

## ***CHAPTER 1***

# ***BACKGROUND OF THE PROJECT***

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### 1.1 Background of Requested Grant Aid

The Azerbaijan Republic is a new country that became independent from the former Soviet Union in 1991 and joined the European Community (EC) in 2001. The area of the national land is 86,600 km<sup>2</sup>, which is equivalent to one fourth of Japan, and the population is 8.20 million<sup>1</sup>. It faces Dagestan in the Russian Federation to the north, Georgia to the northwest, Armenia to the southwest, Iran and Turkey to the south and the Caspian Sea to the east. The topography is complex and varied. Three fifth of the whole area is mountainous region. A plain extends along the Kura River flowing down to the southeast. The climate differs from place to place. As for the area facing the Caspian Sea, the northern part is classified into the Humid Subtropical climates (Cfa) with rather less precipitation that is about 570 mm/year in Guba, and southern part is into the Mediterranean climates (Cs) with further less precipitation about 280 mm/year in Salyan. Because of such less precipitation, 90% of the farm products are cultivated with irrigation. Under such condition, extensive networks of irrigation and drainage systems consisting of canals, pumping stations, regulating reservoirs, etc. have been constructed in Azerbaijan.

Further, the water resources in Azerbaijan are limited to a less amount. As for the surface water resources, the total amount is about 28 to 32 billion m<sup>3</sup>. However, the runoff from water sources in the country is only 6 to 10 billion m<sup>3</sup>, while it from the outside is 22 billion m<sup>3</sup>.

The whole water volume in dam reservoirs is about 21.5 billion m<sup>3</sup>. On the other hand, the groundwater resources are rather abundant and the available water volume is 5 billion m<sup>3</sup>. It is equivalent to 16 to 18% of the whole water resources in Azerbaijan. However, groundwater volume actually used is only 2 billion m<sup>3</sup>. As for the water usage in the country, the total volume actually used is 16 billion m<sup>3</sup>, of which the majority, or 68%, is used for the agriculture and only 27% for the industry.

In Azerbaijan, extensive networks of irrigation and drainage systems consisting of canals, pumping stations, regulating reservoirs, etc. have been constructed. The Kura River Basin area, which covers most of the irrigated area of the country, is irrigated through the Kura Right Bank Canal and the Kura Left Bank Canal. The water source for these canals is the Mingachevir Reservoir. The irrigation water demand reaches a peak in July and August, and the discharge of the Kura River is lowest in these months.

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<sup>1</sup> Ref. 2003 Statistical Yearbook of Azerbaijan

One of the important components of the extensive networks of irrigation and drainage canals is located in the project area composed of the four districts of Salyan, Sabirabad, Saatli and Neftchala (hereinafter referred to as “the Project Sites”), which is the major agricultural production area in the country. In the Project Sites, there are 202,000 ha of irrigated area containing 5,900 km of irrigation canal networks and 10,400 km of drainage canal networks.

In the existing irrigation and drainage canals in the Project Sites, serious reduction of flow capacity has been caused due to sedimentation and weed growth. The respective management offices concerned are carrying out dredging work. However, the actual volume dredged is much less than the volume that needs to be dredged due to a lack of equipment and operational budget. In some of the secondary canals, water flow is disrupted by sedimentation. Sedimentation at the beginning point of tertiary canals interferes with distribution of water to the on-farm systems. The water shortage resulting from sedimentation is also leading to salinization damage in many irrigated areas. Taking into consideration the situation mentioned above, it is judged that urgent rehabilitation of such canals in the Project Sites with dredging is indispensable.

In accordance with the presidential decree of November 2003, the national development plan is now under preparation. As to the agricultural sector, “The Amelioration and Irrigation Development Program 2004-2010” was worked out by the Committee of Amelioration and Water Farm (hereinafter referred to as “CAWF”). This program includes development of 31,000 ha of new irrigation area and rehabilitation of existing irrigation and drainage facilities in 61,000 ha. In such background, the dredging of the canals has been decided to be partly implemented with use of equipment to be procured as a project under Japan’s Grant Aid Scheme (hereinafter referred to as “the Project”).

## **1.2 Outline of Requested Grant Aid**

The original request for procurement of equipment by the Japan’s Grant Aid was made by the Government of Azerbaijan (hereinafter referred to as “GOA”) in August 1999. Then, the Preparatory Study was conducted by the Japan International Cooperation Agency (hereinafter referred to as “JICA”) in September 2003 to examine the background, purpose, contents and effect of the requested project. As a result of the study, the Project Sites were changed from the whole country to the four (4) regions as confirmed in the Minutes of Discussions on the Preparatory Study dated September 26, 2003. Kind and number of equipment were also modified from those of the original request as mentioned in the Preparatory Study Report of October 2003. These modified ones have been recognized as the equipment of the modified request.

Based on the said modified request, this Basic Design Study has been conducted. The field survey was carried out from January 5 to January 24, 2004 and then the home work has been conducted for analysis of the collected data and information. The Draft Basic Design Report was sent to the Government of Azerbaijan by the end of February 2004. The explanation mission of the draft report was not dispatched to Azerbaijan. As a result of the Basic Design, the following have been finally determined.

The purpose of the Project is to procure necessary equipment for rehabilitation of the selected 15 canals and one (1) floodway that are suffering from serious sedimentation and are in need of dredging. The following equipment has been selected and agreed between the Japanese Basic Design Study Team and the Azerbaijan Republic.

- |     |   |                 |
|-----|---|-----------------|
| 1)  | Wheel type hydraulic excavator, 1.4 m <sup>3</sup> (heaped) | : 4 units       |
| 2)  | Wheel type hydraulic excavator, 0.8 m <sup>3</sup> (heaped) | : 19 units      |
| 3)  | Wheel type hydraulic excavator, 0.5 m <sup>3</sup> (heaped) | : 2 units       |
| 4)  | Bulldozer, 21 ton   | : 2 units       |
| 5)  | Bulldozer, 15 ton   | : 10 units      |
| 6)  | Hydraulic type truck crane, 20 ton or more                  | : 1 unit        |
| 7)  | Cargo truck, 14 ton or more                                 | : 1 unit        |
| 8)  | Tractor with semi-trailer, 40 ton or more                   | : 1 unit        |
| 9)  | Mobile workshop with repairing equipment and tools          | : 1 unit, 1 set |
| 10) | Spare parts   | : 1 set         |

## ***CHAPTER 2***

# ***CONTENTS OF THE PROJECT***

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### 2.1 Basic Concept of the Project

#### 2.1.1 Purpose of the Project

The purpose of the canal dredging plan was determined taking the serious sedimentation and the necessity for urgent rehabilitation of the canals into consideration. The rehabilitation work will be implemented for i) 15 secondary canals and ii) Girdiman floodway aiming at recovery of flow capacity of these canals and the floodway. Further, the dredging plan expects to recover the agricultural production in the Project Sites with this rehabilitation work.

On the other hand, the purpose of the Project is to procure necessary equipment for the dredging works of the canals and the floodway, which will partly be executed in combination with the existing equipment.

It is noted that the ratio of length of the objective secondary canals of the dredging plan to total length of the whole secondary ones in the four (4) regions is about 5%.

#### 2.1.2 Outline of the Canal Dredging Plan

In the Azerbaijan Republic, the dredging work for irrigation and drainage canals are insufficiently carried out due to the limitation of equipment and the shortage of operational budget. For effective use of existing facilities and improvement of agricultural productivity, it is important to execute the rehabilitation work to recover the flow capacities of the objective canals.

With interview survey at the 11 management offices controlling the objective canals and with discussion with CAWF in Baku, which is “the Implementation Agency”, the canals that suffer from crucial sedimentation and need to be urgently rehabilitated with the dredging have been selected. In the selection of the objective canals, i) sedimentation condition, ii) salinization damage condition, iii) access to the dredging work site of the equipment were considered comprehensively. As a result of the evaluation, it is judged that the objective canals have properly been selected and need to be rehabilitated urgently with dredging work, because the selected canals have common conditions that are of serious sedimentation and in serious salinization damage area. Names of the objective canals to be dredged and volumes of sediments to be dredged within the required period of three (3) years are shown in the following Table 2.1-1.

**Table 2.1-1 Objective Canals and Dredging Volume**

Name of management offices and selected canals	Parameter		Dredging Volume (m <sup>3</sup> )
	Length (m)	Design discharge (m <sup>3</sup> /s)	
<b>①Salyan Irrigation Management Office</b>			
-Abudullah irrigation canal	5,600	1.0	48,384
-SHA irri. canal	32,000	3.5	324,480
<b>②Neftchala Irrigation Management Office</b>			
-M-0 irrigation canal	3,000	2.0	25,380
-S-2 irrigation canal	12,000	3.5	115,920
-KHOL-2 irrigation canal	10,000	3.5	96,600
<b>③Sabirabad Irrigation Management Office</b>			
-Debur irrigation canal	7,000	2.5	85,295
-Gumush Arkh irrigation canal	11,000	4.5	153,285
<b>④Sabirabad Mechanical Irrigation Management Office</b>			
-D irrigation canal	18,000	3.5	200,520
-KL irrigation canal	19,000	3.5	211,660
<b>⑤Kur-Araz River Dike Protection Management Office</b>			
-Girdiman floodway	15,000	200.0	1,588,500
<b>⑥Saatlı Irrigation Management Office</b>			
-Swartz irrigation canal	22,500	4.5	245,025
<b>⑦Mugan Pump Amelioration Management Office</b>			
-Kuryany drainage canal	37,000	1.2	352,980
<b>⑧Mil Mugan Collector Management Office</b>			
-Sabir drainage canal	21,000	2.0	171,360
<b>⑨Sabirabad Amelioration Management Office</b>			
-VPK-24 drainage canal	22,500	1.8	231,750
<b>⑩Main Sirvan Collector Management Office</b>			
-K-1 drainage canal	15,300	4.5	171,207
<b>⑪Mugan Salyan Forest &amp; Amelioration Management Office</b>			
-PBK drainage canal	20,000	0.6	161,700
Total	270,900		4,184,046

### 2.1.3 Outline of the Project

The Grant Aid Project is to procure necessary equipment for implementation of the objective canals and the floodway. In following sections, the necessary equipment is described separately for i) dredging equipment of irrigation and drainage canals and ii) supporting equipment.

