.09	0.26	0.92	1.82	1.63	1.66	0.96	0.48	0.16	0.05	0.04	0.04	0.68	16.5	29.8	36.0	193.0	200
Akyurt	24.2	0.08	0.22	1.06	1.45	1.19	1.16	0.56	0.23	0.08	0.03	0.02	0.03	0.51	20.0	31.9	37.5	136.0	100

Result of Irrigation Suitability Classification

Physiography		Suit. Class	Area (ha)	Remarks
Upland				
	US	VI	144,900	Steep slope, Shallow Soil Depth, High rock content
	UG	VI	13,400	Steep slope, Shallow Soil Depth, High rock content
	UL	VI	47,500	Steep slope, Shallow Soil Depth, High rock content
Marl Hills				
	Hhb	VI	4,300	Hilly, shallow soil depth
	HrA	V	1,000	Rolling, High carbonate content
Colluvial slopes				
	CsL	V	1,800	Sloping
Pediment				
	EsS	V	1,200	Sloping
	EmW	V	1,000	Gently sloping, High carbonate content
Terraces				
	TlB	III	1,500	Rolling
	TbB	I	500	
Old dissetected alluvial fans				
	DsS	V	7,500	Sloping, Rock content
	DsG	V	3,900	Sloping, Rock content
	DsM	V	3,800	Sloping, Rock content
Young dissetected alluvial fans				
	PsS	VI	3,900	Sloping, High rock content, Coarse texture
	PsG	VI	900	Sloping, High rock content, Coarse texture
	PsL	VI	1,800	Sloping, High rock content, Coarse texture
	PmS	III	26,200	Coarse texture, low water holding capacity
	PmG	III	3,900	Coarse texture, low water holding capacity
	PmL	III	2,800	Coarse texture, low water holding capacity
	PlS	II	20,600	Gently sloping
	PlG	III	1,900	Coarse texture, low water holding capacity
	PlL	II	700	Gently sloping
	PlM	II	5,500	Gently sloping
	PbM	I	3,600	
	PbH	III	600	Flood
Basins				
	BfN	II	1,400	Imperfect drain
	BfV	III	5,700	Imperfect drain, Low fertility
	BwI	III	1,600	Imperfect drain, Low fertility
Young alluvial plains				
	AyC	III	6,100	Coarse texture, low water holding capacity
	AyB	I	24,000	
	AyA	III	1,400	Imperfect drain, Low fertility
Streambeds				
	R	VI	1,900	-
Built-up Area		-	5,000	-
Total			351,800	

Table 2.1.4

CroppedArea by District in the River Basin (Ave.1990-1994)

Crop	Beydag		Kiraz		Ödemis		Tire		Bayindir		Torbali		Selçuk		Total	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Field crops																
Wheat	240	4.3	518	5.3	1,426	3.7	5,840	16.1	3,550	11.5	10,260	31.3	970	6.7	22,804	13.5
Barley	315	5.6	430	4.4	1,086	2.8	2,661	7.3	630	2.0	2596	7.9	91	0.6	7,809	4.6
Oat	23	0.4	0	0.0	0	0.0	100	0.3	98	0.3	654	2.0	0	0.0	874	0.5
Rye	21	0.4	310	3.1	16	0.0	0	0.0	22	0.1	0	0.0	0	0.0	369	0.2
Cotton	260	4.7	414	4.2	5,832	15.0	8,226	22.7	5,305	17.2	8,274	25.2	2,789	19.1	31,100	18.4
Tobacco	533	9.5	866	8.8	2,840	7.3	2,688	7.4	336	1.1	1,354	4.1	66	0.4	8,683	5.1
Maize	62	1.1	222	2.3	132	0.3	356	1.0	264	0.9	366	1.1	73	0.5	1,475	0.9
Legumes	82	1.5	214	2.2	80	0.2	0	0.0	0	0.0	32	0.1	0	0.0	407	0.2
Sesami	7	0.1	32	0.3	337	0.9	533	1.5	61	0.2	184	0.6	188	1.3	1,342	0.8
Potatoes	169	3.0	200	2.0	8,594	22.1	274	0.8	215	0.7	0	0.0	3	0.0	9,455	5.6
Onions	35	0.6	7	0.1	113	0.3	58	0.2	0	0.0	23	0.1	5	0.0	241	0.1
Vetches	36	0.6	33	0.3	30	0.1	274	0.8	228	0.7	426	1.3	72	0.5	1,099	0.7
Alfalfa	175	3.1	322	3.3	1,239	3.2	694	1.9	483	1.6	93	0.3	12	0.1	3,018	1.8
Others	158	2.8	10	0.1	30	0.1	153	0.4	87	0.3	418	1.3	9	0.1	865	0.5
Subtotal	2,115	37.9	3,577	36.3	21,755	56.0	21,856	60.4	11,280	36.5	24,679	75.3	4,277	29.3	89,540	53.1
Vegetables																
Tomatoes	33	0.6	34	0.3	231	0.6	412	1.1	139	0.4	209	0.6	73	0.5	1,131	0.7
Pepper	53	0.9	27	0.3	438	1.1	198	0.5	218	0.7	175	0.5	19	0.1	1,127	0.7
Egg plant	26	0.5	16	0.2	192	0.5	129	0.4	123	0.4	78	0.2	15	0.1	578	0.3
Watermelons	264	4.7	40	0.4	2,774	7.1	3,489	9.6	1,220	3.9	1,520	4.6	344	2.4	9,650	5.7
Melon	8	0.1	0	0.0	17	0.0	116	0.3	25	0.1	154	0.5	135	0.9	456	0.3
Cucumber	36	0.6	131	1.3	1,388	3.6	59	0.2	615	2.0	186	0.6	48	0.3	2,462	1.5
Squash	3	0.1	2	0.0	12	0.0	42	0.1	30	0.1	35	0.1	25	0.2	150	0.1
Okra	32	0.6	7	0.1	378	1.0	37	0.1	7	0.0	13	0.0	3	0.0	477	0.3
Cabbages	34	0.6	10	0.1	170	0.4	42	0.1	71	0.2	159	0.5	2	0.0	489	0.3
Leeks	23	0.4	20	0.2	136	0.4	68	0.2	85	0.3	95	0.3	4	0.0	431	0.3
Cauliflowers	9	0.2	8	0.1	120	0.3	44	0.1	62	0.2	98	0.3	11	0.1	352	0.2
Spinach	15	0.3	13	0.1	69	0.2	39	0.1	41	0.1	172	0.5	92	0.6	441	0.3
Lettuce	12	0.2	1	0.0	89	0.2	34	0.1	66	0.2	134	0.4	21	0.1	356	0.2
Celery	1	0.0	2	0.0	7	0.0	7	0.0	14	0.0	17	0.1	0	0.0	48	0.0
Green onions	22	0.4	13	0.1	22	0.1	153	0.4	1	0.0	35	0.1	7	0.0	252	0.1
Green legumes	102	1.8	36	0.4	186	0.5	457	1.3	267	0.9	48	0.1	3	0.0	1,100	0.7
Carrots	5	0.1	0	0.0	3	0.0	13	0.0	0	0.0	0	0.0	0	0.0	21	0.0
Radish	6	0.1	0	0.0	19	0.0	10	0.0	2	0.0	17	0.1	4	0.0	58	0.0
Others	4	0.1	0	0.0	34	0.1	0	0.0	26	0.1	9	0.0	0	0.0	72	0.0
Subtotal	687	12.3	359	3.6	6,284	16.2	5,350	14.8	3,013	9.7	3,153	9.6	807	5.5	19,653	11.6
Tree crops (trees)																
Olive	740	13.3	1,340	13.6	4,431	11.4	5,000	13.8	14,610	47.3	3,309	10.1	7,662	52.5	37,093	22.0
Figs	809	14.5	1,038	10.5	2,732	7.0	2,485	6.9	61	0.2	130	0.4	445	3.0	7,701	4.6
Citrus	0	0.0	0	0.0	15	0.0	17	0.0	46	0.1	20	0.1	114	0.8	212	0.1
Apple	33	0.6	1,445	14.6	109	0.3	82	0.2	18	0.1	0	0.0	15	0.1	1,701	1.0
Pears	8	0.1	256	2.6	87	0.2	171	0.5	75	0.2	77	0.2	24	0.2	698	0.4
Quince	5	0.1	131	1.3	48	0.1	17	0.0	19	0.1	29	0.1	14	0.1	263	0.2
Peaches	41	0.7	63	0.6	174	0.4	481	1.3	71	0.2	416	1.3	792	5.4	2,041	1.2
Cherries	47	0.8	226	2.3	296	0.8	36	0.1	86	0.3	0	0.0	12	0.1	703	0.4
Plums	63	1.1	71	0.7	233	0.6	43	0.1	17	0.1	21	0.1	17	0.1	464	0.3
Pomegranates	19	0.3	42	0.4	37	0.1	20	0.1	17	0.1	20	0.1	3	0.0	158	0.1
Chestnuts	630	11.3	354	3.6	671	1.7	126	0.3	40	0.1	0	0.0	0	0.0	1,820	1.1
Other nuts	96	1.7	784	7.9	214	0.6	383	1.1	51	0.2	33	0.1	52	0.4	1,611	1.0
Grapes (ha)	80	1.4	99	1.0	465	1.2	510	1.4	1,065	3.4	1,347	4.1	360	2.5	3,927	2.3
Others	22	0.4	112	1.1	72	0.2	44	0.1	4	0.0	34	0.1	9	0.1	297	0.2
Subtotal	2,592	46.4	5,961	60.4	9,583	24.7	9,417	26.0	16,179	52.3	5,438	16.6	9,518	65.3	58,689	34.8
Populas	250	4.5	111	1.1	2,000	5.2	64	0.2	1,700	5.5	50	0.2	0	0.0	4,175	2.5
Farrow land	0	0.0	0	0.0	100	0.3	0	0.0	0	0.0	0	0.0	0	0.0	100	0.1
Others	45	0.8	0	0.0	856	2.2	629	1.7	110	0.4	0	0.0	0	0.0	1,640	1.0
Total	5,690	101.9	10,008	101.5	40,578	104.5	37,316	103.1	32,281	101.4	33,320	101.6	14,603	100.1	173,797	103.0
Farm land	5,584	100.0	9,863	100.0	38,825	100.0	36,210	100.0	30,919	100.0	32,790	100.0	14,586	100.0	168,777	100.0

Source: "Agricultural Structure and Production" from1990 to1994 ,Provincial Office of MARA, Izmir.

Yearly Crop Production in the River Basin

(tons)

Crop	(1990)	(1991)	(1992)	(1993)	(1994)	(Average)
Common field crops						
Wheat	62,184	84,605	64,599	120,151	101,655	86,639
Barley	19,537	21,766	20,023	25,818	20,941	21,617
Oat	2,573	2,054	1,643	2,289	2,845	2,281
Rye	755	640	786	795	842	764
Cotton	80,600	78,274	84,209	83,102	86,525	82,542
Tobacco	9,530	4,802	8,425	8,397	4,208	7,072
Maize	13,847	9,330	8,158	13,189	9,433	10,791
Legumes	554	483	661	1,420	1,496	923
Sesami	1,682	2,468	1,142	414	379	1,217
Potatoes	209,495	230,795	249,072	262,420	288,650	248,086
Onions	2,833	2,006	2,704	5,319	6,392	3,851
Vetches	2,133	1,812	4,678	5,111	3,409	3,429
Clover	23,249	32,500	32,268	68,269	46,230	40,503
Vegetables						
Tomatoes	29,760	32,095	24,597	38,465	46,690	34,321
Pepper	22,204	23,479	21,836	21,503	25,192	22,843
Egg plant	14,500	15,520	12,930	17,010	18,330	15,658
Watermelons	280,916	293,242	305,434	296,650	317,735	298,795
Melon	7,475	7,445	7,900	8,281	10,146	8,249
Cucumber	27,632	42,715	39,968	27,146	37,797	35,052
Squash	2,985	2,980	2,900	3,020	3,936	3,164
Okra	1,540	1,686	1,505	1,818	2,075	1,725
Cabbages	20,210	20,102	17,422	18,605	21,392	19,546
Leeks	11,590	11,890	11,105	12,615	14,180	12,276
Cauliflowers	6,593	6,713	7,378	8,000	10,240	7,785
Spinach	4,022	3,954	3,944	3,820	4,737	4,095
Lead Lettuce	6,360	7,050	7,090	7,590	8,265	7,271
Celery	441	491	365	856	1,558	742
Garlic green	2,138	2,083	2,168	2,680	6,120	3,038
Beans	6,478	7,375	7,256	8,041	12,182	8,266
Carrots	370	390	272	260	516	362
Red radish	530	404	405	580	1,429	670
Others	905	1,730	646	1,023	97	880
Tree crops						
Olive	108,714	12,715	69,089	21,454	117,603	65,915
Figs	37,116	44,879	34,917	43,816	46,129	41,371
Citrus	2,106	2,850	3,090	2,773	2,931	2,750
Apple	9,800	9,840	8,865	8,907	6,989	8,880
Pears	2,757	2,529	2,360	2,714	2,672	2,606
Quince	1,127	1,050	861	1,001	1,007	1,009
Peaches	12,163	12,097	12,133	15,418	16,727	13,708
Cherries	1,566	1,757	2,257	2,089	2,503	2,034
Plums	2,220	2,398	2,237	2,347	2,499	2,340
Pomegranates	937	913	843	832	863	878
Chestnuts	7,505	7,629	8,390	8,363	7,728	7,923
Other nuts	2,432	2,551	2,394	2,478	2,599	2,491
Grape	38,743	38,851	42,145	32,132	32,134	36,801
Others	1,108	978	991	1,280	1,476	1,167

Source: "Agricultural Structure and Production" from 1990 to 1994, Provincial Office of MARA, İzmir.