#### (1) Dredging Equipment of Irrigation and Drainage Canals

Dredging equipment of irrigation and drainage canals as well as the floodway are 25 units of hydraulic excavators and 12 units of bulldozers. The equipment will be allocated to the 11 management offices respectively, and be used for the canal dredging works to be completed within three (3) years. The dredging equipment are shown in Table 2.1-2.

**Table 2.1-2 Dredging Equipment of Irrigation and Drainage Canals**

Name of offices	Excavator			Bulldozer	
	Bucket capacity (heaped)			Mass weight	
	1.4 m <sup>3</sup>	0.8 m <sup>3</sup>	0.5 m <sup>3</sup>	21 ton	15 ton
① Salyan Irrigation Management Office	0	2	1	0	0
② Neftchala Irrigation Management Office	0	2	0	0	1
③ Sabirabad Irrigation Management Office	0	2	0	0	1
④ Sabirabad Mechanical Irrigation Management Office	0	2	1	0	0
⑤ Kur-Araz River Dike Protection Management Office	4	2	0	2	2
⑥ Saatli Irrigation Management Office	0	2	0	0	1
⑦ Mugan Pump Amelioration Management Office	0	2	0	0	1
⑧ Mil Mugan Collector Management Office	0	1	0	0	1
⑨ Sabirabad Amelioration Management Office	0	2	0	0	1
⑩ Main Sirvan Collector Management Office	0	1	0	0	1
⑪ Mugan Salyan Forest & Amelioration Management Office	0	1	0	0	1
Total	4	19	2	2	10

## (2) Supporting Equipment

The supporting equipment will be allocated to the Ali-Bairamli Mechanical and Repair Center, and be mobilized at work sites as required. Table 2.1-3 shows a list of the supporting equipment.

**Table 2.1-3 Supporting Equipment**

Equipment	Number
Hydraulic type truck crane: lifting capacity 20 ton or more	1
Cargo truck: 14 ton or more	1
Tractor with semi-trailer: 40 ton or more	1
Mobile workshop with repairing equipment and tools	1
Total	4



(3) Spare Parts

Spare parts for 1.5 years of operation will be supplied for the whole 41 units of equipment; 37 units of dredging equipment for canals and the floodway, four (4) units of supporting equipment.

## 2.2 Basic Design of the Requested Japanese Assistance

### 2.2.1 Design Policy

(1) Basic Policy

Equipment to be procured by the Project have been selected from a viewpoint of the urgency and necessity for rehabilitation of the secondary irrigation and drainage canals, and the Girdiman floodway in the four (4) regions of Salyan, Sabirabad, Saatli and Neftchala along the Kura River.

Items of the basic policy of the Project are as follows:

- The implementation period of canal dredging is set at three (3) years.
- The objective canals for the dredging are the 15 secondary irrigation and drainage canals and the Girdiman floodway under the management of the 11 offices in the 4 regions.
- It is planned to commence the dredging work in an early time to mitigate the salinization damage to farm products.
- Dredging equipment have been selected in consideration of i) site topography, ii) cross section of canals, iii) length of the canals for dredging, iv) dredging work volume, v) operation and maintenance system of equipment of Azerbaijan and other factors affecting.
- Spare parts required for 3,000 hours of operation in the first two (2) years should be procured together with the dredging equipment.
- The training for operation and maintenance on the equipment should be conducted in Azerbaijan just after delivery of the equipment by the contractor, the supplier of the equipment, under the supervision of the consultant.

(2) Policy for Natural Conditions

The Project Sites are the four (4) regions of Salyan, Sabirabad, Saatli and Neftchala, which are located in the middle and lower reaches of the Kura River that has 1,364 km (749 km in Azerbaijan) of length and 188,800 km<sup>2</sup> of catchment area. As mentioned above, the

water source facilities of irrigation water for the Kura River basin is the Mingachevir Dam (16.1 billion m<sup>3</sup> of gross storage volume). The required water is secured in the reservoir.

Sedimentation materials in the four (4) regions laying in the middle and lower reaches of the Kura is created in the downstream reaches and the Araz River basin, because 97.6% of the sediment from the upper Kura is caught in the reservoir. Though the check dam construction and the river basin conservation are required for prevention of the sediment from the catchment areas concerned, those measures would be taken in the other sectors than this irrigation sector.

On the other hand, in watching the climate from the agricultural cropping point of view, the annual average temperature is 14.5°C in Salyan, which is located in the center of the Project Site. The hottest months are July and August and their monthly average temperatures are 26.2 - 26.0°C. On the other hand, the coldest month is January and the monthly average is 2.5°C. As for the rainfall, the annual rainfall is small as 283 mm. The seasonal rainfall in April to October, which is the cropping period, is 127 mm that is only 45% of the total. As for the evaporation, it in the cropping period is 85% of the total.

In such situation, the proper irrigation and drainage are very important. The policy of Project for the natural conditions is to improve the present irrigation and drainage conditions to cope with the severe natural conditions mentioned above. The Project is to be implemented to procure the equipment required for the canal dredging to rehabilitate the canals and recover the original irrigation and drainage functions.

### (3) Policy for Other Conditions

The policy for the approaches to engineering issues to be clarified for the canal dredging work and the equipment plan are mentioned below. They are of the dredging volume estimation and the equipment trafficability judgment.

#### 1) Sedimentation volume

Grasping the real conditions of sedimentation in canals is very important to estimate the volume to be dredged. In order to estimate the volume to be dredged, annual sedimentation volume per canal length of 1 m is calculated at first.

There are two (2) data of the annual sedimentation volume used. One is the data of the Preparatory Study in 2003 and the other is it obtained through this Basic Design Study.

The annual sedimentation volume per 1 m is calculated by dividing the annual volume by the canal length. The volume per 1 m is equivalent to the sedimentation

cross-sectional area. Then, the cross-sectional area is converted to the depth of sedimentation.

Appropriateness of estimation of annual sedimentation volume per canal length of 1m is verified with examination of the sedimentation depths calculated based on the two (2) data source. Results of the annual sedimentation volume per canal length of 1 m and the depth of sedimentation of canals managed by each management office are shown in Table 2.2-1 for comparison.

**Table 2.2-1 Annual Sedimentation Volume and Depth of Sedimentation**

No.	Name of offices	(a)		(b)	(c)	
		Annual sedimentation volume per 1m (m <sup>3</sup> /m)=(m <sup>2</sup> )			Canal width (m)	Depth of sedimentation (a) / (b) (m)
		B/D	Prep. Study	B/D		Prep. Study
1.	Salvan Irrigation Management Office	2.2	0.8	2.5	0.88	0.32
2.	Neftchala Irrigation Management Office	0.7	0.7	1.2	0.58	0.58
3.	Sabirabad Irrigation Management Office	3.0	0.1	4.0	0.75	0.03
4.	Sabirabad Mechanical Irrigation Management Office	0.8	0.6	2.5	1.33	0.24
5.	Kur-Araz River Dike Protection Management Office	23.3	-	15.0	1.55	-
6.	Saatli Irrigation Management Office	40.1	0.7	3.0	13.40	0.23
7.	Mugan Pump Amelioration Management Office	1.7	2.1	1.5	1.13	1.40
8.	Mil Mugan Collector Management Office	2.1	2.1	2.0	1.05	1.05
9.	Sabirabad Amelioration Management Office	2.1	2.1	2.0	1.05	1.05
10.	Main Sirvan Collector Management Office	2.4	2.1	5.0	0.48	0.42
11.	Mugan Salyan Forest & Amelioration Management Office	2.1	2.1	1.6	1.31	1.31

From the above, the annual sedimentation volumes per canal length of 1m have been decided except for those of three (3) management offices, which are Neftchala irrigation, Sabirabad mechanical irrigation and Saatli irrigation offices, because of the large deviation from the conceivable value of the sedimentation depth.

Accordingly, the annual sedimentation volumes per canal length of 1m of the three (3) management offices have been re-calculated in consideration of reliability of the data shown by the respective management offices.

Then, the annual sedimentation volumes per canal length of 1m have eventually been decided based on the quantitative comparison with annual sedimentation

volumes of other eight (8) offices. Table 2.2-2 shows the adopted annual sedimentation volumes per canal length of 1m for the 11 offices.

**Table 2.2-2 Adopted Annual Sedimentation Volume**

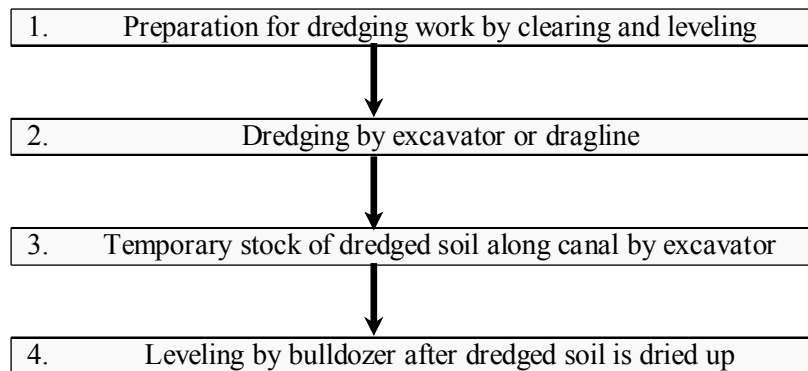
No.	Name of offices	Annual sedimentation volume per 1m (m <sup>3</sup> /m)=(m <sup>2</sup> )
1.	Salyan Irrigation Management Office	2.2
2.	Nefchala Irrigation Management Office	2.2
3.	Sabirabad Irrigation Management Office	3.0
4.	Sabirabad Mechanical Irrigation Management Office	2.5
5.	Kur-Araz River Dike Protection Management Office	23.3
6.	Saatli Irrigation Management Office	2.3
7.	Mugan Pump Amelioration Management Office	1.7
8.	Mil Mugan Collector Management Office	2.1
9.	Sabirabad Amelioration Management Office	2.1
10.	Main Sirvan Collector Management Office	2.4
11.	Mugan Salyan Forest & Amelioration Management Office	2.1

2) Trafficability of the Project Sites

In order to confirm the trafficability of the equipment in the Project Sites, the bearing capacity test was carried out.

a) Work flow of dredging

General work flow of dredging in the work site is as shown below.



b) Bearing capacity test by cone penetrometer

In order to confirm trafficability of the equipment on the dredged soil, the bearing capacity test with use of the cone penetrometer was carried out in the Main Sirvan collector management office in Saatli Region on January 14, 2004.

Generally, leveling work as shown in the process No. 4 of the above work flow is not carried out on the muddy soil that is immediately after dredged. Accordingly, the test was done on the relatively dried soil, which was dredged one (1) month ago and stocked along the drainage canal.

The test results could conclude that the trafficability of the clearing, leveling and spreading equipment on the dredged soil satisfies the requirement.

In addition, members of the Basic Design Study Team visited a dredging site in the Sabirabad mechanical irrigation management office where no notable problem was found through the dredging works.

#### (4) Procurement Policy

##### 1) Policy for country of product

The equipment to be procured would be the Japanese products of high quality in accordance with intention of the Azerbaijan side.

As for the operation and maintenance of the equipment, the staff of Azerbaijan will master the necessary skill through the guidance to be performed by the contractor at the delivery.

The spare parts of the equipment are procured for about one and a half year, or about 3,000 hours in operation, in this Project. After it, CAWF would procure the spare parts. As there are several organizations in Azerbaijan who could supply the spare parts. They are branch offices or local offices of Japanese companies and local subsidiaries and have dealt with the 2KR equipment and the spare parts for the Ministry of Agriculture.

They have also smoothly dealt with the heavy repairs such overhauls with support of the branch offices of Japanese companies in Moscow, etc. They have arranged qualified technicians, procured and transported necessary parts.

The way to have been taken in the past could be applied to the procurement of spare parts and the overhauls for the equipment of this Project. Therefore, it is judged appropriate to procure the Japanese equipment.

##### 2) Policy for transportation

As for the transportation routes from Japan to Azerbaijan, transportations by sea, by railway and by truck are conceivable. Major routes are as follows:

- i. Japan - Iran (Bandar Abbas Port) - Azerbaijan (by sea and by truck)
- ii. Japan - Russia (the Trans-Siberian Railroad) - Azerbaijan (by sea and by railway)

As a policy, the transportation route has been determined to be a combination of i) transportation by sea from Japan to the Bandar Abbas Port and ii) transportation by truck or by trailer from the port to Baku, from the viewpoint of reduction of the time and cost of transportation.

3) Policy for customs clearance

The equipment is shipped after the pre-shipment inspection. The customs clearance for transit goods is done at the Bandar Abbas Port for entrance to Iran. It takes about two days. After the clearance, the equipment are transported by trailer to Azerbaijan. At the border of Iran and Azerbaijan, the customs clearance for transit goods is done for departure from Iran and entrance to Azerbaijan. It takes a few hours. Then, at arrival in Baku, the formal customs clearance is done at the Baku Central Customs Committee.

For this Project, as a policy, the Government of Azerbaijan (GOA) has the obligations to arrange the exemption from customs, charges and corporation taxes for the equipment procured from Japan.

To exempt the taxes for the equipment, CAWF submits the request letter together with the copy of the contract of the equipment procurement and the shipment certificate to the Cabinet of Ministers. The Cabinet of Ministers requests for the customs clearance to the State Committee for Customs, and the State Committee requests it to the Baku Chief Customs Committee. After these procedures, the customs clearance for the equipment is completed.

It is noted that, in the Azerbaijan Republic, by the "Law on the Grant Aid" issued on 17th April 1988, all the equipment procured under the Grant Aid are to be cleared on the customs exemption condition.

(5) Management Policy of Implementation Agency (CAWF)

The equipment procured by the Project is allocated and operated by the respective management offices for the dredging works of the priority secondary canals for the implementation period of three (3) years.

The maintenance of the equipment is carried out by each management office and the Ali-Bairamli Mechanical and Repair Center under the following work demarcation, according to CAWF.

Each management office:	Periodic maintenance and minor repairs
Ali-Bairamli Mechanical and Repair Center:	Overhaul, heavy repair and supply of spare parts

It was confirmed in a restructuring plan of the Ali-Bairamli Mechanical and Repair Center that the recipient country secures the budget and sufficient staff for smooth and effective operation and maintenance of the equipment procured by the Project.

The spare parts procured by the Project will be stored at the Ali-Bairamli Mechanical and Repair Center after delivery to the executing agency. These spare parts will be delivered to management offices upon written request by the office in compliance with the necessary procedures of CAWF.

Training on the equipment to be supplied will be carried out by the supplier at the time of delivery of equipment so as to support the knowledge and know-how of the Ali-Bairamli Mechanical and Repair Center and each management office in such hydraulic mechanism and electrical control system that have been developed in these days. It is noted that this training is enough and any other technical support is not necessary for operation and maintenance of the equipment to be procured by the Project.

CAWF should have an appropriate and efficient organization and management system with arrangement of equipment and tools for repair, assignment of staff, and installation of spare parts shelf for the operation and maintenance of the equipment of the Project.

(6) Basic Policy for Selection of Equipment

The equipment to be procured by the Project is selected taking into consideration the following factors:

- Scale of the dredging operation area
- Dredging volume required at each management office
- Non-uniform working sections of the secondary canals
- Compatibility of spare parts
- Ease of maintenance
- Skill of operators and mechanics

(7) Procurement Policy

As mention in the previous section, in accordance with the intention of the Azerbaijan side, all the equipment of this Grant Aid Scheme would be Japanese products of high quality and purchased in Japan as the policy of procurement.

**2.2.2 Basic Plan**

(1) Overall Plan

1) Comparison with Requested Equipment

As a result of the field work of this Basic Design Study and the discussion with the Azerbaijan, the following canals and a floodway were selected in the four (4) regions in consideration of the urgent necessity for dredging work.

- ① Secondary canals (15 routes, total length 255.9 km)
- ② Girdiman floodway (1 route, total length 15.0 km)

Bottom width of secondary canals ranges from 1.0 m to 4.5 m. Taking small size of the canals into account, it has become necessary to select smaller size excavators.

Therefore, size of bulldozers that work for spreading and leveling of the dredged soil in combination with the excavator has also become necessary to be smaller. The standard combinations are as follows:

Standard Combination of Equipment

Small canals : Small volume : 0.5 m<sup>3</sup> (0.4 m<sup>3</sup> struck) Excavator + 15 ton Bulldozer  
Medium canals : Medium volume : 0.8 m<sup>3</sup> (0.6 m<sup>3</sup> struck) Excavator + 15 ton Bulldozer  
Large canals : Large volume : 1.4 m<sup>3</sup> (1.0 m<sup>3</sup> struck) Excavator + 21 ton Bulldozer

As a result of the above study, the following modification as shown in Table 2.2-3 has been agreed with the Minutes of Discussions (M/D).



**Table 2.2-3 Comparison between Requested Equipment and Agreed Equipment with M/D**

	Equipment	Requested Type & Nos.			Agreed Type & Nos. with M/D	
1.1	Wheel type excavator	heaped 1.4 m <sup>3</sup>	13units	→	heaped 1.4 m <sup>3</sup>	4 units
1.2	Wheel type excavator	heaped 0.8 m <sup>3</sup>	-	→	heaped 0.8 m <sup>3</sup>	19 units
1.3	Wheel type excavator	heaped 0.5 m <sup>3</sup>	-	→	heaped 0.5 m <sup>3</sup>	2 units
2.1	Bulldozer	32 ton	8 units	→	32 ton	-
2.2	Bulldozer	21 ton	-	→	21 ton	2 units
2.3	Bulldozer	15 ton	-	→	15 ton	10 units
3.1	Hydraulic type truck crane	lifting 20 ton	1 unit	→	lifting 20 ton	1 unit
4.1	Cargo truck	loading 20 ton	1 unit	→	loading 14 ton	1 unit
5.1	Tractor with semi-trailer	loading 50 ton	1 unit	→	loading 40 ton	1 unit
6.1	Mobile workshop with repairing equipment and tools	loading 10 ton	1 unit, 1set	→	loading 10 ton	1 unit, 1set
7.1	Spare parts	-	1set	→	-	1set
		Total	25 units		Total	41 units

It is noted that the required amount estimated at preliminary level for the equipment agreed with the M/D has become almost the same as it for the requested equipment.