Table 2.1.6

Application of Chemical Fertilizer and Agro-chemicals in the River Basin

(a) Chemical Fertilizer (tons)

Items	1992	1993	1994	Average
Ammonium Sulfate	8,076	9,166	6,380	7,874
Ammonium Nitrate	9,492	10,732	11,285	10,503
Urea	6,711	9,051	6,191	7,318
Diammoniup Phosphate	1,088	1,432	1,320	1,280
Potasium Sulfate (50%K)	485	1,022	573	693
Triple super phosphate	433	540	652	542
Compound 15-15-15	10,018	10,908	11,828	10,918
Compound 20-20-0	5,612	3,981	3,697	4,430
Ammonium Nitrate	1,330	75	63	489
Potasium Nitrate	0	18	1	6
Calsium Ammonium Nitrate	49	856	249	385
Compound 25-5-10	0	594	186	260
Compound 25-5-0	374	23	22	140
Compound 26-13-0	0	0	0	0
Compound 15-45-0	22	0	1	8
Compound 11-52-0	0	0	5	2
Total	45,682	50,391	44,447	44,847
Converted to N21% fertilizer	50,734	56,977	47,885	51,865
P17%	19,466	19,708	19,965	19,713
K50%	3,416	4,426	4,159	4,000
Total	73,772	81,111	71,979	75,621
Kg/ha				
N21% fertilizer	301	338	284	307
P17%	115	117	118	117
K50%	20	26	25	24

Source : Provincial Office of MARA, Izmir

(b) Agro-chemicals (kg.lit)

Agro-Chemicals	1993		1994		Average		kg.lit/ha
	No. of brand	Quantities sold	No. of brand	Quantities sold	No. of brand	Quantities sold	
Incecticides	100	477,113	107	420,571	104	448,842	1.2
Fungicides	63	425,502	93	487,493	78	456,498	1.2
Herbicides	31	120,913	35	324,050	33	222,482	0.6
Acarisides	19	41,861	15	53,214	17	47,538	0.1
Nematocides	6	4,400	8	12,410	7	8,405	0.0
Fumigants	5	67,152	15	101,057	10	84,105	0.2
Plant growth regulators	11	22,706	17	30,828	14	26,767	0.1
Others	7	194,069	13	191,124	10	192,597	0.5
Total	242	1,353,716	303	1,620,747	273	1,487,232	3.9

Source: Provincial Office of MARA, Izmir

Table 2.1.7

Number of Livestock and Production in the River Basin (Average 1990-1994)

(a) Number (unit: heads)

Livestock	Beydağ	Kiraz	Ödemiş	Tire	Bayındır	Torbalı	Selçuk	Total
Cattle	6671.4	17720.8	32858	22325	17640.6	9808.2	2764.6	109788.6
Sheep	7631	36687	56652	25296.2	17803	22556.4	5784.6	172410.2
Goats	1549.4	2069.8	6000.2	4870	5070	12347.6	4156.2	36063.2
Horse	302	581	1250.8	822	1149	1040.2	683.4	5828.4
Mule	8.2	97.8	38.2	93.4	34.6	21.2	44	337.4
Donkey	1889.4	1646	1390.4	940.6	737.4	2230.2	411.2	9245.2
Hen	10370	42400	93740	60000	135840	427560	5960	775870
Other poultry	442.2	0	4884	2880	0	5240	356	13802.2

Source: Agricultural Structure and Production, Provincial Office of MARA, Izmir

(b) Production (unit: tons)

Livestock products	Beydağ	Kiraz	Ödemiş	Tire	Bayındır	Torbalı	Selçuk	Total
Milk	8767.4	30409.6	40476	15839.4	27083.2	25271.8	1736.4	149583.8
Meats	89.2	671.8	2307.2	649.2	511.2	731.6	300.6	5260.8
Fats	39.6	170.8	159.4	46.2	208.8	10.6	16.2	651.6
Cheese	161.4	2544	4364	722	781.6	1458	73	10104
Wool	10	47.22	83.3	38.36	9.7	39.02	14.64	242.24
Honey	5.9	15.3	77.66	181	125.24	105.2	19.18	529.48
Eggs (1,000eggs)	2111	3768	6817.6	2460	5648.8	104000	497	125302.4

Source: Agricultural Structure and Production, Provincial Office of MARA, Izmir

Table 2.1.8

Present Irrigation Schemes Controled by DSİ in the River Baisn

Irrigation scheme	Town	Established year	Well			Spring		Stream		Remarks
			Number of wells	Discharge (l/sec)	Irrigated Area(ha)	Discharge (l/sec)	Irrigated Area(ha)	Discharge (l/sec)	Irrigated Area(ha)	
1 Ankbasi	Bayındır	1958 - 72	4	160.0	120.0					
2 Burunsuk	Bayındır	(1995)	4	120.0	142.4					under construction
3 Canli	Bayındır	(1995)	4	100.0	100.0					under construction
4 Ciftcigeedigi	Bayındır	1981	4	150.0	150.0					
5 Cirpi I. Kisim	Bayındır	1981	5	190.0	200.0					
6 Cirpi II. Kisim	Bayındır	(1995)	4	80.0	100.0					under construction
7 Hifli I. Kisim	Bayındır	1991 - 92	5	100.0	100.0					
8 Firinli	Bayındır	1987	9	320.0	280.0					
9 Hasköy I. Kisim	Bayındır	1981	4	280.0	267.1					
10 Kizileaavlu I. Ks.	Bayındır	1976	7	210.0	110.0					
11 Turan I. Kisim	Bayındır	1986	4	210.0	210.0					
12 Yakacik I. Kisim	Bayındır	1985	4	210.0	200.0					
13 Yakapinar	Bayındır	1980 - 82	6	210.0	175.0					
14 Yusuflu I. Kisim	Bayındır	1982	4	200.0	100.0					
15 Zeytinova	Bayındır	1993 - 95	5	120.0	100.0					
16 Arikbasi	Bayındır	1958						20.0	25.0	
17 Ergenli	Bayındır	1977						115.0	116.0	
18 Merkez	Bayındır	1958						20.0	25.0	
19 Yakapinar-Canli	Bayındır	1972						100.0	125.0	
20 Büyükavlucak	Ödemiş	1977	5	90.0	165.0					
21 Demircili	Ödemiş	1968 - 69	4	160.0	200.0					
22 Kaymakci	Ödemiş	1978	1	35.0	61.0					
23 Konakli	Ödemiş	(1995)	6	200.0	200.0					under construction
24 Küçükavlucak I Ks	Ödemiş	1970	7	135.0	160.5					
25 Küçükavlucak II Ks	Ödemiş	(1995)	2	40.0	50.0					under construction
26 Yenikoy	Ödemiş	1981	6	180.0	150.0					
27 Yölüstü I. Kisim	Ödemiş	1983	12	360.0	350.0					
28 Camlik	Ödemiş	1984				4.0	8.0			
29 Camyayla	Ödemiş	1985				65.0	80.0			
30 Kemer	Ödemiş	1975 - 84				75.0	112.0			
31 Bademiye	Ödemiş	1984						35.0	40.0	
32 Bicakci-Halikoy	Ödemiş	1989 - 91						100.0	100.0	
33 Cayirkoy	Ödemiş	1989 - 91						30.0	30.0	
34 Comaklar	Ödemiş	1978 - 79						30.0	40.0	
35 Comaklar (2)	Ödemiş	1980						30.0	30.0	
36 Erikli	Ödemiş	1975						85.0	104.0	
37 Horzum	Ödemiş	1983						70.0	75.0	
38 Kesicli	Ödemiş	1984						52.0	60.0	
39 Kesicli (2)	Ödemiş	1988						12.0	11.0	
40 Kocakoren	Ödemiş	1989 - 91						40.0	54.7	
41 Piringci	Ödemiş	1974						40.0	50.0	
42 Uckonaklar	Ödemiş	1981						50.0	105.0	
43 Yağcılar	Ödemiş	1974						30.0	20.0	
44 Yağcılar (2)	Ödemiş	1975						40.0	70.0	
45 Yilanli	Ödemiş	1991 - 92						60.0	13.0	
46 Gokgen	Tire	1985	6	160.0	160.0					
47 Kahrat I	Tire	1972 - 74	6	305.0	392.0					
48 Kahrat II	Tire	1985	4	305.0	358.0					
49 Yeniciftlik	Tire	1981	3	150.0	100.0					
50 Akcaselir	Tire	1967				60.0	60.0			
51 Ayaklitiri	Tire	1975				65.0	120.0			
52 Büyükkale	Tire	1966				40.0	50.0			
53 Küçükkale	Tire	1966				35.0	40.0			
54 Kursak	Tire	1983				200.0	350.0			
55 Cayirli	Tire	1976						20.0	40.0	
56 Dereli	Tire	1977						100.0	70.0	
57 Egridere	Tire	1980 - 81						25.0	27.0	
58 Egridere (2)	Tire	1990 - 91						55.0	20.0	
59 Kirtepe	Tire	1981						130.0	150.0	
60 Osmancik	Tire	1990 - 91						40.0	42.0	
61 Aslanlar	Torbalı	(1995)	7	200.0	244.0	250.0	250.0			under construction
62 Atalan I. Kisim	Torbalı	1984	6	230.0	200.0					
63 Atalan II. Kisim	Torbalı	1990 - 91	2	80.0	40.0					
64 Caybasi	Torbalı	(1995)	6	140.0	170.0					under construction
65 Merkez I. Kisim	Torbalı	1984	5	220.0	209.0					
66 Merkez II. Kisim	Torbalı	1982 - 83	8		350.0					
67 Ozbey	Torbalı	1981 - 82		200.0	220.0					
68 Pamukyazi	Torbalı	1985	4	200.0	210.0					
69 Pancar	Torbalı	(1995)	11	420.0	433.0					under construction
70 Sehitler	Torbalı	1990 - 91	6	125.0	100.0					
71 Tulum	Torbalı	(1995)	5	100.0	100.0					under construction
72 Yenikoy	Torbalı	(1995)	2	125.0	125.0					under construction
73 Ayrancilar	Torbalı	1963 - 64				350.0	450.0			
74 Pancar	Torbalı	1967 - 68				125.0	200.0			
75 Degdizilca	Torbalı	1980						100.0	100.0	
76 Ozbey	Torbalı	1970 - 71						500.0	500.0	
77 Arkacilar	Kiraz	(1995)	3	90.0	102.5					under construction
78 Catak	Kiraz							10.0	80.0	
79 Cenitler	Kiraz	(1995)						65.0	71.6	under construction
80 Dokuzlar	Kiraz	1981						15.0	24.2	
81 Ovacik	Kiraz	(1995)						18.0	70.0	under construction
82 Uzunkoy	Kiraz	1975 - 76						40.0	50.0	
83 Merkez I. kisim	Selçuk	1977 - 78	4	240.0	209.0					
84 Merkez II. kisim	Selçuk		4	200.0	185.0					
Total			208	7,350	7,633	1,269	1,720	1,977	2,256	

Table 2.1.9

Result of Water Quality Analysis at the Proposed Dam Site

Item	Unit	Sampling Point of Dam Site					
		Beydağ	Aktaş	Burgaz	Ergenli	Uladi	Yenişehir
Sampling Date		9.3.1995	9.3.1995	9.3.1995	9.3.1995	9.3.1995	9.3.1995
pH	-	7.2	7.5	7.3	7.4	7.6	7.5
EC	mS/cm	0.23	0.20	0.23	0.21	0.16	0.24
Cation							
Na+	mg/l	24.61	23.90	12.65	3.91	9.66	12.19
K+	mg/l	0.78	0.78	0.39	0.39	0.39	0.39
Ca++	mg/l	17.20	15.60	27.20	27.00	15.80	18.40
Mg++	mg/l	9.50	8.70	4.80	6.40	7.20	13.80
Total	mg/l	52.09	48.98	45.04	37.70	33.05	44.78
SAR	-	1.67	1.70	0.83	0.25	0.72	0.74
Anion							
CO3- -	mg/l	0.00	0.00	0.00	0.00	0.00	0.00
HCO3-	mg/l	64.50	78.00	60.50	58.50	64.00	84.00
Cl-	mg/l	34.70	13.40	18.40	19.80	9.90	22.60
SO4- -	mg/l	22.90	29.60	28.60	16.20	16.20	28.20
Total	mg/l	122.10	121.00	107.50	94.50	90.10	134.80
Organic Carbon	mg/l	1.49	2.76	4.72	5.01	2.60	1.30
Boron	mg/l	0.00	0.00	0.00	0.00	0.00	0.00

Source : DSI II

Table 2.1.10

Existing Data of Water Quality in Kuçuk Menderes River Basin

Item	Unit	Sampling Point									
		Beydağ	Beydağ	Beydağ	Selçuk	Selçuk	Selçuk	Selçuk	Selçuk	Selçuk	Selçuk
Sampling Date		Feb.1994	Apr.1994	Dec.1994	Jan.1992	Apr.1994	Jan.1992	Apr.1994	Feb.1994	Apr.1994	May.1994
pH	-	8.5	8.2	7.0	9.2	8.3	7.5	8.0	7.3	8.2	7.7
EC	mS/cm	0.25	0.24	0.26	0.58	0.47	1.08	0.31	0.79	0.43	0.76
Cation											
Na+	mg/l	13.57	17.02	37.72	51.52	45.31	127.88	29.21	92.69	31.05	94.76
K+	mg/l	0.39	0.39	0.78	1.56	1.56	3.90	0.78	3.12	0.78	3.12
Ca++	mg/l	35.40	32.60	80.00	24.40	26.60	62.40	26.00	41.00	52.60	58.40
Mg++	mg/l	4.00	7.00	2.67	19.90	17.00	18.70	10.50	21.50	8.80	6.60
Total	mg/l	53.36	57.01	121.17	97.38	90.47	212.88	66.49	158.31	93.23	162.88
SAR	-	0.82	1.00	1.60	2.65	2.39	5.16	1.73	4.13	1.48	4.43
Anion											
CO3- -	mg/l	0.00	0.00	0.00	52.00	20.00	0.00	0.00	0.00	0.00	0.00
HCO3-	mg/l	68.50	90.50	157.50	64.00	105.00	321.50	117.50	244.00	139.00	239.50
Cl-	mg/l	21.60	32.20	18.40	76.90	47.50	104.50	16.60	60.90	50.60	63.40
SO4- -	mg/l	34.80	11.90	40.60	31.20	43.40	45.20	30.90	64.10	25.40	57.20
Total	mg/l	124.90	134.60	216.50	224.10	215.90	471.20	165.00	369.00	215.00	360.10
BOD	mg/l	2.40	2.80	2.20	3.00	-	15.60	1.00	20.70	13.40	7.70
Total dissolved matter	mg/l	136	45	265	298	200	300	300	500	105	123
Nitrogen as ammonia	mg/l	0.00	0.00	0.00	0.18	0.00	0.12	0.00	0.03	0.00	0.00
Nitrogen as nitrite	mg/l	0.00	0.00	0.00	0.042	0.000	0.035	0.050	0.000	0.000	0.000
Nitrogen as nitrate	mg/l	1.01	0.00	0.00	1.58	0.00	0.00	2.05	0.62	2.58	0.90
Total phosphorous	mg/l	0.05	0.04	0.06	0.06	0.00	0.12	0.10	0.11	0.17	0.26
Dissolved oxgen	mg/l	10.50	7.90	10.30	5.30	-	3.00	6.70	6.30	3.08	1.09
Boron	mg/l	0.00	0.00	0.00	0.00	0.00	2.07	0.34	0.59	0.00	0.00

Source : DSI II

Water Quality at the Observation Wells

	Well No.	District	Village	Date of Sampling	pH	EC (μ S/cm)	Cations (meq/l)				Anions (meq/l)				Total (meq/l)	Settling %	SAR	Category of Water	R.S.C.	Hardness P.P.M	Nitrogen	Ammonium	Organic mg/l
							Na++	K+	Ca++	Mg++	CO3- -	HCO3-	Cl-	SO4- -									
1	18622	KIRAZ	Hamitkoy	11/1958	7,5	480	1,20	0,23		4,70	0,00	3,90	0,50	1,00	5,4	21,09	0,8	C2S1	-	21,0	-	-	-
2	10053/A	"	Yaglar	4/1968	7,3	197	0,40	0,06	1,20	0,80	0,00	1,68	0,40	0,45	2,5	16,86	0,6	C1S1	-	10,0	0	0	1,00
	46234	ODEMIS	Kayacukur	5/1993	6,7	992	0,45	0,01	3,50	3,00	0,00	3,84	1,63	1,49	6,96	6,40	0,7	C2S1	-	32,5	0,24	0	0,98
3	27468	"	"	7/1990	7,6	681	1,78	0,07	3,00	2,40	0,00	1,30	1,50	4,25	7,25	24,60	1,1	C2S1	rather hard	27,0	0	0	0,80
4	(18645)-20611	"	K.Armutcuk	3/1987	7,3	259	0,61	0,02	1,21	0,86	0,00	2,07	0,37	0,26	2,70	22,60	0,6	C2S1	soft	10,6	0	0	0,88
	43351	"	B.Armutcuk	7/1992	7,4	282	0,19	0,01	2,28	0,57	0,00	2,47	0,24	0,24	3,1	6,20	0,1	C2S1	-	14,2	0	0	0,84
	20372	"	"	3/1976	7,3	308	0,60	0,12	2,30		0,00	1,85	0,20	1,02	3,07	19,50	0,5	C2S1	-	13,9	0	0	0,48
5	(20122)-42332	"	"	6/1992	7,7	320	0,66	0,02	1,40	1,24	0,00	2,38	0,51	0,41	3,3	19,40	0,6	C2S1	-	13,7	0	0	0,72
	42355	"	"	7/1992	7,7	304	0,28	0,01	2,08	0,77	0,00	2,04	0,71	0,39	3,1	8,90	0,2	C2S1	-	14,3	0	0	0,40
6	27727	"	Yukarc	9/1980	7,4	574	0,86	0,04	2,50	2,60	0,00	3,65	0,80	1,55	6,00	14,30	0,5	C2S1	rather hard	25,5	0	0	0,00
	44186	"	"	1/1992	6,9	492	0,55	0,02	2,36	1,95	0,00	3,29	0,66	1,13	5,1	10,80	0,4	C2S1	-	22,3	0	0	0,68
7	25926	"	"	5/1979	7,1	583	1,09	0,10	2,10	2,60	0,00	4,30	1,20	0,20	5,80	17,20	0,7	C2S1	rather hard	23,5	0	0	1,20
	13426/A	"	Adagide	9/1969	7,0	614		2,34		3,80	0,00	4,60	1,12	0,42	6,1	-	-	C2S1	-	19,0	-	-	-
8	13426/B	"	"	10/1969	7,0	587		2,07		3,80	0,00	3,40	1,40	1,07	5,9	-	-	C2S1	-	19,0	-	-	-
9	25727	"	Yenicoy	5/1979	6,9	586	1,62	0,10	1,60	3,00	0,00	4,30	1,80	0,12	6,22	24,40	1,0	C2S1	rather hard	23,0	-	-	1,04
	10571	"	Demirtli	6/1968	7,0	452		0,92		3,60	0,00	3,20	0,84	0,48	4,5	-	-	C2S1	-	18,0	-	-	-
10	(10571)-39977	"	"	5/1989	7,2	535	0,63	0,02	2,44	2,40	0,00	4,62	0,68	0,19	5,49	11,30	0,4	C2S1	-	24,2	0	0	1,68
	44189	"	Yenikoy	4/1993	7,5	482	0,18	0,01	3,62	1,14	0,00	2,79	1,72	0,43	4,85	3,70	0,1	C2S1	-	23,5	0	0	3,24
11	21920	"	"	4/1978	7,0	428	0,66	0,03	3,40	-	0,00	3,20	0,50	0,39	4,09	16,10	0,3	C2S1	middle soft	17,0	0	warning	-
12	10(12)	"	"	5/1959	7,8	375	1,20	0,25		2,90	0,00	3,97	0,60	0,50	4,2	29,00	1,1	C2S1	-	13,0	-	-	-
13	10046	TIRE	Kahve	4/1968	7,2	216	0,30	0,08	1,00	1,90	0,00	1,95	0,58	0,60	3,2	9,15	0,4	C2S1	-	11,0	0	0	0,70
14	30295	"	Ovacem	4/1973	7,7	290	0,20	0,06	1,55	0,89	0,00	1,92	0,29	0,49	2,80	10,20	0,3	C1S1	-	16,0	0	0	0,30
15	14385	"	"	12/1982	7,2	291	0,99	0,02	2,00	0,40	0,00	2,13	0,90	0,27	3,32	27,10	0,9	C2S1	soft	12,0	0	0	2,60
16	30301	"	"	12/1982	7,9	459	0,82	0,03	2,80	1,40	0,00	4,00	0,80	0,25	5,05	16,20	0,6	C2S1	rather hard	21,0	0	0	0,64
	7264	"	Ovacik	2/1966	7,2	578	0,65	-		3,20	0,00	3,25	0,87	1,73	5,85	11,11	0,4	C2S1	-	-	0	0	0,88
17	39443	BAYINDIR	Zeytinova	7/1990	7,2	391	0,29	0,09	3,80	1,50	0,00	3,55	0,86	1,39	6,00	9,80	0,3	C2S1	-	26,7	0	0	1,60
18	39393	"	Yukarik	5/1993	7,3	310	0,99	0,02	1,90	0,20	0,00	2,20	0,60	0,48	3,28	20,10	0,6	C2S1	soft	13,0	0	0	2,80
19	27362	"	Yesilli	9/1980	7,4	422	0,90	0,08	2,00	1,40	0,00	3,05	0,90	0,43	4,38	20,50	0,7	C2S1	middle soft	17,0	0	0	3,40
20	28425	"	Tuzu	4/1981	7,4	380	0,92	0,04	2,00	1,10	0,00	3,15	0,60	0,21	3,96	20,70	0,7	C2S1	middle soft	15,5	0	0	2,24
21	30963	"	Pinarl	3/1984	-	479	1,36	0,04	2,80	0,60	0,00	3,35	1,00	0,45	4,80	29,30	1,0	C2S1	middle soft	28,0	0	0	0,24
22	30965	"	"	2/1984	7,7	558	1,08	0,03	2,20	0,30	0,00	4,00	0,60	1,21	5,61	31,90	2,8	C2S1	middle soft	12,5	0	0	0,96
23	39994	"	Elifli	1/1990	6,4	754	1,74	0,05	3,44	2,42	0,00	6,02	1,53	0,14	7,69	22,60	1,0	C2S1	-	29,5	0	0	0,40
	39998	"	"	2/1990	7,6	699	0,32	0,01	2,50	3,21	0,00	4,14	0,86	1,04	6,0	5,29	0,2	C2S1	-	28,6	0	0	0,16
24	726203	"	Cicekkoy	2/1966	7,0	288	0,70	0,10		2,40	0,00	2,30	0,80	-	3,2	21,00	0,6	C2S1	-	-	-	-	-
25	21917	"	Yukaposar	2/1978	7,2	329	0,52	0,03	2,50	0,90	0,00	2,35	0,90	0,30	3,55	15,20	0,4	C2S1	middle soft	17,0	0	0	0,88
	44186	"	"	3/1993	7,6	449	0,48	0,01	2,56	1,49	0,00	2,60	0,65	1,29	4,54	10,30	0,3	C2S1	-	20,2	0,003	0	0,80
26	19145	"	Kizilcaova	4/1975	6,8	538	1,14	0,06	3,20	1,40	0,00	3,40	1,00	1,40	5,80	19,20	0,8	C2S1	-	23,0	0	0	0,40
27	24962	"	Cifteselat	9/1978	7,6	978	1,20	0,01	6,00	-	0,00	4,45	1,20	1,56	7,21	16,60	0,7	C3S1	rather hard	30,0	-	-	-
	14492	"	Acikbel	8/1970	7,1	590	0,95	0,05	2,95	1,85	0,00	4,02	0,60	1,33	5,80	16,20	0,6	C2S1	-	-	0	0	0,40
28	(14492)-42333	"	"	3/1992	7,3	521	0,89	0,01	2,95	1,35	0,00	4,15	0,91	0,24	5,40	16,40	0,6	C2S1	-	22,5	0,001	0,01	0,80
29	24879	"	Cimi	8/1978	7,5	593	1,87	0,03	2,20	2,30	0,00	4,45	1,30	0,60	6,35	28,60	1,2	C2S1	rather hard	25,0	0	0	0,80
30	24966	"	Hasbey	9/1978	-	572	0,76	0,03	2,20	-	0,00	1,25	0,70	1,00	2,99	28,40	0,7	C2S1	soft	11,0	0	0	1,00
31	24957	TIRE	Yenicifli	7/1978	7,6	421	1,18	0,03	2,90	0,90	0,00	2,73	0,60	0,76	4,11	2,87	1,0	C2S1	-	-	0	0	1,12
	40952	"	"	4/1990	7,1	305	0,94	0,01	1,10	1,05	0,00	2,22	0,53	0,35	3,10	30,20	0,9	C2S1	-	19,7	0	0	0,00
32	26902	TOKRALI	Aslan	6/1979	7,5	266	1,04	0,05	1,10	1,60	0,00	2,90	0,80	0,09	3,79	27,40	0,9	C2S1	soft	13,5	0	warning	0,88
33	26907	"	Aslanlar	10/1979	-	964	3,72	0,19	2,10	2,50	0,00	6,55	1,60	0,36	8,51	43,70	2,4	C3S1	rather hard	23,0	0	0	0,48
34	33270	"	Sahinler	6/1987	7,8	484	0,53	0,01	2,98	1,46	0,00	4,17	0,79	0,10	4,98	19,60	0,6	C2S1	rather hard	22,2	0	0	0,72
35	30907	"	Pamukyaka	9/1983	7,9	487	1,04	0,03	1,90	1,90	0,00	4,20	0,50	0,17	4,87	21,40	0,8	C2S1	-	19,0	0	0	1,60
	28554	"	DSI Karakilsi	6/1981	7,8	701	2,58	0,09	2,30	2,20	0,00	3,55	0,80	0,82	7,17	36,00	1,7	C2S1	rather hard	27,5	-	-	0,48
36	(22331)-44601	"	Ceyhan	7/1993	7,2	425	0,81	0,02	3,15	2,27	0,00	5,28	0,46	0,54	6,4	12,70	0,5	C2S1	-	27,1	0	0	0,00
37	10044/A	"	Yenikoy	3/1968	7,1	340	0,70	0,05	3,50	2,40	0,00	5,43	0,88	0,28	6,60	10,53	0,6	C2S1	-	26,0	0	0	3,80
38	10063	"	Mesdre	3/1968	7,2	432	0,70	0,04	1,90	3,20	0,00	4,90	0,80	0,20	5,8	12,00	0,6	C2S1	-	26,0	-	-	-
39	27414	"	Merkez I	5/1980	7,5	1060	1,94	0,13	5,00	3,20	0,00	9,15	0,90	0,12	10,17	18,10	0,9	C3S1	very hard	43,0	0	0	1,44
40	29963	"	Merkez II	6/1982	7,4	600	0,88	0,04	3,00	2,60	0,00	5,00	0,80	0,72	6,52	13,20	0,5	C2S1	-	-	warning	0	3,36
41	31492	"	Pazar	6/1984	7,5	404	2,00	0,03	2,50	1,60	0,00	4,12	1,00	0,08	6,10	32,60	1,4	C2S1	-	20,2	0	0	3,60
42	39495	"	"	10/1991	7,1	1071	3,64	0,06	4,60	2,60	0,00	5,26	4,24	1,40	10,90	33,40	1,9	C3S1	-	34,0	0	0	0,40
43	18495	SELCUK	Merkez II	8/1972	7,5	946	1,70	0,09	7,00	-	0,00	5,60	2,60	0,29	8,79	19,30	0,9	C3S1	-	-	-	-	-
44	21381	"	"	10/1976	7,4	1958	10,00	0,28	9,00	-	0,00	5,45	11,10	2,73	19,28	51,80	4,7	C3S2	very hard	45,0	-	-	-

Table 2.1.12

List of Endemic Species of Plants and Endangered or Vulnerable Species of Animals in İzmir Province

(a) Endemic Species of Plants

- Alopecurum davisi
- Asperula daphneoia
- Astragalus papasianus
- Centaurea zeybekii
- Prunus cocomilia var. puberula
- Scrophularia scopolii var. smyrnaea
- Verbascum smyrnaeum
- Campanula teucroides
- Vincetoxicum tmoleum
- Circium tmoleum
- Galium tmolium

(b) Endangered or Vulnerable Species of Animals

Mammals	Endangered	
		Hyaena hyaena
	Vulnerable	
		Myotis myotis macrosefalicus
		Myotis c. capaccinii
		Lutra lutra
Birds	Endangered	
		Pelecanus crispus
		Haliaeetus albicilla
		Hieraaetus fasciatus
		Ketupa zeylonensis
	Vulnerable	
		Accipiter brevipes
		Halcyon smyrnensis
Fish	Endangered	
		Acipencer guldenstaedti
		Acipenser stellatus
		Acipencer sturio
	Vulnerable	
		Salmo trutta macsostigmata

Examination of Respective Dam Development Plans

Name of Dam	Dam Embankment Volume (m3)	Net Reservoir Capacity		Construction Cost		Engineering Remarks	Judgement
		Total (m3)	per m3 of D.E.V. (m3)	Total (TL billion)	per 1m3 of N.R.C. (TL)		
Uladı	5,700,000	41,700,000	7.32	1,654.00	39,664	The slope stability of right bank side, just upstream of the dam site, and hydrological properties of the arete at the right abutment should be investigated.	Economically justifiable
Beydağ	9,000,000	241,300,000	26.81	3,288.30	13,627	The cut-off treatment and workability of very thick alluvial deposit should be studied.	Economically justifiable
Ergenli	6,850,000	61,780,000	9.02	20,884.00	33,733	The treatment of the hot spring located at the dam site should be studied.	Economically justifiable
Aktaş	1,600,000	16,720,000	10.45	521.90	31,214	Bearing strength and permeability of the sediments distributed in the left bank side should be checked.	Econimically justifiable
Burgaz	7,020,000	68,900,000	9.81	2,176.20	31,585		Economically justifiable
Bucak	5,600,000	9,200,000	1.64	1,451.40	157,761	The construction of the cut-off will be difficult because of fan deposit. Furthermore, there will occur a plenty of sedimentation from the erosion and transportation of fan deposit.	Econimically not justifiable
Akyurt	1,380,000	8,480,000	6.14	1,039.70	122,606	A detailed investigation will be required fto check the existence of caverties in lime stone. In addition, hydrological properties of the arete of right abutment should be investigated.	Economically not justifiable
Sarılar	17,800,000	30,000,000	1.69	4,592.70	153,090	The existence of hard rock basement at river bed should be confirmed.	Economically not justifiable
Prinçci	3,440,000	5,230,000	1.52	891.70	170,497		Economically not justifiable

Note: D.E.V : Dam embankment volume

Table 2.2.2
(1)

Crop Production under the "Present", "Future without Project" and "Future with Project" Conditions in Beydağ Dam Area

Crops	Present Condition			"Future without Project" Condition			"Future with Project" Condition			Incremental Production	
	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	(1)* (tons)	(2)** (tons)
Cereals	970	2.8	2,720	1,230	2.8	3,440	770	5.5	4,240	1,520	800
Cotton	4,260	2.5	10,650	3,570	2.5	8,930	4,620	3.5	16,170	5,520	7,240
Tobacco	1,110	0.8	890	1,410	0.8	1,130	-	-	-	-890	-1,130
Potatoes	2,850	28.0	79,800	2,390	28.0	66,920	3,080	33.0	101,640	21,840	34,720
Second Potatoes	1,410	20.0	28,200	850	20.0	17,000	1,540	28.0	43,120	14,920	26,120
Other field crops	320	4.8	1,540	410	4.8	1,970	-	-	-	-1,540	-1,970
Fodders	540	12.0	6,480	690	12.0	8,280	770	18.0	13,860	7,380	5,580
Watermelon	1,740	30.0	52,200	1,050	30.0	31,500	1,540	35.0	53,900	1,700	22,400
Summer vegetables	1,550	32.0	49,600	940	32.0	30,080	3,080	45.0	138,600	89,000	108,520
Second vegetables	560	25.0	14,000	340	25.0	8,500	3,080	27.0	83,160	69,160	74,660
Green Legumes	-	-	-	-	-	-	1,540	15.0	23,100	23,100	23,100
Olives	370	1.8	670	470	1.8	850	-	-	-	-670	-850
Figs	420	5.4	2,270	530	5.4	2,860	-	-	-	-2,270	-2,860
Other Fruits	320	11.8	3,780	190	11.8	2,240	1,540	15.0	23,100	19,320	20,860
Poplar	1,000	-	-	1,000	-	-	-	-	-	-	-
Total	17,420			15,070			21,560				

Remarks; (1)* : Difference between production under the present condtion and "future with project" condition.
(2)**: Difference between production under the "future without project" condtion and "future with project" condition.