## 2) Dredging volume

### a) Calculation of dredging volume

Dredging volume is calculated by the following formula.

#### **Dredging volume (m<sup>3</sup>)**

$$= \text{Present sedimentation volume (m}^3\text{)} + \text{Annual sedimentation volume (m}^3\text{/year)}$$

$$\times \text{Implementation period (year)}$$

### b) Appropriateness for the selection of canals to be dredged

Based on the interview for the 11 management offices and the discussion with CAWF, the canals to be dredged were finally selected from the viewpoint of seriousness of sedimentation.

Appropriateness for the selection of canals was evaluated from the viewpoints of i) seriousness of sedimentation, ii) damages caused by salinization and iii) access of machinery to canals in case of dredging and/or maintenance.

In order to mitigate the serious damages caused by salinization to farmland, water level of drainage canals should be reduced to the original (designated) condition.

Accordingly, “damages caused by salinization” was also applied to evaluation as an evaluation index.

As a result of the evaluation, it could be concluded that the selection of canals is appropriate because of the following reasons:

- All selected canals are seriously damaged due to sedimentation.
- All selected canals pass in and around the area where damaged due to salinization as shown in Appendix 9.

c) Total dredging volume for the selected canals

At the meeting held in December 2003 among the Ministry of Foreign Affairs of Japan, JICA and the consultant, it was confirmed that the implementation period of rehabilitation by dredging would be three (3) years in consideration of the urgency. Then, the total dredging volume is calculated by following formula.

**Dredging volume (m<sup>3</sup>)**

$$= \text{Present sedimentation volume (m}^3\text{)} \quad (\text{A})$$

$$+ \text{Annual sedimentation volume (m}^3\text{/year)} \times 3 \text{ (years)} \quad (\text{B})$$

i) Present sedimentation volume (the portion (A) of above formula)

- Present sedimentation volume is calculated by the following formula.

**Present sedimentation volume (m<sup>3</sup>)**

$$= \text{Sectional area of sedimentation (m}^2\text{)} \times \text{Canal length (m)}$$

- Sectional area of sedimentation is calculated by the following formula.

**Sectional area of sedimentation (m<sup>2</sup>)**

$$= (2n \times \text{Depth of sedimentation (m)} + 2 \times \text{Bottom width of canal (m)})$$

$$\times \text{Depth of sedimentation (m)} \times (1/2)$$

where,

- Symbol “n” is inside side slope of canal.
- Depth of sedimentation was decided based on the interview to the 11 offices and the site survey.
- The results of calculation are shown in Table 2.2-4.

**Table 2.2-4 Present Sedimentation Volume in Selected Canals**

Name of selected canals	Canal length (m)	Design discharge (m <sup>3</sup> /s)	Canal bottom width (m)	Canal inside slope 1:n	Depth of Sedimentation (m)	Sectional area of sedimentation (m <sup>2</sup> )	Present sedimentation volume (m <sup>3</sup> )
<b>1. Salyan Irrigation Management Office</b>							
-Abudullah irrigation canal	5,600	1.0	2.5	1.5	0.6	2.04	11,424
-SHA irrigation canal	32,000	3.5	5.0	1.5	0.6	3.54	113,280
<b>2. Neftchala Irrigation Management Office</b>							
-M-0 irrigation canal	3,000	2.0	2.5	1.0	0.6	1.86	5,580
-S-2 irrigation canal	12,000	3.5	4.5	1.0	0.6	3.06	36,720
-KHOL-2 irrigation canal	10,000	3.5	4.5	1.0	0.6	3.06	30,600
<b>3. Sabirabad Irrigation Management Office</b>							
-Debur irrigation canal	7,000	2.5	3.5	1.5	0.7	3.19	22,295
-Gumush Arkh irrigation canal	11,000	4.5	6.0	1.5	0.7	4.94	54,285
<b>4. Sabirabad Mechanical Irrigation Management Office</b>							
-D irrigation canal	18,000	3.5	4.5	1.0	0.7	3.64	65,520
-KL irrigation canal	19,000	3.5	4.5	1.0	0.7	3.64	69,190
<b>5. Kur-Araz River Dike Protection Management Office</b>							
-Girdiman floodway	15,000	200	15	1.5	2.0	36.00	237,600
<b>6. Saatli Irrigation Management Office</b>							
-Swartz irrigation canal	22,500	4.5	5.0	1.0	0.7	3.99	89,775
<b>7. Mugan Pump Amelioration Management Office</b>							
-Kuryany drainage canal	37,000	1.2	2.5	1.0	1.2	4.44	164,280
<b>8. Mil Mugan Collector Management Office</b>							
-Sabir drainage canal	21,000	2.0	2.5	1.0	0.6	1.86	39,060
<b>9. Sabirabad Amelioration Management Office</b>							
-VPK-24 drainage canal	22,500	1.8	2.5	1.5	1.0	4.00	90,000
<b>10. Main Sirvan Collector Management Office</b>							
-K-1 drainage canal	15,300	4.5	5.0	1.0	0.7	3.99	61,047
<b>11. Mugan Salyan Forest &amp; Amelioration Management Office</b>							
-PBK drainage canal	20,000	0.6	1.5	1.5	0.7	1.79	35,700

ii) Annual sedimentation volume (the portion (B) of above formula)

- Annual sedimentation volume is calculated by the following formula.

**Annual sedimentation volume (m<sup>3</sup>)**

**= Annual sedimentation volume per canal length of 1m (m<sup>3</sup>/m)**

**x Canal length (m)**

- Annual sedimentation volume is shown in Table 2.2-5.

**Table 2.2-5 Annual Sedimentation Volume**

Name of selected canals	Canal length (m)	Annual sedimentation volume per canal length of 1m (m <sup>3</sup> /m/year)	Annual sedimentation volume (m <sup>3</sup> )
<b>1. Salyan Irrigation Management Office</b>			
-Abudullah irrigation canal	5,600	2.2	12,320
-SHA irrigation canal	32,000	2.2	70,400
<b>2. Nefchala Irrigation Management Office</b>			
-M-0 irrigation canal	3,000	2.2	6,600
-S-2 irrigation canal	12,000	2.2	26,400
-KHOL-2 irrigation canal	10,000	2.2	22,000
<b>3. Sabirabad Irrigation Management Office</b>			
-Debur irrigation canal	7,000	3.0	21,000
-Gumush Arkh irrigation canal	11,000	3.0	33,000
<b>4. Sabirabad Mechanical Irrigation Management Office</b>			
-D irrigation canal	18,000	2.5	45,000
-KL irrigation canal	19,000	2.5	47,500
<b>5. Kur-Araz River Dike Protection Management Office</b>			
-Girdiman floodway	15,000	10.3	154,500
<b>6. Saatli Irrigation Management Office</b>			
-Swartz irrigation canal	22,500	2.3	51,750
<b>7. Mugan Pump Amelioration Management Office</b>			
-Kuryany drainage canal	37,000	1.7	62,900
<b>8. Mil Mugan Collector Management Office</b>			
-Sabir drainage canal	21,000	2.1	44,100
<b>9. Sabirabad Amelioration Management Office</b>			
-VPK-24 drainage canal	22,500	2.1	47,250
<b>10. Main Sirvan Collector Management Office</b>			
-K-1 drainage canal	15,300	2.4	36,720
<b>11. Mugan Salyan Forest &amp; Amelioration Management Office</b>			
-PBK drainage canal	20,000	2.1	42,000

iii) Total dredging volume

From the above, total dredging volume for implementation period of three (3) years is obtained and shown in Table 2.2-6.

**Table 2.2-6 Dredged Volume for Implementation Period of 3 Years**

Name of selected canals	Canal length (m)	Present sedimentation volume (m)	Annual sedimentation volume per canal length of 1m (m <sup>3</sup> /m/year)	Annual sedimentation volume (m <sup>3</sup> )	Present sedimentation volume (m <sup>3</sup> )
<b>1. Salyan Irrigation Management Office</b>					
-Abudullah irrigation canal	5,600	11,424	2.2	12,320	48,384
-SHA irrigation canal	32,000	113,280	2.2	70,400	324,480
<b>2. Nefchala Irrigation Management Office</b>					
-M-0 irrigation canal	3,000	5,580	2.2	6,600	25,380
-S-2 irrigation canal	12,000	36,720	2.2	26,400	115,920
-KHOL-2 irrigation canal	10,000	30,600	2.2	22,000	96,600
<b>3. Sabirabad Irrigation Management Office</b>					
-Debur irrigation canal	7,000	22,295	3.0	21,000	85,295
-Gumush Arkh irrigation canal	11,000	54,285	3.0	33,000	153,285
<b>4. Sabirabad Mechanical Irrigation Management Office</b>					
-D irrigation canal	18,000	65,520	2.5	45,000	200,520
-KL irrigation canal	19,000	69,190	2.5	47,500	211,660
<b>5. Kur-Araz River Dike Protection Management Office</b>					
-Girdiman floodway	15,000	237,600	10.3	154,500	698,940
<b>6. Saatli Irrigation Management Office</b>					
-Swartz irrigation canal	22,500	89,775	2.3	51,750	245,025
<b>7. Mugan Pump Amelioration Management Office</b>					
-Kuryany drainage canal	37,000	164,280	1.7	62,900	352,980
<b>8. Mil Mugan Collector Management Office</b>					
-Sabir drainage canal	21,000	39,060	2.1	44,100	171,360
<b>9. Sabirabad Amelioration Management Office</b>					
-VPK-24 drainage canal	22,500	90,000	2.1	47,250	231,750
<b>10. Main Sirvan Collector Management Office</b>					
-K-1 drainage canal	15,300	61,047	2.4	36,720	171,207
<b>11. Mugan Salyan Forest &amp; Amelioration Management Office</b>					
-PBK drainage canal	20,000	35,700	2.1	42,000	161,700
<b>TOTAL</b>	<b>270,900</b>				<b>4,184,046</b>

(2) Project Plan (Equipment Plan of Grant Aid Project)

CAWF is now dredging canals in the Project Sites with depreciated and superannuated Russian made equipment. However this equipment is having many troubles. Therefore, the amount of equipment currently held is inadequate to execute the required work. The equipment plan of the Grant Aid Project is formulated considering such conditions so as to

complete the dredging work within the implementation period of three (3) years in the selected highest priority canals.