Table 2.2.2
(2)

Crop Production under the "Present", "Future without Project" and "Future with Project" Conditions in Aktaş Dam Area

Crops	Present Condition			"Future without Project" Condition			"Future with Project" Condition			Incremental Production	
	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	(1)* (tons)	(2)** (tons)
Cereals	470	2.8	1,320	520	2.8	1,460	195	5.5	1,070	-250	-390
Cotton	380	2.5	950	320	2.5	800	390	3.5	1,370	420	570
Tobacco	130	0.8	100	150	0.8	120	0	-	-	-100	-120
Potatoes	50	28.0	1,400	40	28.0	1,120	195	33.0	6,440	5,040	5,320
Second Potatoes	100	20.0	2,000	60	20.0	1,200	195	28.0	5,460	3,460	4,260
Other field crops	0	4.8	0	0	4.8	0	0	-	-	0	0
Fodders	0	12.0	0	0	12.0	0	65	18.0	1,170	1,170	1,170
Watermelon	160	30.0	4,800	100	30.0	3,000	195	35.0	6,830	2,030	3,830
Summer vegetables	70	32.0	2,240	40	32.0	1,280	130	45.0	5,850	3,610	4,570
Second vegetables	70	25.0	1,750	40	25.0	1,000	195	27.0	5,270	3,520	4,270
Green Legumes	0	-	-	0	-	-	130	15.0	1,950	1,950	1,950
Olives	40	1.8	70	50	1.8	90	0	-	-	-70	-90
Figs	0	5.4	0	0	5.4	0	0	-	-	0	0
Other Fruits	0	11.8	0	0	11.8	0	130	15.0	1,950	1,950	1,950
Poplar	0	-	-	0	-	-		-	-	-	-
Total	1,470			1,320			1,820				

Remarks: (1)* : Difference between production under the present condtion and "future with project" condition.
(2)**: Difference between production under the "future without project" condtion and "future with project" condition.

Table 2.2.2 (3)

Crop Production under the "Present", "Future without Project" and "Future with Project" Conditions in Burgaz Dam Area

Crops	Present Condition			"Future without Project" Condition			"Future with Project" Condition			Incremental Production	
	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	(1)* (tons)	(2)** (tons)
Cereals	990	2.8	2,770	1,100	2.8	3,080	730	5.5	4,020	1,250	940
Cotton	1,460	2.5	3,650	1,220	2.5	3,050	1,230	3.5	4,310	660	1,260
Tobacco	100	0.8	80	110	0.8	90	0	-	-	-80	-90
Potatoes	50	28.0	1,400	30	28.0	840	250	33.0	8,250	6,850	7,410
Second Potatoes	0	20.0	0	0	20.0	0	0	28.0	0	0	0
Other field crops	100	4.8	480	110	4.8	530	0	-	-	-480	-530
Fodders	190	12.0	2,280	210	12.0	2,520	190	18.0	3,420	1,140	900
Watermelon	340	30.0	10,200	220	30.0	6,600	490	35.0	17,150	6,950	10,550
Summer vegetables	250	32.0	8,000	160	32.0	5,120	730	45.0	32,850	24,850	27,730
Second vegetables	150	25.0	3,750	100	25.0	2,500	1,120	27.0	30,240	26,490	27,740
Green Legumes	0	-	-		-	-	390	15.0	5,850	5,850	5,850
Olives	1,080	1.8	1,940	1,200	1.8	2,160	590	3.5	2,070	130	-90
Figs	20	5.4	110	20	5.4	110	0	-	-	-110	-110
Other Fruits	290	11.8	3,420	190	11.8	2,240	640	15.0	9,600	6,180	7,360
Poplar	0	-	-	0	-	-	0	-	-	-	-
Total	5,020			4,670			6,360				

Remarks; (1)* : Difference between production under the present condtion and "future with project" condition.
(2)**: Difference between production under the "future without project" condtion and "future with project" condition.

Table 2.2.2 (4)

Crop Production under the "Present", "Future without Project" and "Future with Project" Conditions in Ergenli Dam Area

Crops	Present Condition			"Future without Project" Condition			"Future with Project" Condition			Incremental Production	
	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	Cropped area (ha)	Unit yield (ton/ha)	Pro-duction (tons)	(1)* (tons)	(2)** (tons)
Cereals	920	2.8	2,580	1,020	2.8	2,860	700	5.5	3,850	1,270	990
Cotton	1,400	2.5	3,500	1,170	2.5	2,930	1,160	3.5	4,060	560	1,130
Tobacco	90	0.8	70	100	0.8	80	0	-	-	-70	-80
Potatoes	50	28.0	1,400	30	28.0	840	230	33.0	7,590	6,190	6,750
Second Potatoes	0	20.0	0	0	20.0	0	0	28.0	0	0	0
Other field crops	90	4.8	430	100	4.8	480	0	-	-	-430	-480
Fodders	190	12.0	2,280	210	12.0	2,520	190	18.0	3,420	1,140	900
Watermelon	330	30.0	9,900	210	30.0	6,300	470	35.0	16,450	6,550	10,150
Summer vegetables	230	32.0	7,360	150	32.0	4,800	700	45.0	31,500	24,140	26,700
Second vegetables	140	25.0	3,500	90	25.0	2,250	1,080	27.0	29,160	25,660	26,910
Green Legumes	0	-	-	0	-	-	370	15.0	5,550	5,550	5,550
Olives	1,020	1.8	1,840	1,130	1.8	2,030	560	3.5	1,960	120	-70
Figs	20	5.4	110	20	5.4	110	0	-	-	-110	-110
Other Fruits	280	11.8	3,300	180	11.8	2,120	600	15.0	9,000	5,700	6,880
Poplar	0	-	-	0	-	-	0	-	-	-	-
Total	4,760			4,410			6,060				

Remarks; (1)* : Difference between production under the present condition and "future with project" condition.
(2)**: Difference between production under the "future without project" condition and "future with project" condition.

Table 2.2.3

Production Value under the "Present" and "Future with Project" Condition

Crops	Production (ton)					Price	Value (TL billion)				
	Beydağ	Aktağ	Burgaz	Ergenli	Total	(TL/kg)	Beydağ	Aktağ	Burgaz	Ergenli	Total
1. Present Condition											
Cereals	2,720	1,320	2,770	2,580	9,390	7,200	20	10	20	19	69
Cotton	10,650	950	3,650	3,500	18,750	45,300	482	43	165	159	849
Tobacco	890	100	80	70	1,140	181,200	161	18	14	13	206
Potatoes	79,800	1,400	1,400	1,400	84,000	7,500	599	11	11	11	632
2nd Potatoes	28,200	2,000	-	-	30,200	6,500	183	13	-	-	196
Other field crops	1,540	-	480	430	2,450	4,000	6	-	2	2	10
Fodders	6,480	-	2,280	2,280	11,040	4,500	29	-	10	10	49
Watermelon	52,200	4,800	10,200	9,900	77,100	5,400	282	26	55	53	416
Summer vege.	49,600	2,240	8,000	7,360	67,200	5,000	248	11	40	37	336
2nd vegetables	14,000	1,750	3,750	3,500	23,000	5,400	76	9	20	19	124
Olives	670	70	1,940	1,840	4,520	19,400	13	1	38	36	88
Figs	2,270	-	110	110	2,490	5,700	13	-	1	1	15
Other Fruits	3,780	-	3,420	3,300	10,500	12,000	45	-	41	40	126
Total							2,157	142	417	400	3,116
2. "Future with Project" Condition											
Cereals	4,240	1,070	4,020	3,850	13,180	7,200	31	8	29	28	96
Cotton	16,170	1,370	4,310	4,060	25,910	45,300	733	62	195	184	1,174
Potatoes	101,640	6,440	8,250	7,590	123,920	7,500	762	48	62	57	929
2nd Potatoes	43,120	5,460	-	-	48,580	6,500	280	35	-	-	315
Fodders	13,860	1,170	3,420	3,420	21,870	4,500	62	5	15	15	97
Watermelon	53,900	6,830	17,150	16,450	94,330	5,400	291	37	93	89	510
Summer vege.	138,600	5,850	32,850	31,500	208,800	5,000	693	29	164	158	1,044
2nd vegetables	83,160	5,270	30,240	29,160	147,830	5,400	449	28	163	157	797
Green Legumes	23,100	1,950	5,850	5,550	36,450	11,600	268	23	68	64	423
Olives	-	-	2,070	1,960	4,030	19,400	-	-	40	38	78
Other Fruits	23,100	1,950	9,600	9,000	43,650	12,000	277	23	115	108	523
Total							3,846	298	944	898	5,986
3. Increment							1,689	156	527	498	2,870
(Increase Rate)							78%	110%	126%	125%	92%

Proposed Water Requirement

Crops	Cotton	Vegetable	Watermelon	Cereals	Fodders	Green Leg.	Potatoes	PotetosII	VegetaII	F.Fruits	Olive	Net Total (mm)	Gross Total 0.78	Total (m³/s/1,000ha)
a) Beydağ														
Area (%)	30.0	20.0	10.0	5.0	5.0	10.0	20.0	10.0	20.0	10.0	-	140.0*		
Jan.	0.00	0.00	0.00	0.02	0.14	0.00	0.00	0.00	0.00	0.00	-	0.16	0.20	0.001
Feb.	0.00	0.00	0.00	0.06	0.16	0.00	0.00	0.00	0.00	0.00	-	0.22	0.29	0.001
Mar.	0.00	0.00	0.00	0.77	0.87	0.00	0.00	0.00	0.00	0.00	-	1.65	2.11	0.008
Apr.	0.00	1.15	0.07	2.91	2.54	0.00	1.83	0.00	0.00	0.01	-	8.51	10.91	0.042
May	2.53	17.32	2.82	3.55	4.40	0.00	19.82	0.00	0.00	2.42	-	52.87	67.78	0.253
Jun.	31.46	22.64	4.54	0.23	1.94	0.00	15.38	0.00	0.00	12.37	-	88.57	113.55	0.438
Jul.	50.78	7.66	0.51	0.00	4.02	5.27	0.00	2.87	7.87	16.44	-	95.44	122.35	0.457
Aug.	46.70	0.00	0.00	0.00	10.57	11.99	0.00	14.11	25.45	18.79	-	127.62	163.62	0.611
Sep.	16.01	0.00	0.00	0.00	7.03	8.69	0.00	12.68	19.66	12.25	-	76.31	97.84	0.377
Oct.	0.54	0.00	0.00	0.18	2.94	4.72	0.00	7.55	7.26	3.30	-	26.50	33.97	0.127
Nov.	0.00	0.00	0.00	0.18	0.44	0.75	0.00	2.27	0.08	0.06	-	3.78	4.85	0.019
Dec.	0.00	0.00	0.00	0.05	0.06	0.02	0.00	0.08	0.00	0.02	-	0.23	0.29	0.001
	148.02	48.77	7.94	7.96	35.13	31.44	37.04	39.56	60.33	65.67	-	481.86	617.77	
b) Aktaş														
Area (%)	30.0	10.0	15.0	15.0	5.0	10.0	15.0	15.0	15.0	10.0	-	140.0*		
Jan.	0.00	0.00	0.00	0.02	0.14	0.00	0.00	0.00	0.00	0.00	-	0.16	0.20	0.001
Feb.	0.00	0.00	0.00	0.06	0.16	0.00	0.00	0.00	0.00	0.00	-	0.22	0.29	0.002
Mar.	0.00	0.00	0.00	0.77	0.87	0.00	0.00	0.00	0.00	0.00	-	1.65	2.11	0.015
Apr.	0.00	1.15	0.07	2.91	2.54	0.00	1.83	0.00	0.00	0.01	-	8.51	10.91	0.066
May	2.53	17.32	2.82	3.55	4.40	0.00	19.82	0.00	0.00	2.42	-	52.87	67.78	0.229
Jun.	31.46	22.64	4.54	0.23	1.94	0.00	15.38	0.00	0.00	12.37	-	88.57	113.55	0.377
Jul.	50.78	7.66	0.51	0.00	4.02	5.27	0.00	2.87	7.87	16.44	-	95.44	122.35	0.437
Aug.	46.70	0.00	0.00	0.00	10.57	11.99	0.00	14.11	25.45	18.79	-	127.62	163.62	0.614
Sep.	16.01	0.00	0.00	0.00	7.03	8.69	0.00	12.68	19.66	12.25	-	76.31	97.84	0.385
Oct.	0.54	0.00	0.00	0.18	2.94	4.72	0.00	7.55	7.26	3.30	-	26.50	33.97	0.138
Nov.	0.00	0.00	0.00	0.18	0.44	0.75	0.00	2.27	0.08	0.06	-	3.78	4.85	0.026
Dec.	0.00	0.00	0.00	0.05	0.06	0.02	0.00	0.08	0.00	0.02	-	0.23	0.29	0.002
	148.02	48.77	7.94	7.96	35.13	31.44	37.04	39.56	60.33	65.67	-	481.86	617.77	
c) Ergenli & Burgaz														
Area (%)	25.0	16.0	10.0	15.0	4.0	8.0	5.0	0.0	23.0	13.0	12.0	131.0*		
Jan.	0.00	0.00	0.00	0.06	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.22	0.001
Feb.	0.00	0.00	0.00	0.18	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.40	0.002
Mar.	0.00	0.00	0.00	2.32	0.70	0.00	0.00	0.00	0.00	0.00	0.00	3.02	3.87	0.014
Apr.	0.00	0.92	0.07	8.72	2.04	0.00	0.46	0.00	0.00	0.02	0.17	12.39	15.88	0.061
May	2.10	13.86	2.82	10.66	3.52	0.00	4.96	0.00	0.00	3.14	9.60	50.66	64.95	0.243
Jun.	26.22	18.11	4.54	0.70	1.55	0.00	3.85	0.00	0.00	16.09	20.80	91.85	117.75	0.454
Jul.	42.32	6.13	0.51	0.00	3.22	4.22	0.00	0.00	9.05	21.37	22.72	109.54	140.43	0.524
Aug.	38.92	0.00	0.00	0.00	8.46	9.59	0.00	0.00	29.27	24.43	20.74	131.41	168.47	0.629
Sep.	13.34	0.00	0.00	0.00	5.62	6.95	0.00	0.00	22.61	15.92	10.04	74.48	95.49	0.368
Oct.	0.45	0.00	0.00	0.55	2.35	3.77	0.00	0.00	8.35	4.30	2.68	22.45	28.78	0.107
Nov.	0.00	0.00	0.00	0.54	0.35	0.60	0.00	0.00	0.10	0.08	0.04	1.71	2.19	0.008
Dec.	0.00	0.00	0.00	0.15	0.05	0.02	0.00	0.00	0.00	0.02	0.00	0.24	0.30	0.001
	123.35	39.02	7.94	23.87	28.10	25.15	9.26	0.00	69.38	85.37	86.78	498.22	638.75	

*: Total Crop Intencity (%)

Table 3.1.1

Population of Villages and Towns Included in the Project Area

Administrative unit	1980 Population	1985 Population	1985 Growth Rate	1990 Population	1990 Growth Rate	80 - 90 Growth Rate	Land* Area (ha)	Population Density (per km2)
Beydağ District	7,016	7,312	0.83%	7,798	1.30%	1.06%	7,259	107.4
Şehir (Town)	4,710	5,131	1.73%	5,831	2.59%	2.16%	854	682.8
Merkez	2,306	2,181	-1.11%	1,967	-2.04%	-1.58%	6,405	30.7
Alakeçili	356	221	-9.09%	191	-2.88%	-6.04%	446	42.8
Halıköy	612	668	1.77%	646	-0.67%	0.54%	1,904	33.9
Sarıkaya	154	199	5.26%	161	-4.15%	0.45%	553	29.1
Yağcılar	938	841	-2.16%	747	-2.34%	-2.25%	2,177	34.3
Tosunlar	246	252	0.48%	222	-2.50%	-1.02%	1,325	16.8
Ödemiş District	71,653	79,161	2.01%	82,513	0.83%	1.42%	45,508	181.3
Şehir (Town)	40,736	47,475	3.11%	51,620	1.69%	2.40%	4,350	1,186.7
Merkez	7,232	7,011	-0.62%	6,945	-0.19%	-0.40%	7,418	93.6
Büyükavlucak	502	406	-4.16%	380	-1.31%	-2.75%	450	84.4
Demircili	1,109	1,161	0.92%	1,136	-0.43%	0.24%	823	138.0
Gerçekli	576	624	1.61%	609	-0.49%	0.56%	1,134	53.7
Gereli	1,100	1,071	-0.53%	1,100	0.54%	0.00%	1,015	108.4
Karakova	258	188	-6.13%	169	-2.11%	-4.14%	654	25.8
Ocaklı	980	695	-6.64%	668	-0.79%	-3.76%	757	88.2
Seyrekli	1,100	1,196	1.69%	1,193	-0.05%	0.81%	1,320	90.4
Yolüstü	1,607	1,670	0.77%	1,690	0.24%	0.50%	1,265	133.6
Bademli	2,486	2,461	-0.20%	2,238	-1.88%	-1.05%	2,589	86.4
Emirli	1,191	1,163	-0.47%	1,110	-0.93%	-0.70%	1,438	77.2
Mescitli	1,295	1,298	0.05%	1,128	-2.77%	-1.37%	1,151	98.0
Birgi	143	142	-0.14%	137	-0.71%	-0.43%	1,100	12.5
Kışlaköy	143	142	-0.14%	137	-0.71%	-0.43%	1,100	12.5
Kaymakçı	11,022	11,604	1.03%	11,716	0.19%	0.61%	18,201	64.4
Kaymakçı	4,239	4,879	2.85%	5,325	1.76%	2.31%	4,335	122.8
Araşarlı	524	524	0.00%	560	1.34%	0.67%	1,670	33.5
Çaylı	2,783	2,843	0.43%	2,547	-2.17%	-0.88%	1,671	152.4
Ertuğrulköy	804	828	0.59%	801	-0.66%	-0.04%	789	101.5
Eselli	330	133	-16.62%	113	-3.21%	-10.16%	1,743	6.5
Kızılcaavlu	642	670	0.86%	650	-0.60%	0.12%	1,682	38.6
Kurucaova	1,000	1,014	0.28%	1,035	0.41%	0.34%	4,349	23.8
Türkönü	480	511	1.26%	467	-1.78%	-0.27%	1,048	44.6
Yeşilköy	220	202	-1.69%	218	1.54%	-0.09%	914	23.9
Ovakent	10,034	10,468	0.85%	9,857	-1.20%	-0.18%	11,850	83.2
Ovakent	4,753	4,837	0.35%	4,404	-1.86%	-0.76%	3,180	138.5
Balabanlı	1,140	1,223	1.42%	1,189	-0.56%	0.42%	1,682	70.7
Bozcayaka	650	748	2.85%	684	-1.77%	0.51%	3,131	21.8
Kazanlı	717	814	2.57%	1,057	5.36%	3.96%	1,187	89.0
Konaklı	2,774	2,846	0.51%	2,523	-2.38%	-0.94%	2,670	94.5
Tire District	1,947	2,193	2.41%	2,067	-1.18%	0.60%	3,300	62.6
Gökçen	1,947	2,193	2.41%	2,067	-1.18%	0.60%	3,300	62.6
Kızılcahavlu	1,343	1,537	2.74%	1,457	-1.06%	0.82%	2,326	62.6
Yeğenli	604	656	1.67%	610	-1.44%	0.10%	974	62.6
Grand Total	80,616	88,666	1.92%	92,378	0.82%	1.37%	56,067	164.8

Note; *: Data on land area of villages from Provincial Directorate of Ministry of Agriculture and Rural Affairs.
Source: Population Census 1980, 1985 and 1990, State Institue of Statistics.

Table 3.1.2

Employment and Occupational Status of Population above 12 Years Old in the Project Area

Irems	Beydağ District Center			Ödemiş District Center			District Centers			Villages and Municipalities			Total in Project Area		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1. Total population	2,870	2,960	5,830	25,850	25,770	51,620	28,720	28,730	57,450	17,210	17,720	34,930	45,930	46,450	92,380
2. Population above 12 years old	2,300	2,390	4,690	20,130	20,590	40,720	22,430	22,980	45,410	13,390	13,870	27,260	35,820	36,850	72,670
3. Enomonic inactive population	600	2,010	2,610	4,580	17,450	22,030	5,180	19,460	24,640	1,290	3,000	4,290	6,470	22,460	28,930
3.1 Retired	180	10	190	1,420	240	1,660	1,600	250	1,850	240	60	300	1,840	310	2,150
3.2 House wife	0	1,780	1,780	0	15,380	15,380	0	17,160	17,160	0	2,350	2,350	0	19,510	19,510
3.3 Students	260	220	480	1,940	1,630	3,570	2,200	1,850	4,050	620	470	1,090	2,820	2,320	5,140
3.4 Others	160	0	160	1,220	200	1,420	1,380	200	1,580	430	120	550	1,810	320	2,130
4. Economic active population	1,700	380	2,080	15,550	3,140	18,690	17,250	3,520	20,770	12,100	10,870	22,970	29,350	14,390	43,740
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
5. Unemployment	190	40	230	1,060	330	1,390	1,250	370	1,620	120	40	160	1,370	410	1,780
	11.2%	10.5%	11.1%	6.8%	10.5%	7.4%	7.2%	10.5%	7.8%	1.0%	0.4%	0.7%	4.7%	2.8%	4.1%
6. Employment	1,510	340	1,850	14,480	2,800	17,280	15,990	3,140	19,130	11,980	10,830	22,810	27,970	13,970	41,940
	88.8%	89.5%	88.9%	93.1%	89.2%	92.5%	92.7%	89.2%	92.1%	99.0%	99.6%	99.3%	95.3%	97.1%	95.9%
6.1 Technical worker	90	50	140	870	480	1,350	960	530	1,490	280	120	400	1,240	650	1,890
	5.3%	13.2%	6.7%	5.6%	15.3%	7.2%	5.6%	15.1%	7.2%	2.3%	1.1%	1.7%	4.2%	4.5%	4.3%
6.2 Administrative worker	30	0	30	300	10	310	330	10	340	70	10	80	400	20	420
	1.8%	0.0%	1.4%	1.9%	0.3%	1.7%	1.9%	0.3%	1.6%	0.6%	0.1%	0.3%	1.4%	0.1%	1.0%
6.3 Clerical worker	70	30	100	580	270	850	650	300	950	140	60	200	790	360	1,150
	4.1%	7.9%	4.8%	3.7%	8.6%	4.5%	3.8%	8.5%	4.6%	1.2%	0.6%	0.9%	2.7%	2.5%	2.6%
6.4 Serveice worker	150	10	160	2,360	120	2,480	2,510	130	2,640	360	30	390	2,870	160	3,030
	8.8%	2.6%	7.7%	15.2%	3.8%	13.3%	14.6%	3.7%	12.7%	3.0%	0.3%	1.7%	9.8%	1.1%	6.9%
6.5 Commercial worker	180	10	190	1,620	130	1,750	1,800	140	1,940	490	40	530	2,290	180	2,470
	10.6%	2.6%	9.1%	10.4%	4.1%	9.4%	10.4%	4.0%	9.3%	4.0%	0.4%	2.3%	7.8%	1.3%	5.6%
6.6 Agriculture	300	180	480	2,680	1,320	4,000	2,980	1,500	4,480	8,350	10,330	18,680	11,330	11,830	23,160
	17.6%	47.4%	23.1%	17.2%	42.0%	21.4%	17.3%	42.6%	21.6%	69.0%	95.0%	81.3%	38.6%	82.2%	52.9%
6.7 Others	690	60	750	6,060	470	6,530	6,750	530	7,280	2,290	240	2,530	9,040	770	9,810
	40.6%	15.8%	36.1%	39.0%	15.0%	34.9%	39.1%	15.1%	35.1%	18.9%	2.2%	11.0%	30.8%	5.4%	22.4%
6.8 Unknown	0	0	0	10	0	10	10	0	10	0	0	0	10	0	10
	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: 1990 Census of Population (Social and Economic Characteristics of Population), State Institute of Statistics.

Table 3.1.3

Cropped Areas by Crops in Three Districts

Crops	(ha) Beydağ	(ha) Ödemiş	(ha) Tire
Common field crops			
Wheat	240	1,426	5,840
Barley	315	1,086	2,661
Oat	23	0	100
Rye	21	16	0
Cotton	260	5,832	8,226
Tobacco	533	2,840	2,688
Maize	62	132	356
Legumes	82	80	0
Sesami	7	337	533
Potatoes	169	8,594	274
Onion and Garlic	35	113	58
Vetches	36	30	274
Alfalfa	175	1,239	694
Others	158	30	153
Sub-total	2,115	21,755	21,856
Vegetables			
Tomatoes	33	231	412
Pepper	53	438	198
Egg plant	26	192	129
Watermelons	264	2,774	3,489
Melon	8	17	116
Cucumber	36	1,388	59
Squash	3	12	42
Okra	32	378	37
Cabbages	34	170	42
Leeks	23	136	68
Cauliflowers	9	120	44
Spinach	15	69	39
Lettuce	12	89	34
Celery	1	7	7
Green onions	22	22	153
Green legumes	102	186	457
Carrots	5	3	13
Radish	6	19	10
Others	4	34	0
Sub-total	687	6,284	5,350
Tree crops			
Olive	740	4,431	5,000
Figs	809	2,732	2,485
Citrus	0	15	17
Apple	33	109	82
Pears	8	87	171
Quince	5	48	17
Peaches	41	174	484
Cherries	47	296	36
Plums	63	233	43
Pomegranates	19	37	20
Chestnuts	630	671	126
Other nuts	96	214	383
Grape (ha)	80	465	510
Others	22	72	44
Sub-total	2,592	9,583	9,417
Total	5,395	37,622	36,623

Source: Provincial Agricultural Office of MARA, Izmir

Farm Inputs Prevailing in Aegean Region

(a) Main Varieties Cropped in This Region

Crop	Main varieties
Wheat:	Cumhriyet-75, Gediz-75, Penjamo-62
Barley:	Zefer 160, Gem, Kaya
Maise:	Kompozit 3/74, Kompozit ADA, NKPX 20, NKPX 525, NKPX 616 etc.
Cotton:	Nazilli 66-100, Coker 100 A/2
Tobacco:	İzmir-Kokulu 64, 6265 Karabaglar, İzmir-ÖZBAS, İzmir-İNCEKARA
Potato:	Ari, Cosima, Fina, Frigga, Alpa, İsola, Resy, Jaerla, Desiree
Tomato:	Wc 156, ES.58, Sc.2121, Campbell-33, Pearson, Roma VF, Red
Eggplant:	Halkapınar, Kemer, Topan
Pepper:	Çarliston, Dolmalık-16, ACI ve TATLI SİVRİ, ACI SİVRİ 48-4 ÇEŞİDİ
Cabbage:	Bayraklı
Cauliflower:	Brioosenia, Winner Osenia
Watermelon:	(native) Yeni Dünya Karupuzu, Tekifdag Karupuzu, Karbuz Karabuz etc.
	(imported) Dixie Qeen, Florida Giant, Îrish Gray, Klondike etc.
Olive:	Memecik, Ayvalık, Gemlik, Domat, Memeli, Uslu, İzmir Sofralık
Fig:	Ak İlek, Elmma İlek, Hacı Mestan İlegi, Kara İlek, Kaba İlek etc.
Peach:	Springtime, Cardinal, Dixired, Red Globe, Starking, Red Haven, Triogem,
	J.H.Hale etc.
Apple:	Starkrimson delicious, Starkspur golden, Starking delicious, Jonathan etc.
Grape:	Rupestris Du Lot, Berlandieri * V= (R-99, R-110, 41-B, 420-A, 5-BB)

Source: Agricultural extention handbook

(b) Fertilizer application standard in Agean region (kg/ha)

Crop	N		P_2O_5		K_2O
	Irrigated	Rainfed	Irrigated	Rainfed	
Wheat	110-130	80-100	70-90	60-80	-
Cotton	90-110		60-80		-
Tobacco		30-50		40-50	40-60
Potato	140-160	110-130		60-80	-
Watemelon	80-100	50-70	60-80	50-70	-
Vegetable	100-120		60-80		50-70
Alfalfa	30-50		130-150		-
Grape	120-140	80-100	60-80	50-70	-
Olive*		0.2-0.3		0.15-0.2	0.2-0.3
Fruits tree*		2-4		2-3	-

Remark * : kg/ tree
Source: Provincial office of MARA, İzmir

Table 3.1.5

Summary of Farm Inputs under the Present Condition

(Unit: days/ha, kg/ha, lit./ha)

Items	Sub-items	Unit	Cereals	Cotton	Potatoes	2nd Potatoes	Vege-tables	2nd Vege-tables	Water-melon	Tobacco	Fodders	Olive	Figs	Other fruits
Yield		(kg)	2,800	2,500	28,000	20,000	32,000	25,000	30,000	800	12,000	1,800	5,400	11,800
Land Prep.	Labour/Operator	(days)	1.2	1.4	11.9	11.6	11.6	11.2	0.9	11.4	1.5	1.0	0.8	3.0
	Machinery	(days)	1.2	1.4	1.9	1.6	1.6	1.2	0.9	1.4	1.5	1.0	0.8	3.0
Seeding	Labour	(days)	0.2	0.2	11.5	9.5	20.0	10.0	9.0	60.0	0.7	-	12.5	-
	Machinery	(days)	0.2	0.2	1.5	1.5	-	-	-	-	-	-	-	-
	Seed/seedlings	(kg)	160	80	2,500	2,500	20	30	2.5	20	-	-	-	-
Pruning	Labour	(days)	-	-	-	-	-	-	-	-	-	10.0	10.0	20.0
Fertilizer App.	Labour	(days)	0.8	0.8	6.0	4.0	8.0	2.0	0.6	-	2.0	1.0	7.6	1.1
	N	(kg)	106	83	130	134	97	94	83	30	31	30	38	60
	P2O5	(kg)	60	60	75	76	63	63	60	30	-	30	38	60
	K2O	(kg)	60	60	75	90	50	50	60	30	-	30	38	60
Manure App.	Labour	(days)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	-	-	2.0	2.0	2.0
	Manure	(kg)	5,000	5,000	5,000	5,000	3,000	3,000	3,000	-	-	3,000	3,000	3,000
Pest Control	Labour	(days)	-	0.6	6.0	5.0	5.0	2.0	0.3	2.0	-	1.0	0.4	10.0
	Chemicals	(kg or lit.)	-	6.0	4.0	3.0	8.0	7.0	3.0	3.0	-	4.0	2.0	4.0
Irrigation	Labour	(days)	-	9.0	15.0	9.0	15.5	12.0	18.2	-	8.0	-	-	12.0
Cultivating	Labour/Operator	(days)	-	26.6	20.3	20.3	21.9	20.3	20.6	40.0	-	10.0	38.8	21.6
	Machinery	(days)	-	0.6	0.3	0.3	1.9	0.3	0.6	-	-	-	-	1.6
Harvesting	Labour/Operator	(days)	0.5	30.0	4.0	3.0	80.0	50.0	30.0	160.0	40.0	50.0	21.0	100.0
	Machinery	(days)	0.5	-	2.0	1.0	-	-	-	-	-	-	-	-
Post-harvest	Labour/Operator	(days)	2.0	5.0	10.0	8.0	10.0	5.0	8.0	10.0	40.0	1.5	7.6	15.0
	Machinery	(days)	0.5	-	-	-	-	-	2.0	-	-	0.8	-	-
Other materials	Sacks	(kg)	40	25	100	-	-	-	-	-	-	-	-	1,000
	Nylon	(kg)	160	100	150	-	-	-	-	-	-	-	-	-
	Others	(kg)	-	-	-	-	-	-	-	-	-	-	-	-
Transporting	Labour/Operator	(days)	1.0	0.3	-	-	2.0	2.0	-	2.0	2.0	-	0.1	6.0
	Machinery	(days)	1.0	0.3	-	-	1.0	1.0	-	2.0	2.0	-	-	3.0
Total	Labour/Operator	(days)	7.7	75.9	86.7	72.4	176.0	116.5	89.6	285.4	94.2	76.5	100.8	190.7
	Machinery	(days)	3.4	2.5	5.7	4.4	4.5	2.5	3.5	3.4	3.5	1.8	0.8	7.6

Remarks: Labour/operator (1 manday = 10 hours), machenery (1man operation =10 hours).