The equipment plan has been prepared through the following steps in the Basic Design Study.

<u>Step No.</u>	<u>Study Item</u>	<u>Study Method</u>
1	Prioritization of canals for dredging	By Azerbaijan side
2	Survey of the proposed priority canals	By the Study Team and GOA
3	Selection of the priority canals	Through discussion between the Study Team and Azerbaijan side
4	Estimation of canal length and dredging	Through discussion between the Study Team, review of the volume of the priority canals and GOA
5	Setting of implementation period	Through discussion between the Study Team and GOA
6	Review of the equipment in the preparatory study	By the Study Team and GOA
7	Survey of existing CAWF equipment	By the Study Team based on the list provided by CAWF
8	Selection of equipment type	After discussion between the Study Team and GOA based on the preliminary plan prepared by the Study Team
9	Selection of equipment capacity	After discussion between the Study Team and GOA based on the preparatory plan prepared by the Study Team
10	Estimate of the number of equipment	Through discussion between the Study Team and GOA
11	Signature of minutes of discussion	By the Study Team and GOA
12	Finalization of Equipment Plan	Data analysis and planning in Japan

The equipment plan is shown below.

1) Objective Canals [Step No. 1 to 4]

Table 2.2-6 shows the names of canals, canal lengths and dredging volume of those selected as the highest priority for the dredging operation under the management of the 11 offices of CAWF. Those canals are suffering from the serious sedimentation and the functions of the canals have been reduced. Therefore, the high effect of the dredging work is expected.

2) Implementation (rehabilitation) Period of Dredging Operation [Step No. 5]

The dredging works on the highest priority canals at the 11 management offices of the CAWF will be completed within three (3) years.

3) Review of Equipment Request by GOA in the Preparatory Study [Step No. 6]

GOA requested the Preparatory Study Team that Japan would supply the following equipment under the Japan's Grant Aid.

- Excavator 1.0 m<sup>3</sup>, wheel type and long arm : 13 units
- Bulldozer, 300 HP or equivalent : 8 units
- Truck crane, 20 ton lifting capacity or more : 1 unit
- Cargo truck, 20 ton loading capacity or more : 1 unit
- Tractor with trailer, 50 ton loading capacity or more : 1 unit
- Mobile workshop with repairing equipment and tools : 1 unit, 1 set
- Spare parts : 1 set

CAWF and the Study Team have reviewed these equipment requests considering the adaptability and suitability of the equipment to the dredging works for the selected secondary priority canals based on the site investigation, operation and maintenance costs, and combination of excavators and bulldozers for the dredging operation. The review is concluded as follows:

- Combination of excavator and bulldozer suit to the dredging works for efficiency.
- Standard length arm is to be selected for the excavators because of the smaller canals.
- Middle weight bulldozers are adequate because of the smaller canals..

4) Present Condition of Equipment Owned by CAWF [Step No. 7]

The following Table 2.2-7 shows the total number and status of the equipment items owned by CAWF at the 11 management offices.

**Table 2.2-7 Number and Status of Equipment of CAWF Offices**

Name of equipment	Total number of equipment at 11 offices		
	Total	Operable	Under repair
Dredging equipment <1	48	42	6
Bulldozers	71	56	15
Scrapers	22	13	9
Tractors	43	38	5
Towing trailers	2	2	0
Motorgrader	1	1	0
Ordinary trucks	64	57	7
Dump trucks	33	32	1
Special vehicles**	2	2	0
Buses	3	3	0
Fuel tankers	16	15	1

Note: <1 Hydraulic excavator, Dragline. <2 Vehicle for survey

Source: CAWF as of Jan. 2004

The following Table 2.2-8 shows the total number and status of dredging equipment items owned by CAWF at the 11 management offices.

**Table 2.2-8 Number and Status of Dredging Equipment of CAWF Offices**

Name of equipment	Capacity	Total number of dredging equipment items		
		Total	Operable	Under repair
Hydraulic excavators	0.25 m <sup>3</sup>	17	16	1
Hydraulic excavators	0.4-0.55 m <sup>3</sup>	11	10	1
Draglines	0.4 m <sup>3</sup>	2	0	2
Draglines	1.0 m <sup>3</sup>	8	6	2
Draglines	1.2 m <sup>3</sup>	10	10	0
Total		48	42	6

Source: CAWF as of Jan. 2004

Most of the above equipment was made in the 1980's and has low working efficiency due to many troubles occurring during the dredging works.

#### 5) Study and Selection of Type and Capacity of Equipment [Step No. 8 to 12]

The type, capacity and number of the pieces of equipment are planned based on the following policies extracted from Clause 2.2.1 (6).

- To focus mobility of equipment to be used in a large area.
- To decide amount of equipment required for each management office, based on the dredging volume
- To meet the non-uniform work sections of the secondary canals
- To consider compatibility of spare parts
- To consider easy operation and maintenance



- To consider operators' and mechanics' skills

The following Table 2.2-9 shows selected type of equipment and use.

**Table 2.2-9 Selected Equipment and Purpose to Use**

No.	Selected equipment	Purpose to use
1	Excavator	Dredging work of secondary canals
2	Bulldozer	Dozing and grading of dredged soil
3	Truck crane	Lifting work for equipment or heavy cargo
4	Cargo truck	Transportation of heavy cargo
5	Tractor with trailer	Transportation of equipment and heavy cargo
6	Mobile workshop with repairing equipment and tools	Maintenance and repair at dredging operation site

The capacity and number of pieces of equipment are shown hereinafter.

i) Excavator

Excavator is selected for the dredging of the highest priority secondary canals. Capacity of the excavators must suit target canals' sizes (B=1.0 – 4.0 m, H=1.0 – 4.0 m)

Specifications of excavators

- Bucket capacity (heaped) : 3 types of 0.5 m<sup>3</sup>, 0.8 m<sup>3</sup> and 1.4 m<sup>3</sup>
- Type : hydraulic system and wheel type with outriggers

Number of excavators

The number of excavators is calculated based on the dredging volume of the highest priority secondary canals at each management office. The parameters applied to the calculation of the number are as shown in the following Table 2.2-10.

**Table 2.2-10 Parameters Applied to the Calculation of Number of Excavators**

Parameter	1.4 m <sup>3</sup> excavator	0.8 m <sup>3</sup> excavator	0.5 m <sup>3</sup> excavator
Annual dredging volume(m <sup>3</sup> /year · unit)	100,800	60,480	40,320
Hourly dredging volume (m <sup>3</sup> /hr · unit)	50	30	20
Daily operation hours (hours/day)	8.0	8.0	8.0
Annual operation days (day/year)*	250	250	250

\* Assumed referring to number of Sundays, national holidays, suspend days due to rainfall (data 1982-1983 at Salyan and Sabirabad) and fog.

The following Table 2.2-11 gives the number of excavators at each management office.

**Table 2.2-11 Number of Excavators**

Name of management offices	Dredging volume (m <sup>3</sup> )	Required number for implementation within 3 years		
		1.4 m <sup>3</sup>	0.8 m <sup>3</sup>	0.5 m <sup>3</sup>
Salyan Irrigation Management Office	372,864	0	2	1
Neftchala Irrigation Management Office	237,900	0	2	0
Sabirabad Irrigation Management Office	238,580	0	2	0
Sabirabad Mechanical Irrigation Management Office	412,180	0	2	1
Kur-Araz River Dike Protection Management Office	1,588,500	4	2	0
Saatli Irrigation Management Office	245,025	0	2	0
Mugan Pump Amelioration Management Office	352,980	0	2	0
Mil Mugan Collector Management Office	171,360	0	1	0
Sabirabad Amelioration Management Office	231,750	0	2	0
Main Sirvan Collector Management Office	171,207	0	1	0
Mugan Salyan Forest & Amelioration Management Office	161,700	0	1	0
Total	4,184,046	4	19	2

ii) **Bulldozers**

Bulldozers will be mainly used for the dozing and the spreading of the excavated materials, and occasionally used for road maintenance works. The bulldozers will be operated in combination with the excavators for the works.

The following middle weight classes of bulldozers are selected to perform the dozing and spreading of works.