Existing Water Quality Data at Beydağ Dam Site

Item	Unit	Sampling Month						
		Feb.1994	Apr.1994	Dec.1994	Feb.1995	Apr.1995	June.1995	Average
pH	-	8.5	8.2	7.0	7.1	7.9	7.8	7.8
EC	mS/cm	0.25	0.24	0.26	0.19	0.18	0.49	0.27
Suspended solids	mg/l	1	1	2	1	12	18	6
Cation								
Na+	mg/l	13.57	17.02	37.72	11.27	21.39	30.13	21.85
K+	mg/l	0.39	0.39	0.78	0.39	0.39	0.78	0.52
Ca++	mg/l	35.40	32.60	80.00	20.00	32.80	55.00	42.63
Mg++	mg/l	4.00	7.00	2.67	6.80	3.40	23.90	7.96
Total	mg/l	53.36	57.01	121.17	38.46	57.98	109.81	72.97
SAR	-	0.82	1.00	1.60	0.79	1.34	1.21	1.12
Anion								
CO3- -	mg/l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO3-	mg/l	68.50	90.50	157.50	36.00	76.00	187.00	102.58
Cl-	mg/l	21.60	32.20	18.40	31.90	11.30	29.00	24.07
SO4- -	mg/l	34.80	11.90	40.60	21.30	49.00	71.80	38.23
Total	mg/l	124.90	134.60	216.50	89.20	136.30	287.80	164.88
BOD	mg/l	2.40	2.80	2.20	5.03	3.77	3.47	3.28
COD	mg/l	-	0.00	5.60	4.00	-	-	3
Permanganate Value	mgO2/l	0.82	2.46	4.56	0.00	1.54	0.44	
Total dissolved matter	mg/l	136	45	265	-	200	434	216
Nitrogen as ammonia	mg/l	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nitrogen as nitrite	mg/l	0.14	0.00	0.00	0.70	0.03	0.17	0.17
Nitrogen as nitrate	mg/l	1.01	0.00	0.00	0.29	0.64	4.98	1.15
Phosphorous as phosphate	mg/l	0.05	0.04	0.06	0.06	0.11	0.00	0.05
Dissolved oxygen	mg/l	10.50	7.90	10.30	9.61	6.66	8.79	8.96
Boron	mg/l	0.00	0.00	0.00	0.87	0.00	2.07	0.49

Source : DSI II Laboratory

Table 3.1.7

Groundwater Quality in the Project Area

Sample No.	Village	Date of Sampling	pH	EC (umhos/cm)	Cations (mek/l)				Anions (mek/l)				Total (mek/l)	Sodium %	SAR	Category of Water	Boron (ppm)
					Na+	K+	Ca++	Mg++	CO3- -	HCO3-	Cl-	SO4- -					
1		15/6/1995	7.5	742	1.96	0.04	5.71		0.00	4.56	1.26	1.69	7.71	25.42	1.16	C2S1	0.00
2		15/6/1995	7.4	735	1.53	0.04	5.77		0.00	4.85	1.02	1.77	7.64	23.95	1.05	C2S1	0.16
3		15/6/1995	7.6	613	2.35	0.05	3.94		0.00	4.92	0.85	0.60	6.37	37.36	1.70	C2S1	0.00
4		15/6/1995	7.4	519	2.09	0.04	3.26		0.00	4.20	0.92	0.27	5.39	38.78	1.64	C2S1	0.29
5		15/6/1995	7.7	425	1.31	0.03	3.08		0.00	3.21	0.94	0.27	4.42	29.64	1.06	C2S1	0.72
6		15/6/1995	7.6	410	0.70	0.01	3.55		0.00	2.96	0.78	0.62	4.26	16.43	0.53	C2S1	0.69
7		15/6/1995	7.6	607	1.94	0.04	4.33		0.00	4.74	1.18	0.39	6.31	30.74	1.32	C2S1	0.18
8		15/6/1995	7.2	504	0.96	0.02	4.26		0.00	3.86	1.06	0.32	5.24	18.32	0.66	C2S1	0.18
9		15/6/1995	7.3	501	1.71	0.03	3.52		0.00	4.15	0.80	0.31	5.26	32.51	1.29	C2S1	0.10
10		15/6/1995	7.1	715	1.93	0.04	5.46		0.00	5.54	1.50	0.39	7.43	25.98	1.17	C2S1	0.35
11		15/6/1995	7.1	572	1.86	0.04	4.04		0.00	4.22	1.26	0.46	5.94	31.31	1.31	C2S1	0.11

Proposed Farm Inputs per Hectare

(Unit: days/ha, kg/ha, lit./ha)

Crops Items	Sub-items	Unit	Cereals	Cotton	Potatoes	2nd Potatoes	Vege-tables	2nd Vege-tables	Water-melon	Green legumes	Fodders	Olive	Grape	Other fruits
Yield		(kg)	5,500	3,500	33,000	28,000	45,000	27,000	35,000	15,000	18,000	3,500	15,000	25,000
Land Prep.	Labour/Operator	(days)	1.2	1.6	11.9	11.6	12.2	11.5	3.5	11.5	1.2	1.0	1.9	3.0
	Machinery	(days)	1.2	1.6	1.9	1.6	2.2	1.5	1.5	1.5	1.2	1.0	1.9	3.0
Seeding	Labour	(days)	0.2	0.2	12.5	11.5	20.0	15.0	9.0	10.0	0.2	-	-	-
	Machinery	(days)	0.2	0.2	0.5	0.5	-	-	-	-	0.2	-	-	-
	Seed/seedlings	(kg)	160	80	2,500	3,000	30	40	4	120	-	-	-	-
Pruning	Labour	(days)	-	-	-	-	-	-	-	-	-	10.0	40.0	20.0
Fertilizer App.	Labour	(days)	1.0	2.0	6.0	4.0	10.0	2.5	3.0	3.0	2.0	1.0	3.0	4.0
	N	(kg)	130	110	160	140	120	120	120	80	50	50	140	150
	P2O5	(kg)	70	80	90	60	80	70	80	70	150	30	80	80
	K2O	(kg)	50	50	90	75	60	50	60	20	-	60	0	50
Manure App.	Labour	(days)	3.0	4.0	4.0	3.0	4.0	3.0	5.0	3.0	3.0	3.0	4.0	4.0
	Manure	(kg)	10,000	15,000	15,000	10,000	15,000	10,000	20,000	10,000	10,000	10,000	15,000	15,000
Pest Control	Labour	(days)	2.0	2.0	6.0	6.0	6.0	6.0	3.0	2.0	2.0	1.0	2.0	10.0
	Chemicals	(kg or lit.)	2.0	7.0	4.0	3.0	8.0	7.0	3.0	2.0	1.0	4.0	5.0	5.0
Irrigation	Labour	(days)	3.0	18.0	16.0	10.0	23.0	14.0	16.0	14.0	6.0	-	8.0	9.0
Cultivating	Labour/Operator	(days)	-	41.2	41.0	41.0	40.0	46.0	31.0	20.0	-	10.0	47.1	52.1
	Machinery	(days)	-	1.2	1.0	1.0	2.9	-	-	-	-	-	2.1	2.1
Harvesting	Labour/Operator	(days)	0.8	50.0	6.0	6.0	100.0	70.0	40.0	50.0	40.0	50.0	40.0	100.0
	Machinery	(days)	0.8	-	3.0	3.0	-	-	-	-	-	-	-	-
Post-harvest	Labour/Operator	(days)	4.0	10.0	12.0	10.0	15.0	7.0	11.0	10.0	40.0	1.5	18.0	16.0
	Machinery	(days)	1.0	-	-	-	-	-	-	-	-	1.5	-	-
Other materials	Sacks	(kg)	70	30	500	360	750	120	120	120	-	-	-	500
	Nylon	(kg)	-	-	-	-	-	-	-	-	-	-	-	-
	Others	(kg)	-	-	-	-	-	-	-	-	-	-	-	-
Transporting	Labour/Operator	(days)	1.0	1.0	3.0	3.0	3.0	2.0	2.0	2.0	2.0	-	2.0	2.0
	Machinery	(days)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	-	1.0	1.0
Total	Labour/Operator	(days)	16.2	130.0	118.4	106.1	233.2	177.0	123.5	125.5	96.4	77.5	166.0	220.1
	Machinery	(days)	4.2	4.0	7.4	7.1	6.1	2.5	2.5	2.5	3.4	2.5	5.0	6.1

Remarks: Labour/operator (1 manday = 10 hours), machenery (1man operation =10 hours).

Yearly Labour Requirement for Crop Production under the "Future with Project" Condition

(mandays per hectare)

Crops	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Cereals				3.0	2.5	5.8				3.4	1.5		16.2
Cotton				5.7	13.6	21.6	20.0	7.6	30.5	30.5	0.5		130.0
Potatoes	0.5	31.9		48.0	22.5	15.5							118.4
Potatoes II							0.5	46.6	39.5	0.5	19.0		106.1
Watermelon	0.3	1.4	7.8	10.0	26.0	51.5	26.5						123.5
Summer vegetables	0.5	4.6	0.6	42.0	29.5	31.5	65.0	59.0			0.5		233.2
Vegetables II							37.5	33.5	27.0		79.0		177.0
Green legumes							32.5	17.0	14.0		62.0		125.5
Fodders			20.5	25.5	24.5	20.5				3.4	2.0		96.4
Grape		29.5	47.0	21.5		3.0	3.0	62.0					166.0
Other tree fruits		25.0		2.0	34.6	95.0	59.0	4.5					220.1

(per farm)

Crops	Area %	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Wheat	5	0.00	0.00	0.00	0.26	0.21	0.49	0.00	0.00	0.00	0.29	0.13	0.00	1.38
Cotton	30	0.00	0.00	0.00	2.91	6.94	11.02	10.20	3.88	15.56	15.56	0.26	0.00	66.30
Potatoes	20	0.17	10.85	0.00	16.32	7.65	5.27	0.00	0.00	0.00	0.00	0.00	0.00	40.26
Potatoes II	10	0.00	0.00	0.00	0.00	0.00	0.00	0.09	7.92	6.72	0.09	3.23	0.00	18.04
Watermelon	10	0.05	0.24	1.33	1.70	4.42	8.76	4.51	0.00	0.00	0.00	0.00	0.00	21.00
Summer vegetables	20	0.17	1.56	0.20	14.28	10.03	10.71	22.10	20.06	0.00	0.00	0.17	0.00	79.29
Vegetables II	20	0.00	0.00	0.00	0.00	0.00	0.00	12.75	11.39	9.18	0.00	26.86	0.00	60.18
Green legumes	10	0.00	0.00	0.00	0.00	0.00	0.00	5.53	2.89	2.38	0.00	10.54	0.00	21.34
Fodders	5	0.00	0.00	1.74	2.17	2.08	1.74	0.00	0.00	0.00	0.29	0.17	0.00	8.19
Grape	5	0.00	2.51	4.00	1.83	0.00	0.26	0.26	5.27	0.00	0.00	0.00	0.00	14.11
Other tree fruits	5	0.00	2.13	0.00	0.17	2.94	8.08	5.02	0.38	0.00	0.00	0.00	0.00	18.71
Total	140	0.39	17.28	7.27	39.63	34.27	46.32	60.44	51.79	33.83	16.22	41.35	0.00	348.78
1.7 ha														

Design Discharge of Proposed Secondary Drains

Secondary No.	Catchment area (ha)	Runoff coefficient (C)				River bed gradient (S) (o/oo)	Flow length (L) (m)	Flow height (H) (m)	Tc $0.0195(L^3/H)^{0.385}$ (min)	Rainfall intensity * (mm/hr)	Peak discharge $0.0023CIS^{0.2}A^{0.8}$ (m3/sec)	Remarks
		Vegetation	Soil	Topography	Total							
D-R-1	208	0.16	0.22	0.08	0.46	103.2	4,400	454	29.9	35.0	6.69	
D-R-2	63	0.16	0.22	0.11	0.49	158.5	1,760	279	12.5	59.0	5.04	
D-R-3	78	0.16	0.22	0.11	0.49	190.0	1,500	285	10.3	66.3	6.96	
D-R-4	40	0.16	0.22	0.11	0.49	153.1	1,600	245	11.8	61.2	3.61	
D-R-5	129	0.16	0.22	0.11	0.49	169.6	2,300	390	15.0	53.0	8.13	
D-R-6	73	0.16	0.16	0.11	0.43	187.5	1,600	300	10.9	64.1	5.59	
D-R-7	116	0.16	0.16	0.11	0.43	163.6	2,200	360	14.7	53.6	6.59	
D-R-8	286	0.16	0.16	0.08	0.4	118.1	4,200	496	27.4	36.9	8.13	
D-R-9	681	0.22	0.16	0.06	0.44	96.7	5,100	493	34.3	32.2	15.00	Emineksigi River
SD-R-1	321	0.22	0.16	0.06	0.44	66.3	4,100	272	33.5	32.6	7.73	
SD-R-2	3,621	0.22	0.12	0.04	0.38	43.6	13,700	597	99.8	16.9	22.14	Gokkuyu River
SD-R-3	3,558	0.22	0.12	0.06	0.4	62.9	11,800	742	77.3	19.8	28.84	Sican River
SD-R-4	1,145	0.16	0.16	0.04	0.36	47.0	6,700	315	55.9	24.0	12.01	
SD-R-5	9,220	0.16	0.16	0.06	0.38	98.4	20,600	2,028	99.8	16.9	55.03	Gelinboz River
SD-R-6	2,826	0.16	0.16	0.06	0.38	61.0	16,500	1,007	101.2	16.8	19.26	Birgi River
SD-R-7	4,710	0.16	0.16	0.04	0.36	47.3	19,600	928	127.4	14.6	22.73	Geney River
SD-R-8	5,355	0.16	0.16	0.06	0.38	51.9	18,000	935	115.1	15.5	28.78	Tombaki River
SD-R-9	11,560	0.16	0.16	0.04	0.43	41.4	24,400	1,010	158.8	12.8	47.48	Rahmanlar River
D-L-1	773	0.16	0.16	0.11	0.43	162.1	6,200	1,005	32.7	33.1	18.53	Tokelli River
D-L-2	505	0.16	0.12	0.11	0.39	155.4	6,500	1,010	34.5	32.1	11.48	
D-L-3	825	0.16	0.12	0.08	0.36	139.2	7,200	1,002	38.9	29.8	14.28	Baglar River
D-L-4	659	0.16	0.16	0.11	0.43	165.6	6,200	1,027	32.4	33.3	16.46	Cengiller River
D-L-5	1,209	0.16	0.16	0.11	0.43	176.3	5,900	1,040	30.5	34.6	28.11	Aksaikallar River
SD-L-1	416	0.16	0.16	0.15	0.47	266.4	3,900	1,039	18.9	46.1	18.94	Incirlik River
SD-L-2	7,929	0.16	0.16	0.04	0.36	20.9	19,200	402	171.6	12.2	24.48	Pirinccı River
SD-L-3	1,806	0.16	0.16	0.08	0.4	142.2	9,700	1,379	48.5	26.1	26.10	
SD-L-4	3,138	0.16	0.16	0.06	0.38	79.5	11,000	874	66.9	21.5	28.32	
SD-L-5	1,848	0.16	0.16	0.06	0.38	83.2	7,700	641	49.9	25.7	22.31	Caralkaya River
SD-L-6	938	0.22	0.16	0.06	0.44	83.3	5,400	450	38.0	30.3	17.71	
SD-L-7	2,693	0.22	0.16	0.04	0.42	45.7	12,400	567	90.7	17.9	20.64	

*: Rainfall intensity is at 5 years return period. Rainfall intensity curve of ODEMIS in the "MAKSIMUM YAGISLARIN FREKANS ATLASI" is applied.

Table 3.3.1

Summary of Project Cost

Cost Item	Local Currency Portion (TL billion)	Local Currency Portion (US$ thousand)	Foreign Currency Portion (US$ thousand)	Total (US$ thousand)
A. Irrigation and Drainage Systems				
A-1 Direct Construction Cost				
(1) Package-I				
- Headrace & Irrigation System	1,027.0	20,542	2,345	22,887
- Drainage System	163.1	3,263	605	3,868
(2) Package-II				
- Irrigation System	701.7	14,034	1,731	15,765
- Drainage System	89.7	1,794	323	2,117
(3) On-farm Development				
Right Bank	640.4	12,809	16,089	28,898
Left Bank	383.0	7,661	9,818	17,479
Sub-total (A-1)	3,005.0	60,103	30,911	91,014
A-2 O&M and Office Equipment	4.1	82	1,558	1,640
A-3 Land Acquisition	61.1	1,222	0	1,222
A-4 Project Administration	455.1	9,101	0	9,101
A-5 Technical Support	214.4	4,288	11,134	15,422
Sub-total (A-1 to A-5)	3,739.7	74,796	43,603	118,399
A-6 Physical Contingency	374.0	7,480	4,360	11,840
Sub-total (A-1 + A-7)	4,113.7	82,276	47,963	130,239
A-7 Price Contingency	1,231.3	24,625	7,195	31,820
Total (A)	5,345.0	106,901	55,158	162,059
B. Beydağ Dam				
B-1 Direct Construction Cost	1,049.7	20,995	21,776	42,771
B-2 Land Acquisition	637.0	12,740	0	12,740
B-3 Project Administration	213.9	4,277	0	4,277
Sub-total (B-1 to B-3)	1,900.6	38,012	21,776	59,788
B-4 Physical Contingency	190.1	3,801	2,178	5,979
Sub-total (B-1 + B-4)	2,090.7	41,813	23,954	65,767
B-5 Price Contingency	363.5	7,270	2,189	9,459
Total (B)	2,454.2	49,083	26,143	75,226
C. Total Project Cost	7,799.2	155,984	81,301	237,285

Administration: 10% of construction cost.
Physical contingency: 10% of direct construction cost, land acquisition, project admionistration, technical support, and physical contingency.
Price contingency: 2% annum for foreign currency portion and 4% annum for local currency portion.

Financial and Economic Prices of Inputs and Outputs
(1995 Constant Price)

Item	Unit	1995 Financial Price	2005 Economic Price	Remarks
Field crops				
Wheat	TL/kg	7,200	6,200	Import/Export parity
Cotton	TL/kg	45,300	35,200	Export parity
Tobacco	TL/kg	181,200	38,800	Export parity
Potatoes	TL/kg	7,500	6,800	Domestic market
2nd Potatoes	TL/kg	6,500	5,900	Domestic market
Other field crops (maize)	TL/kg	4,000	3,600	Domestic market
Fodders (Alfalfa)	TL/kg	4,500	4,100	Domestic market
Vegetables				
Watermelon	TL/kg	5,400	4,900	Domestic market
Summer vegetables				
Average	TL/kg	5,000	4,600	Average by production
Tomatoes	TL/kg	3,700	3,400	Domestic market
Cucumber	TL/kg	5,500	5,000	Domestic market
Peppers	TL/kg	5,100	4,600	Domestic market
2nd Vegetables				
Leafy vegetables (Cabbage)	TL/kg	5,400	4,900	Domestic market
Green legumes	TL/kg	11,600	10,600	Domestic market
Tree Crops				
Olive (oil)	TL/kg	19,400	22,000	Export parity
Figs	TL/kg	5,700	5,200	Domestic market
Other fruits				
Grapes (fresh)	TL/kg	12,000	10,900	Domestic market
Orange/Citrus	TL/kg	9,000	8,200	Export parity
Sub-products				
Straw	TL/kg	1,000	1,900	Domestic market
Fertilizers (price per effective content)				
N	TL/kg	20,700	23,300	Import parity
P2O5	TL/kg	18,400	20,700	Import parity
K2O	TL/kg	12,400	14,000	Import parity
Agro-chemicals				
Average	TL/kg	572,400	520,900	
Labour				
Casual	TL/day	190,000	95,000	
Operator	TL/day	250,000	125,000	

Note; 1995 prices are projected by Consumer Price Index (1.812) from 1994 average prices.
1994 average prices are quoted from the price list of the provincial agricultural statistics.

Table 3.5.2

Incremental Benefit

Crop	per ha Yield (ton)	Price (TL/kg)	Gross Value (TL1000)	Cost (TL1000)	Net Value (TL1000)	Net Value (US$)	Area (ha)	Total Net Value (US$)
1. "Future without Project" Condition								
Cereals (Rainfed)	2.8	6,200	22,100	12,400	9,700	194	1,230	239,000
Cotton (Rainfed)	0.9	35,200	31,700	21,200	10,500	210	1,880	395,000
Cotton (Irrigated)	2.5	35,200	88,000	24,000	64,000	1,280	1,690	2,163,000
Tobacco (Rainfed)	0.8	38,800	31,000	42,900	-11,900	-238	1,410	-336,000
Potatoes (Rainfed)	10.0	6,800	68,000	28,700	39,300	786	1,260	990,000
Potatoes (Irrigated)	28.0	6,800	190,400	36,600	153,800	3,076	1,130	3,476,000
2nd Potatoes (Irrigated)	20.0	5,900	118,000	31,800	86,200	1,724	850	1,465,000
Other Field Crops (Rainfed)	4.8	3,600	17,300	12,400	4,900	98	410	40,000
Fodders (Rainfed)	12.0	4,100	49,200	13,300	35,900	718	690	495,000
Watermelon (Irrigated)	30.0	4,900	147,000	24,000	123,000	2,460	1,050	2,583,000
Vegetables (Irrigated)	32.0	4,600	147,200	36,600	110,600	2,212	940	2,079,000
2nd Vegetables (Irrigated)	25.0	4,900	122,500	30,700	91,800	1,836	340	624,000
Olive (Rainfed)	1.8	22,000	39,600	16,200	23,400	468	470	220,000
Figs (Rainfed)	5.4	5,200	28,100	15,900	12,200	244	530	129,000
Fruits (Irrigated)	11.8	10,900	128,600	39,900	88,700	1,774	190	337,000
Poplars (Irrigated)	-	-	-	-	12,200	244	1,000	244,000
Total	-	-	-	-	-	-	15,070	15,143,000
								983 /ha
2. "Future with Project" Condition								
Cereals	5.5	6,200	43,200	17,000	26,200	524	770	403,000
Cotton	3.5	35,200	123,200	33,800	89,400	1,788	4,620	8,261,000
Potatoes	33.0	6,800	224,400	51,700	172,700	3,454	3,080	10,638,000
2nd Potatoes	28.0	5,900	165,200	46,000	119,200	2,384	1,540	3,671,000
Fodders	18.0	4,100	73,800	19,500	54,300	1,086	770	836,000
Watermelon	35.0	4,900	171,500	35,200	136,300	2,726	1,540	4,198,000
Vegetables	45.0	4,600	207,000	59,000	148,000	2,960	3,080	9,117,000
2nd Vegetables	27.0	4,900	132,300	44,100	88,200	1,764	3,080	5,433,000
Green Legumes	15.0	10,600	159,000	33,800	125,200	2,504	1,540	3,856,000
Olive	3.5	22,000	77,000	15,800	61,200	1,224	0	0
Fruites (Grapes)	15.0	10,900	163,500	33,000	130,500	2,610	770	2,010,000
Fruites (Oranges)	25.0	8,200	205,000	43,800	161,200	3,224	770	2,482,000
Total	-	-	-	-	-	-	21,560	50,905,000
								3,306 /ha
3. Incremental Benefit								35,762,000
								$2,322 /ha

Remarks: Value of cereals includes value of sub-products (straws).

Economic Cost and Benefit Flow

(US$1,000)

Year in Order	Year	Project Cost				Irrigation Benefit	Negative Benefit	Total Benefit	Balance
		Const. Cost	Replace. Cost	O&M Cost	Total Cost				
1	1997	9,940	-	-	9,940	-	-	0	-9,940
2	1998	12,270	-	-	12,270	-	110	-110	-12,380
3	1999	12,750	-	-	12,750	-	190	-190	-12,940
4	2000	20,950	-	-	20,950	-	270	-270	-21,220
5	2001	34,800	-	-	34,800	-	270	-270	-35,070
6	2002	31,230	-	250	31,480	4,000	270	3,730	-27,750
7	2003	24,770	-	750	25,520	12,440	270	12,170	-13,350
8	2004	8,990	-	1,200	10,190	21,660	270	21,390	11,200
9	2005	1,900	-	1,360	3,260	27,270	270	27,000	23,740
10	2006	1,870	-	1,360	3,230	30,830	270	30,560	27,330
11	2007	-	-	1,360	1,360	33,750	270	33,480	32,120
12	2008	-	5,500	1,360	6,860	35,370	270	35,100	28,240
13	2009	-	10,680	1,360	12,040	35,760	270	35,490	23,450
14	2010	-	10,010	1,360	11,370	35,760	270	35,490	24,120
15	2011	-	3,430	1,360	4,790	35,760	270	35,490	30,700
16	2012	-	100	1,360	1,460	35,760	270	35,490	34,030
17	2013	-	70	1,360	1,430	35,760	270	35,490	34,060
18	2014	-	750	1,360	2,110	35,760	270	35,490	33,380
19	2015	-	6,210	1,360	7,570	35,760	270	35,490	27,920
20	2016	-	10,680	1,360	12,040	35,760	270	35,490	23,450
21	2017	-	9,960	1,360	11,320	35,760	270	35,490	24,170
22	2018	-	3,340	1,360	4,700	35,760	270	35,490	30,790
23	2019	-	-	1,360	1,360	35,760	270	35,490	34,130
24	2020	-	50	1,360	1,410	35,760	270	35,490	34,080
25	2021	-	90	1,360	1,450	35,760	270	35,490	34,040
26	2022	-	5,600	1,360	6,960	35,760	270	35,490	28,530
27	2023	-	10,750	1,360	12,110	35,760	270	35,490	23,380
28	2024	-	10,710	1,360	12,070	35,760	270	35,490	23,420
29	2025	-	4,050	1,360	5,410	35,760	270	35,490	30,080
30	2026	-	-	1,360	1,360	35,760	270	35,490	34,130
31	2027	-	3,900	1,360	5,260	35,760	270	35,490	30,230
32	2028	-	2,330	1,360	3,690	35,760	270	35,490	31,800
33	2029	-	5,500	1,360	6,860	35,760	270	35,490	28,630
34	2030	-	10,730	1,360	12,090	35,760	270	35,490	23,400
35	2031	-	10,050	1,360	11,410	35,760	270	35,490	24,080
36	2032	-	3,440	1,360	4,800	35,760	270	35,490	30,690
37	2033	-	70	1,360	1,430	35,760	270	35,490	34,060
38	2034	-	750	1,360	2,110	35,760	270	35,490	33,380
39	2035	-	710	1,360	2,070	35,760	270	35,490	33,420
40	2036	-	5,500	1,360	6,860	35,760	270	35,490	28,630
41	2037	-	10,680	1,360	12,040	35,760	270	35,490	23,450
42	2038	-	9,960	1,360	11,320	35,760	270	35,490	24,170
43	2039	-	3,340	1,360	4,700	35,760	270	35,490	30,790
44	2040	-	50	1,360	1,410	35,760	270	35,490	34,080
45	2041	-	90	1,360	1,450	35,760	270	35,490	34,040
46	2042	-	100	1,360	1,460	35,760	270	35,490	34,030
47	2043	-	5,570	1,360	6,930	35,760	270	35,490	28,560
48	2044	-	11,430	1,360	12,790	35,760	270	35,490	22,700
49	2045	-	10,670	1,360	12,030	35,760	270	35,490	23,460
50	2046	-	3,340	1,360	4,700	35,760	270	35,490	30,790
Total	Total					Economic Internal Rate of Return =			13.9%
						B/C Ratio =			2.26
						Net Present Value =			241,549

Table 3.5.4

Financial Cash Flow Statement (Foreign Loan Including the Cost for Beydağ Dam)

(Unit: US$ 1,000)