Specifications of bulldozers

- Operating mass (class) : 2 types of 15 ton and 21 ton with rear hook
- Shoe : Crawler, Standard
- Blade : Angle blade

Number of bulldozers

The parameters applied to the calculation of the number are listed in Table 2.2-12.

**Table 2.2-12 Production Rates of Bulldozers**

Type of bulldozer	Hourly production rate	Annual production rate
21 ton Bulldozer	80 m <sup>3</sup> /hour	160,000 m <sup>3</sup> /year
15 ton Bulldozer	70 m <sup>3</sup> /hour	140,000 m <sup>3</sup> /year

### Combination of excavators and bulldozers

It is proposed that a bulldozer is to be combined generally with two excavators. The following are the grounds of the combination that is efficient and suitable to dredging works.

- Small canals : Small volume : 0.5 m<sup>3</sup> (0.4 m<sup>3</sup> struck) Excavator + 15 ton Bulldozer
- Medium canals : Medium volume : 0.8 m<sup>3</sup> (0.6 m<sup>3</sup> struck) Excavator + 15 ton Bulldozer
- Large canals : Large volume : 1.4 m<sup>3</sup> (1.0 m<sup>3</sup> struck) Excavator + 21 ton Bulldozer

### iii) Supporting Equipment

The following are to be supplied as supporting equipment.

- Truck crane (1 unit) : Lifting capacity = 20 ton
- Lorry truck (1 unit) : Loading capacity = 14 ton
- Workshop car (1 unit) : for on-site repair tools and equipment transportation

The capacities and the number are decided to meet the required lifting, transportation and repair works and their operating frequency.

### iv) Spare Parts

Spare parts are also supplied together with the equipment. Quantity of the parts is estimated for about 3,000 operation hours (for about 1.5 years, 2,000 hours/year).

### v) Training

Training will be conducted at the Ali-Bairamli Mechanical and Repair Center after the delivery of equipment by the supplier under the supervision of the consultant.

The training items are listed below.

- Operation
- Daily, weekly and monthly check points and methods
- Break adjustment
- Filter, element and other consumables replacement intervals and methods
- Oil and lubricant replacement intervals and methods
- Tire replacement intervals and methods

### 2.2.3 Basic Design Drawing

#### (1) Equipment of Grant Aid Project

The following equipment is selected to be procured under the Japan's Grant Aid.

- |  |   |               |
|--|---|---------------|
| 1) Wheel type hydraulic excavators, 1.4m <sup>3</sup> (heaped) | : | 4 units       |
| 2) Wheel type hydraulic excavators, 0.8m <sup>3</sup> (heaped) | : | 19 units      |
| 3) Wheel type hydraulic excavators, 0.5m <sup>3</sup> (heaped) | : | 2 units       |
| 4) Bulldozers, 21 ton  | : | 2 units       |
| 5) Bulldozers, 15 ton  | : | 10 units      |
| 6) Hydraulic type truck crane, 20 ton or more                  | : | 1 unit        |
| 7) Cargo truck, 14 ton or more                                 | : | 1 unit        |
| 8) Tractor with semi-trailer, 40 ton or more                   | : | 1 unit        |
| 9) Mobile workshop with repairing equipment and tools          | : | 1 unit, 1 set |
| 10) Spare parts  | : | 1 set         |

#### (2) Major Specifications of Equipment

##### 1) Excavators

1	Type	Hydraulic	Hydraulic	Hydraulic
2	Bucket capacity (heaped, class)	1.4 m <sup>3</sup>	0.8 m <sup>3</sup>	0.5 m <sup>3</sup>
3	Travel type	Wheel	Wheel	Wheel
4	Engine, rated power (class)	114 kW	96 kW	63 kW
5	Operating mass, backhoe (class)	19 ton	19 ton	12 ton
6	Boom and arm	Standard	Standard	Standard
7	Option	Outriggers	Outriggers	Outriggers

##### 2) Bulldozers

1	Type	Angle dozer/Hydraulic	Angle dozer/Hydraulic
2	Operating mass (class)	21 ton	15 ton
3	Travel type	Crawler	Crawler
4	Engine, rated power (class)	140 kW	100 kW
5	Blade	Angle	Angle

### 3) Truck crane

1	Type	Hydraulically controlled, 6x4 wheel driving carrier
2	Lifting capacity (class)	20 ton at 3.0 m working radius by basic boom
3	Max. lift with boom (class)	22 m
4	Max. lift with boom and jib (class)	30 m
5	Gross vehicle weight (class)	22 ton
6	Carrier engine, rated power (class)	Diesel, 130 kW
7	Outriggers	4 outriggers hydraulically operated and controlled
8	Carrier drive	Left hand drive

### 4) Cargo truck

1	Type	6x4 wheel driving
2	Payload capacity (class)	14 ton or more
3	Vehicle mass (class)	8 ton
4	Minimum turning radius (class)	10 m
5	Engine	Diesel
6	Engine displacement (class)	10 lit.
7	Engine maximum output (class)	Diesel, 230 kW
8	Driving position	Left hand drive

### 5) Tractor with semi-trailer

1	Type	Truck tractor with low bed semi-trailer
2	Drive	6x4 wheel driving
3	Payload capacity (class)	40 ton or more
4	Max. travel speed	60 km/h or more with Gross Vehicle Weight
5	Min. turning radius of tractor (class)	10 m
6	Grade ability (class)	10 degrees
8	Engine, rated output (class)	220 kW
9	Driving position	Left hand drive

## 6) Mobile workshop with repairing equipment and tools

A	Chassis		
1	Type	Cab-over type, 6x4 wheel driving, left hand drive	
2	Payload capacity (class)	10 ton or more	
3	Max. speed (class)	70 km/h or more	
4	Engine	Diesel	
5	Max. output (class)	184 kW or more	
6	Truck body	Aluminum van body, rest room and workshop room, 2 windows.	
B	Equipment and tools	Specifications	Quantity
1	Generator/welder (class)	10 kVA, 270 A	1 set
2	Air compressor (class)	2.2 kW	1 set
3	Gas welder set	Standard	1 set
4	Bucket pump for oil and grease	20 lit. can, hand pump	1 set
5	Bench lathe	Center distance: 615 mm	1 set
6	Electric drill	Dia. 13 mm	1 set
7	Hand tools	Standard	1 lot
8	Battery charger	Input: 4 kVA, Output 80A	1 set
9	Parts washing stand	Standard, tank 70 lit.	1 set
10	Hydraulic jack	Lift capacity: 10 ton	2 sets
11	Vise and other tools	Standard	1 set
12	Workbench with tool locker	2,100 x 655 x 842 mm	1 set
13	Tire and wheel service tools	Standard	1 lot

It is noted that the specification about the temperature of all the equipment above have been determined to be it on the ordinary condition of temperature in consideration of the fact that the monthly average temperatures are not below 0°C throughout the year. The coldest month in the Project Sites is January and its monthly average temperature is 2.5°C.

### (3) Basic Design Drawing

The drawings for the selected equipment are hereto attached in Appendix 10 to 15.

## 2.2.4 Implementation Plan

### (1) Implementation Policy

The Project shall be implemented under the scheme of Japan's Grant Aid.

The Government of Japan (GOJ) appraises the Project to see whether it is suitable or not for Japan's Grant Aid Scheme, based on the Basic Design Study Report prepared by JICA, and the results are submitted to the Cabinet for approval. The Project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Government of Azerbaijan (GOA) and GOJ.

After the Exchange of Notes, GOA will select the consulting firms for the Project's implementation recommended by JICA in order to maintain technical consistency with the

basic design of the project. The consultant will provide the consulting services including the detailed design study, assistance for conducting the procurement, and appropriate supervision and guidance to the contractor that is to say the supplier of the equipment in this Project.

As for this Project, it is the implementation policy that the procurement of equipment should be finished within 12 months after signing E/N (Exchange of Note), which would be the minimum period required for the procurement.

After the procurement of equipment, the rehabilitation work for the objective canals and floodway with dredging should be commenced at an early time in consideration of its urgency. The work should be implemented in the three (3) years period.

Basic scope of those concerned with the Project is as follows:

1) Implementation agency

The agency responsible for the implementation of this Project will be CAWF. GOA shall be required to appoint the responsible persons and full-time counterparts to the Project who are in close contact with the consultant and contractor in order to implement the Project smoothly. The responsible person shall coordinate the Project, with a precise explanation, to the related agencies in the Azerbaijan Republic. Especially, it should take customs formality in Baku city into consideration. It is also important to be conducted that the procured equipment should be transported to the Project Sites smoothly.

2) Consultant

GOA will enter into contract with the consultant, who shall be a Japanese national for consulting services with regard to designing, tendering and supervising the procurement for the Project. The consultant will also make tender documents and will promote tendering in Japan on behalf of CAWF.

3) Contractor

The contractor shall be Japanese national who is capable of procurement of equipment and services in a proper manner under the Grant. Since the sustainable after services for equipment, such as the supply of spare parts or the quick and appropriate repair and maintenance, is required after the Project, the contractor shall consider carefully providing the service system including a subcontractor.

4) Necessity for dispatch of a supervisor

Assembling of the equipment will require highly skilled and experienced supervision to ensure the desired performance. Therefore, the contractor, namely

the supplier of equipment, will dispatch a supervisor during the set up period when the equipment is assembled. Then, guidance for operation and maintenance will be held.

(2) Implementation Conditions

As previously mentioned, important notes for the procurement of equipment are summarized as follows:

- a) In Azerbaijan, Japanese equipment is now used not only for the agricultural work but also for the construction work, because of its high quality and economical advantage throughout a whole useful life. Furthermore, as CAWF has an intention to procure the equipment made in Japan, the equipment of this Project should be the Japanese products.
- b) Customs clearance for the equipment of this Project shall be made at the Baku Chief Customs Committee in Baku city.

(3) Scope of Works

The scope of works for the Project is demarcated for both countries as follows:

a) Scope of Japanese side

- Procurement of the equipment
- Insurance for transportation consisting of the marine transportation to the Bandar Abbas port in Iran and the inland transportation from the Bandar Abbas port to the Baku Chief Customs Committee in Baku city in Azerbaijan
- Trial operation and adjustment of the equipment
- Guidance for operation and maintenance of the equipment

b) Scope of Azerbaijan side

- Completion of the restructuring of the Ali-Bairamli Mechanical and Repair Center (within 2004)
- Banking Arrangement (B/A) for payment to the consultant and the contractor, namely the supplier in this Project
- Exemption from customs duties, internal taxes and other fiscal levies for the equipment
- Inland transportation from the Baku Chief Customs Committee in Baku city to the Ali-Bairamli Mechanical and Repair Center



- Receipt of the equipment, and presence for the inspection of the equipment
- Registration of the equipment to GOA
- Arrangement for the guidance for operation and maintenance
- Suitable operation and maintenance of the equipment of the Project

(4) Consultant Supervision

The consultant, following the Japan’s Grant Aid Scheme, will carry out the consulting services for the Project with a consistent project team, from the detail design to the procurement supervision reflecting the result of the Basic Design Study. Spot supervision will be conducted during implementation of the Project. The consultant will dispatch a Japanese engineer to Azerbaijan when the contractor, or the supplier of equipment, conducts the assembly and the guidance on operation and maintenance. More details are mentioned below.

1) Basic policy for procurement supervision

- The consultant will provide the following services at each procurement stage

Stage	Services
1. Before Procurement	Detail Design Study Preparation of Tender Documents Assistance for Opening of Tenders Tender Evaluation Assistance for contracting
2. During Procurement	Procurement Supervision Inspection of the products Preparation of reports

- The tender documents for selection of the contractor shall be approved by CAWF, and then a public announcement will be carried out in such a way that all potential tenderers have a fair opportunity to learn about and participate in the tender. Invitation to tender will be advertised in the general circulation newspaper in Japan.
- All tenders will be opened on the date, time and place specified in the Invitation to Tender, immediately after the closing time, in the presence of CAWF, the consultant and the tenderers. As soon as possible after opening the tenders, the consultant will assist CAWF to follow the necessary procedures for the contract.
- The consultant provides supervisory services for the Project, including the approval of the specifications and schedule, to ensure that the work is executed by the contractor in compliance with the contract in coordination with CAWF.

The contractor shall keep in frequent contact with CAWF about the progress of manufacturing and transportation and the consultant will supervise the progress.

- The consultant conducts a pre-shipment inspection of the equipment procured, which is carried out by an inspection agency assigned by the consultant. The equipment shall be inspected of the outside dimension and number in accordance with the contract before loading. When the equipment arrives at the Ali-Bairamli Mechanical and Repair Center, the test operation shall be performed after assembling and before delivery to GOA.

## 2) Progress Supervision

- The consultant will verify the progress in such a way that the contractor examines the difference between the schedule and the actual progress of the procurement of equipment, and reports it to the consultant.
- The consultant shall issue required instructions when necessary to prevent delays in procurement of the equipment with prior progress examination with the monthly progress control on each item.

## (5) Procurement Plan

It was confirmed in the course of the Basic Design Study that the Azerbaijan side has an intention to procure the Japanese equipment. It is judged appropriate in consideration of an economical advantage throughout a whole useful life. The decrease of the cost for maintenance and repair and the increase of work volume, or production, by decreasing the idling time caused due to a breakdown make the economical advantage.

As mentioned in the previous section, there are several organizations in Azerbaijan such as local offices of Japanese companies and local subsidiaries in relation who could deal with not only the supply of spare parts but also the heavy repairs such overhauls. They have achieved satisfactory results in procurement of the 2KR equipment under the Ministry of Agriculture and the after-sales service for the maintenance and repair. Therefore, there would be no difficulty in the maintenance and repair of the equipment of this Project.

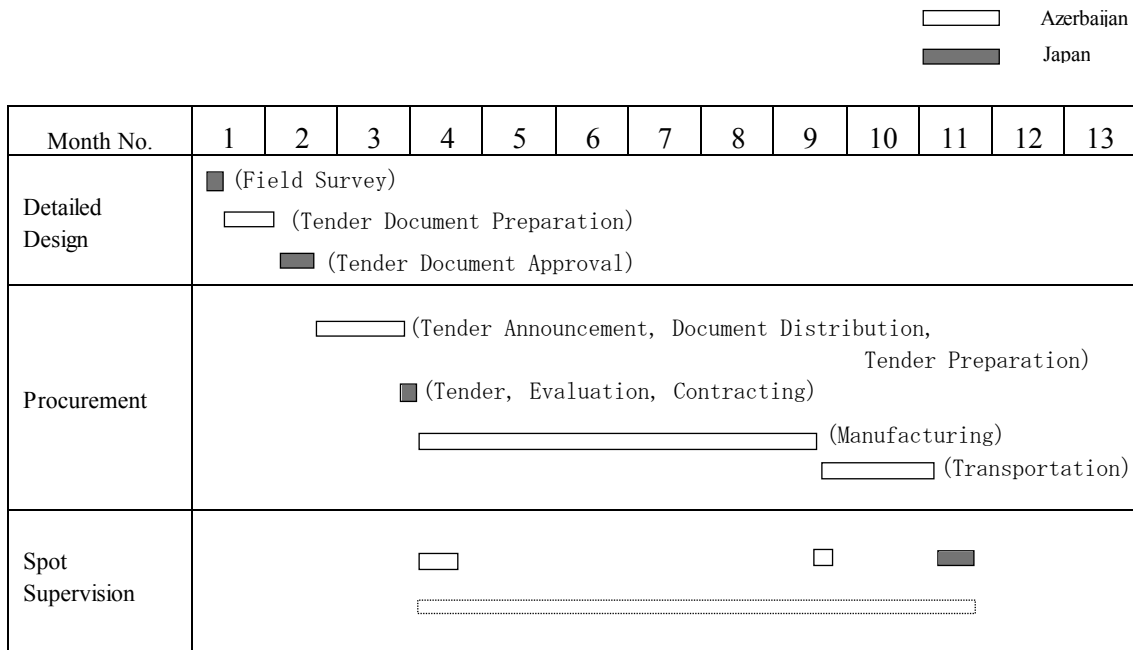
In consideration of the above, it is planned that all the equipment including the spare parts of this Project should be procured in Japan.

## (6) Implementation Schedule

The implementation schedule of the Project has been planned as below, in accordance with Japan's Grant Aid Scheme.

- Detailed Design
    - Field Survey } Duration
    - Tender Document } 1.5 months
  
  - Tendering and Procurement
    - Tendering and Evaluation } Duration
    - Contracting } 1.5 months
    - Manufacturing 5.5 months
    - Transportation 1.5 months
  
  - Spot Supervision
- Total duration: 7.5 months

Figure 2.2-1 shows the implementation schedule plan of the Project.



**Figure 2.2-1 Implementation Schedule**

## **2.3 Obligations of Recipient Country**

### **2.3.1 Obligations of Recipient Country**

Obligations of recipient country to procure the equipment under the Japan's Grant Aid for the canal dredging work are to:

- 1) Provide data and information necessary for implementation of the Project,
- 2) Carry out appropriate operation of the equipment procured under the Grant Aid for dredging work of the objective canals,
- 3) Ensure appropriate storing and maintenance of the equipment procured under the Grant Aid,
- 4) Arrange unloading, customs clearance and tax exemption for the equipment procured under the Grant Aid from Japan at the place of disembarkation,
- 5) Arrange prompt transportation of the equipment procured by the Grant Aid from the Baku Chief Customs Committee to the Ali-Bairamli Mechanical and Repair Center,
- 6) Arrange for the guidance just after the delivery for operation and maintenance of the equipment procured under the Grant Aid appropriately, which are to;
  - Arrange place and facilities in the Ali-Bairamli Mechanical and Repair Center
  - Appoint the required operation and maintenance staff,
  - Ensure operation and maintenance funding,
  - Prepare fuels for the equipment,
- 7) Accord Japanese nationals, whose service may be required in connection with the procurement of the equipment and the services under the verified contract, such facilities as may be necessary for their entry into the recipient country and their stay therein for the performance of their work,
- 8) Exempt Japanese nationals from customs duties, internal taxes and other fiscal levies that may be imposed in the recipient country with respect to the procurement of the equipment and the supply of the services under the verified contracts,
- 9) Arrange exemption from customs charges and corporation taxes for the equipment procured under the Grant Aid,
- 10) Bear the following commissions to the Japanese bank for banking services based upon the Banking Arrangement (B/A);
  - Advising commission of Authorization to Pay (A/P),

- Payment Commission,
- 11) Bear all expenses other than those to be borne by the Grant Aid, which is necessary for the transportation and handling of the equipment, and
- 12) Prohibit the diversion of the equipments procured under the Grant Aid for commercial and military purposes.