Year		Cash Outflow						Cash Inflow							Balance
		Project Cost	Replace-ment	O & M Cost	Loan Interest	Loan Repayment	Sub-total	Foreign Loan	Government Budget	Government Subsidy	Water Charge	Replacement Charge	Repayment by Farmers	Sub-total	
1997	1	14,449	-	-	-	-	14,449	7,047	7,218	184	-	-	-	14,449	0
1998	2	17,928	-	-	176	-	18,104	10,262	7,504	338	-	-	-	18,104	0
1999	3	19,557	-	-	433	-	19,990	13,411	6,150	429	-	-	-	19,990	0
2000	4	32,019	-	-	768	-	32,787	25,423	6,642	722	-	-	-	32,787	0
2001	5	50,385	-	-	1,404	-	51,789	48,185	2,471	1,133	-	-	-	51,789	0
2002	6	46,440	-	275	2,608	-	49,323	45,248	1,246	2,396	275	-	158	49,323	0
2003	7	37,190	-	820	3,739	-	41,749	35,793	1,480	3,188	820	-	468	41,749	0
2004	8	13,527	-	1,324	4,634	11,215	30,700	12,448	1,157	15,014	1,324	-	757	30,700	0
2005	9	2,872	-	1,494	4,665	11,215	20,246	2,018	904	14,976	1,494	-	854	20,246	0
2006	10	2,918	-	1,494	4,435	11,215	20,062	2,033	938	14,743	1,494	-	854	20,062	0
2007	11	-	-	1,494	4,206	11,215	16,915	-	-	14,567	1,494	-	854	16,915	0
2008	12	-	7,749	1,494	3,925	11,215	24,383	-	-	14,286	1,494	7,749	854	24,383	0
2009	13	-	15,038	1,494	3,645	11,215	31,392	-	-	14,006	1,494	15,038	854	31,392	0
2010	14	-	14,074	1,494	3,364	11,215	30,147	-	-	13,725	1,494	14,074	854	30,147	0
2011	15	-	4,810	1,494	3,084	11,215	20,603	-	-	13,445	1,494	4,810	854	20,603	0
2012	16	-	108	1,494	2,804	11,215	15,621	-	-	13,165	1,494	108	854	15,621	0
2013	17	-	74	1,494	2,523	11,215	15,306	-	-	12,884	1,494	74	854	15,306	0
2014	18	-	820	1,494	2,243	11,215	15,772	-	-	12,604	1,494	820	854	15,772	0
2015	19	-	8,528	1,494	1,963	11,215	23,200	-	-	12,324	1,494	8,528	854	23,200	0
2016	20	-	15,038	1,494	1,682	11,215	29,429	-	-	12,043	1,494	15,038	854	29,429	0
2017	21	-	14,024	1,494	1,402	11,215	28,135	-	-	11,763	1,494	14,024	854	28,135	0
2018	22	-	4,706	1,494	1,121	11,215	18,536	-	-	11,482	1,494	4,706	854	18,536	0
2019	23	-	-	1,494	841	11,215	13,550	-	-	11,202	1,494	-	854	13,550	0
2020	24	-	50	1,494	561	11,215	13,320	-	-	10,922	1,494	50	854	13,320	0
2021	25	-	304	1,494	280	11,213	13,291	-	-	10,639	1,494	304	854	13,291	0
2022	26	-	14,815	1,494	-	-	16,309	-	-	-	1,494	14,815	854	17,163	854
2023	27	-	20,791	1,494	-	-	22,285	-	-	-	1,494	20,791	854	23,139	854
2024	28	-	15,712	1,494	-	-	17,206	-	-	-	1,494	15,712	854	18,060	854
2025	29	-	5,485	1,494	-	-	6,979	-	-	-	1,494	5,485	854	7,833	854
2026	30	-	-	1,494	-	-	1,494	-	-	-	1,494	-	854	2,348	854
2027	31	-	-	1,494	-	-	1,494	-	-	-	1,494	-	696	2,190	696
2028	32	-	-	1,494	-	-	1,494	-	-	-	1,494	-	386	1,880	386
2029	33	-	7,749	1,494	-	-	9,243	-	-	-	1,494	7,749	97	9,340	97
2030	34	-	15,088	1,494	-	-	16,582	-	-	-	1,494	15,088	-	16,582	0
2031	35	-	14,128	1,494	-	-	15,622	-	-	-	1,494	14,128	-	15,622	0
Total		237,285	179,090	42,757	56,506	201,868	717,506	201,868	35,710	242,180	42,757	179,090	21,350	722,955	

Remark; Foreign loan: annual interest rate of 2.5% for repayment period of 25 years including grace period of 7 years.

*: The cost for irrigation and drainage systems and Beydağ dam are included in the foreign loan.

Financial Cash Flow Statement (Foreign Loan for Irrigation and Drainage Systems)

(Unit: US$ 1,000)

Year		Cash Outflow						Cash Inflow							Balance
		Project Cost	Replace-ment	O & M Cost	Loan Interest	Loan Repayment	Sub-total	Foreign Loan	Government Budget	Government Subsidy	Water Charge	Replacement Charge	Repayment by Farmers	Sub-total	
1997	1	14,449	-	-	-	-	14,449	2,059	12,390	0	-	-	-	14,449	0
1998	2	17,928	-	-	51	-	17,979	2,552	15,376	51	-	-	-	17,979	0
1999	3	19,557	-	-	115	-	19,672	173	19,384	115	-	-	-	19,672	0
2000	4	32,019	-	-	120	-	32,139	11,787	20,232	120	-	-	-	32,139	0
2001	5	50,385	-	-	414	-	50,799	34,137	16,248	414	-	-	-	50,799	0
2002	6	46,440	-	275	1,268	-	47,983	45,248	1,192	1,110	275	-	158	47,983	0
2003	7	37,190	-	820	2,399	-	40,409	35,793	1,397	1,931	820	-	468	40,409	0
2004	8	13,527	-	1,324	3,294	8,236	26,381	12,448	1,079	10,773	1,324	-	757	26,381	0
2005	9	2,872	-	1,494	3,399	8,236	16,001	2,018	854	10,781	1,494	-	854	16,001	0
2006	10	2,918	-	1,494	3,244	8,236	15,892	2,033	885	10,626	1,494	-	854	15,892	0
2007	11	-	-	1,494	3,089	8,236	12,819	-	-	10,471	1,494	-	854	12,819	0
2008	12	-	7,749	1,494	2,883	8,236	20,362	-	-	10,265	1,494	7,749	854	20,362	0
2009	13	-	15,038	1,494	2,677	8,236	27,445	-	-	10,059	1,494	15,038	854	27,445	0
2010	14	-	14,124	1,494	2,471	8,236	26,325	-	-	9,853	1,494	14,124	854	26,325	0
2011	15	-	4,914	1,494	2,265	8,236	16,909	-	-	9,647	1,494	4,914	854	16,909	0
2012	16	-	216	1,494	2,059	8,236	12,005	-	-	9,441	1,494	216	854	12,005	0
2013	17	-	148	1,494	1,853	8,236	11,731	-	-	9,235	1,494	148	854	11,731	0
2014	18	-	1,640	1,494	1,647	8,236	13,017	-	-	9,029	1,494	1,640	854	13,017	0
2015	19	-	9,307	1,494	1,441	8,236	20,478	-	-	8,823	1,494	9,307	854	20,478	0
2016	20	-	15,038	1,494	1,235	8,236	26,003	-	-	8,617	1,494	15,038	854	26,003	0
2017	21	-	14,024	1,494	1,030	8,236	24,784	-	-	8,412	1,494	14,024	854	24,784	0
2018	22	-	4,706	1,494	824	8,236	15,260	-	-	8,206	1,494	4,706	854	15,260	0
2019	23	-	-	1,494	618	8,236	10,348	-	-	8,000	1,494	-	854	10,348	0
2020	24	-	100	1,494	412	8,236	10,242	-	-	7,794	1,494	100	854	10,242	0
2021	25	-	208	1,494	206	8,236	10,144	-	-	7,588	1,494	208	854	10,144	0
2022	26	-	7,965	1,494	-	-	9,459	-	-	-	1,494	7,965	854	10,313	854
2023	27	-	15,186	1,494	-	-	16,680	-	-	-	1,494	15,186	854	17,534	854
2024	28	-	15,664	1,494	-	-	17,158	-	-	-	1,494	15,664	854	18,012	854
2025	29	-	6,264	1,494	-	-	7,758	-	-	-	1,494	6,264	854	8,612	854
2026	30	-	-	1,494	-	-	1,494	-	-	-	1,494	-	854	2,348	854
2027	31	-	-	1,494	-	-	1,494	-	-	-	1,494	-	696	2,190	696
2028	32	-	-	1,494	-	-	1,494	-	-	-	1,494	-	386	1,880	386
2029	33	-	7,749	1,494	-	-	9,243	-	-	-	1,494	7,749	97	9,340	97
2030	34	-	15,088	1,494	-	-	16,582	-	-	-	1,494	15,088	-	16,582	0
2031	35	-	14,128	1,494	-	-	15,622	-	-	-	1,494	14,128	-	15,622	0
Total		237,285	169,256	42,757	39,014	148,248	636,560	148,248	89,037	171,361	42,757	169,256	21,350	642,009	

Remark; Foreign loan: annual interest rate of 2.5% for repayment period of 25 years including grace period of 7 years.

*: The cost for irrigation and drainage systems are included in the foreign loan, and Beydağ dam is not included in the foreign loan.

Table 3.5.6

Result of IEE in the Project Area

Environmental Items	Ecological Regions				Remarks
	Region I Catchment Area of Dam	Region II Reservoir Area including Dam Site	Region III Irrigation Area	Region IV Downstream River Channel from Dam Site	
1. Displaced of people	-	-/A	-/C	-	EIA is necessary.
2. Land use changes	-	-/C	-/C	-	
3. Impairment of transportation	-	-/C	x	-	
4. Inundation of mineral resource	-	x	x	-	
5. Historical and recreational disturbance					
- Histrical and cultural disturbance	-	x	x	-	
- Recretional disturbance	-	x	x	-	
6. Ecological disturbance					
- Terrestrial fauna and flora	x	x	x	x	
- Aquatic fauna and flora	x	x	x	x	
- Marsh area	-	-	-	-/C	
8. Degradation of forest resources	x	-/C	-/C	-	
9. Erosion and sedimentation	x	-/C	-/C	-	
10. Fisheries losses	x	x	x	x	
11. Groundwater deteriorations					
- Groundwater depth	-	-	+/B	+/C	
- Groundwater quality	-	-	-/B	-/A	EIA is necessary.
12. Change of river flow regime	-	-	-/C	-/C	
13. Surface water deterioration	-	-	-/B	-/A	EIA is necessary.
14. Eutrophication of Dam Reservoir	-	-/A	-	-	EIA is necessary.
15. Public health issues	-	x	x	x	
16. Climatic change	-	x	-	-	
17. Water rights conflicts	-	-	x	x	
18. Soil degradation	-	-	x	-	
19. Changing farming practices	-	-	+/B	-	
20. Earthquake hazards	-	x	-	-	

A : Relative high magnitude of impact is expected
B : Relative medium magnitude of impact is expected
C : Relative low magnitude of impact is expected
x : No effect is expected
- : There is no relation
+ : Possitive effect is expected
- : Negative effect is expected

Environmental Conservation Plan (1/2)

Description of Impact	Source of Impact	Environmental Conservation Plan	Location	Timing	Executor of the Conservation	Supervision Institution	Related Institution
1. People To Be Dislocated from Beydağ Reservoir Area							
1.1 Unsatisfactory of resettlement							
	Shortage of explanation for the dislocation	Implementation of public consultation meeting	Dam reservoir area	Before land acquisition	Project Office	DSI	Local government
	Shortage of the survey of present condition of dislocated people	Implementation of questionnaire survey	Dam reservoir area	Before land acquisition	Project Office	DSI	Local government
	Constraint on new resettlement area	Preparation of support service	Dam reservoir area	During and after land acquisition	Project Office	DSI	Local government
		Implementation of support service	Dam reservoir area	During and after land acquisition	Local government	Local government	DSI
1.2 Unsatisfactory of the amount of compensation							
	Unproper method to decide the compensation amount	Decision of compensation amount at proper method	Dam reservoir area	During and after land acquisition	Land committee	Land committee	DSI
	Constraint on the finance for new life	Monitoring of socio-economical condition of dislocated people	New resettlement area	After land acquisition	Project Office	DSI	Local government
		Preparation of supporting plan	New resettlement area	After land acquisition	Project Office	DSI	Local government
		Implementation of support service	New resettlement area	After land acquisition	Land committee	Local government	DSI
2. Eutrophication of Beydağ dam reservoir							
2.1 Increment of pollution load on the watershed of the Beydağ dam							
	Domestic waste water	Establishment of the municipal sewage system	Watershed of Beydağ dam	During and after the construction	Local government	Local government	DSI
	Runoff of fertilizer in agricultural land	Introduction of proper farming system	Watershed of Beydağ dam	During and after the construction	Project Office	MARA	DSI, MOF
		Improvement of landuse such as introduce of grassland	Watershed of Beydağ dam	During and after the construction	Project Office	MARA	DSI, MOF
	Waste from livestock	Control of the direct intrusion to river	Watershed of Beydağ dam	During and after the construction	Project Office	MARA	DSI, MOF
		Usage of the waste as manure	Watershed of Beydağ dam	During and after the construction	Project Office	MARA	DSI, MOF

Table 3.5.7 (1)

Table 3.5.7 (2)

Environmental Conservation Plan (2/2)

Description of Impact	Source of Impact	Environmental Conservation Plan	Location	Timing	Executor of the Conservation	Supervision Institution	Related Institution
2.2 Increment of solid waste in reservoir							
	Fish culture	Prohibition of Fish culture	Dam reservoir	After the construction	Project Office	DSI	Local government
	Tourism	Limitation of recreational use	Dam reservoir	After the construction	Project Office	DSI	Local government
		Monitoring of water quality of the reservoir	Dam reservoir	After the construction	Project Office	DSI	
		Monitoring of farming practice	Dam reservoir	After the construction	Project Office	DSI	
3. Deterioration of water quality							
	Increment of crop intensity	Introduction of the proposed crop rotation system	Project Area	During and after the construction	Project Office	MARA	DSI
	Increment of utilization of farm inputs : chemical fertilizer and agro-chemicals	Usage of manure or organic fertilizer instead of chemical fertilizer	Project Area	During and after the construction	Project Office	MARA	DSI
		Introduction of IPM system	Project Area	During and after the construction	Project Office	MARA	DSI
		Establishment of proper pest forecasting system	Project Area	During and after the construction	Project Office	MARA	DSI
	Improper use of farm inputs : chemical fertilizer and agro-chemicals	Application of farm inputs at proper timing and volume	Project Area	During and after the construction	Project Office	MARA	DSI
		Limitation of high toxicant agro-chemicals	Project Area	During and after the construction	Project Office	MARA	DSI
4. Watershed management							
Increment of soil erosion							
	Shortage of the integrated approach among related agencies	Monitor and discussion of progress of the watershed management project in the joint committee	Watershed of Beydağ dam	During and after the construction	Joint Committee	DSI	MARA, MOF, GDRS
	Shortage of extension work in sloped area	Implementation of extension work in sloped area by MARA	Watershed of Beydağ dam	During and after the construction	MARA	MARA	DSI

Environmental Monitoring Plan

Description of Impact	Environmental Monitoring Plan	Monitoring Methodology	Analysis Methodology	Location	Timing	Frequency	Monitoring Execution Agency	Related Institution
1. People To Be Dislocated from Beydağ Reservoir Area								
	Progress of land acquisition and compensation	Data collection	Tabulation of data	Dam reservoir area	During land acquisition	Upon on a require	Project Office	DSI
	Socio-economical condition and requirement of dislocated people	Interview	Tabulation of interview result	Resettlement area	After land acquisition	Two times	Project Office	DSI
2. Eutrophication of Beydağ dam reservoir								
	Waste water source in the watershed	Direct Observation and interview	Tabulation of the result	Watershed area	After the construction	One time per year	Project Office	DSI, Local government
	Water quality of the reservoir	Direct Observation and sampling	Laboratory analysis	Dam reservoir	During and after the construction	Bimonthly or monthly	Project Office	DSI
3. Deterioration of water quality								
	Water quality of surface water	Direct Observation and sampling	Laboratory analysis	Kucuk Menders river	During and after the construction	Bimonthly or monthly	Project Office	DSI
	Water quality of groundwater	Direct Observation and sampling	Laboratory analysis	Project Area	During and after the construction	Two time per year	Project Office	DSI
	Farming practice	Interview	Tabulation of interview result	Project Area	During and after the construction	One time per year	Project Office	MARA, DSI
	Groundwater table	Direct Observation	Tabulation of the result	Project Area	During and after the construction	Two time per year	Project Office	DSI
4. Watershed management								
	Progress of watershed management project	Meeting among related agencies	Tabulation of the progress	Watershed area	During and after the construction	One time per year	DSI	MARA, MOF, GDRS
	Sedimentation of the reservoir	Sampling	Laboratory analysis	Dam reservoir	After the construction	Two times per year	Project Office	DSI
5. Others								
- Ecological condition	Condition of ecological condition	Direct Observation and interview	Data analysis and reporting	River basin area	During and after the construction	One time per year	Project Office	MOE, MOF, DSI
- Local disease	Condition of local disease	Data collection	Data analysis and reporting	Project Area	During and after the construction	One time per year	Project Office	MOH, Local government
- Complain of local people	Constraint of local people	Interview	Tabulation of interview result	Project Area	During and after the construction	One time per year	Project Office	DSI
- Others	Upon on a require	Direct Observation and interview	Data analysis and reporting	Project Area	Upon on a require	Upon on a require	Project Office	DSI,etc.

Table 3.5.8