### **2.3.2 Project Cost Undertaking by Azerbaijan Government**

Regarding the cost for procurement of the equipment under the Grant Aid for the canal dredging work, the inland transportation cost, which is required for the part from Baku City (Baku Central Customs Committee) to Ali-Bairamli Mechanical and Repair Center, should be undertaken by the Azerbaijan Government. It is estimated at about 47.8 million AZM (1.1 million yen).

Moreover, the cost for the canal dredging work for three (3) years using the procured equipment is 8.36 billion AZM (190 million yen). On the other hand, the cost for maintenance of the equipment for three (3) years is estimated at 6.35 billion AZM (150 million yen). Then, total cost for the canal dredging work for three (3) years, which is undertaken by the Azerbaijan Government, is calculated to be 14.7 billion AZM (340 million yen).

## **2.4 Operation and Maintenance Plan**

### **2.4.1 Basic Policy for Maintenance**

It is required for the executing agency to not only finish the dredging work on the highest priority secondary canals within three (3) years, but also to continue the canal dredging operation after the priority canal dredging.

Accordingly, periodic checks and maintenance are indispensable to protect the equipment from breakdown and accident as much as possible. Thus, it is basic policy that the preventive maintenance should be carried out on the procured equipment at the respective management offices and the Ali-Bairamli Mechanical and Repair Center to secure the completion of dredging work and future dredging operation continuously.

### **2.4.2 Description of Maintenance Work**

The maintenance work for the procured equipment is outlined the following:

- 1) The maintenance work of the equipment should be carried out following the operation manuals, instructions and maintenance manuals that are to be provided by the equipment manufacturers and delivered to CAWF together with the equipment.
- 2) The maintenance works should be recorded and filed on each piece of equipment at the respective management offices and the Ali-Bairamli Mechanical and Repair Center. Further, a master file should be provided to keep a list of the files related to the procured equipment.
- 3) Storage and control of the spare parts, inventory and records
- 4) Control of lubricants
- 5) Control of tires

The preventive maintenance works for equipment will basically be categorized as follows. The maintenance of the procured equipment should be carried out following this category.

- Major periodic maintenance

Major periodic maintenance work is to be such that the equipment is completely disassembled and then reassembled to restore its power and function. The maintenance is to be carried out at the Ali-Bairamli Mechanical and Repair Center.

- Ordinary maintenance

In order to improve the production rate of the equipment, ordinary maintenance work is carried out on a daily, weekly or monthly basis. This work is usually carried out in the place where the equipment is being used and operated or at the site repair shop. Thus, the maintenance work should be carried out by each management office following the check list on the respective equipment. The check list should be filed after the maintenance work for the purpose of continuous use and reference.

Daily maintenance: Daily maintenance work is carried out a daily basis, before and after the dredging work. The maintenance is performed by the operator or his assistant. The work includes cleaning, inspection and adjustment as well as refueling and adding oil or cooling water.

Weekly maintenance: Monthly maintenance work is carried out every 30 to 60 hours, according to the service meter and/or maintenance schedule of the equipment. The maintenance is performed by the operator and his assistant, and mechanic, if necessary. The work includes adjustment of brakes and clutch, and change of lubricating oil and other maintenance works required.

Monthly maintenance: Monthly maintenance is carried out every 120 to 150 operation hours according to the service meter or maintenance schedule.

The maintenance is performed jointly by the operator and mechanic at the equipment pool. The maintenance work is fairly large-scale compared with the daily and weekly maintenance works and includes replacement of component parts, and/or partial disassemble on the equipment.

Spare parts control: The spare parts procured should be stored and controlled at the Ali-Bairamli Mechanical and Repair Center provided with a inventory list.

Lubrication control: The lubrication control should be performed by each management office following the operation and maintenance manual.

Tire control: The tire control should be performed by each management office following the operation and maintenance manual. Tire control is included as one of the training items.

The following facilities and tools are usually required for large-scale maintenance, such as overhaul of equipment or heavy repair of equipment.

Disassembly and assembly shop: Disassembly parts shelves, overhead traveling crane, chain block, steam cleaner, soda bath, and compressor

Engine maintenance shop: Engine stand, cylinder head stand, horse-power test chamber, nozzle tester, tank for washing parts, small press, and valve grinder

Machine shop: Lathe, outer diameter polisher, boring machine, hydraulic press, work bench, vice, grinder, and electric drill

Electric device repair shop: Electric tester, magnet repair, and charger

Tool shop: Tool set, special tools, and exclusive tools

Welding and sheet metal shop: Electric welder, gas welder, and oxy-acetylene cutter

Track link maintenance shop: Link press, electric welder, and conveyor

Machine wash shop: Steam cleaner, and car washer

Parts store: Parts shelves

Necessary equipment for the above maintenance is to be prepared and provided by Ali-Bairamli Mechanical and Repair Center accordingly.

### **2.4.3 Preparation Plan for Spare Parts**

Spare parts enough for one and a half years are procured together with the equipment under the Project.

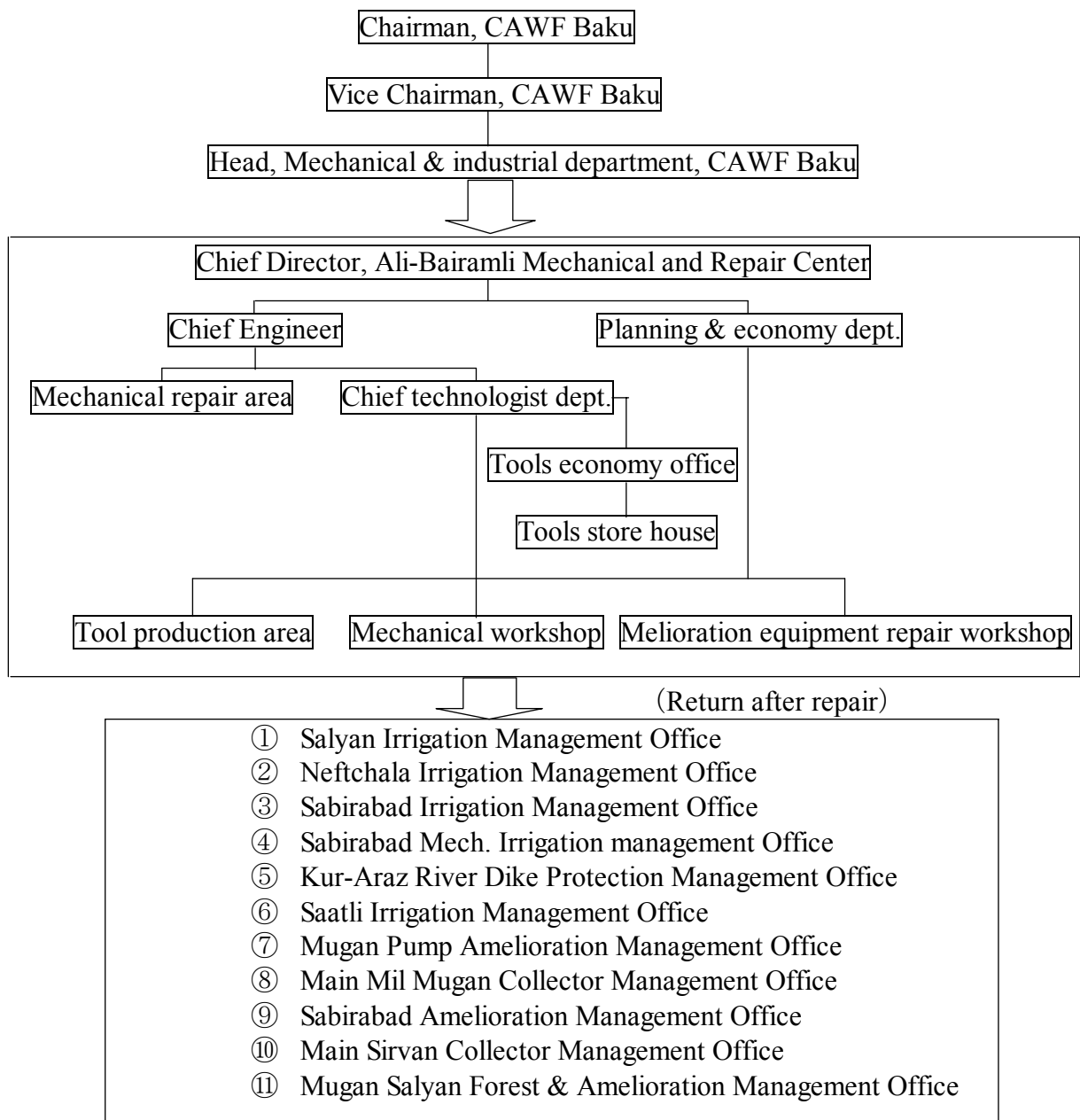
It is, however, required to procure necessary replacement spare parts by the recipient country after their consumption. In procuring, attention shall be paid to the following:

- 1) Operation plan of equipment: It is necessary to calculate an operation period and hour together with the amount of equipment to use so that the required items and the amount of spare parts could be estimated.
- 2) Operation condition at site: It is necessary to monitor the degree of wear and tear of spare parts, e.g. level of site supervision, skill of operators, site topography and geological conditions.
- 3) Market survey: It is necessary to survey the stock of spare parts at the service agents in the market.

#### **2.4.4 Maintenance Organization**

Organizations having maintenance responsibility for the procured equipment under Japan's Grant Aid and its organization chart is shown in Figure 2.4-1:





- Note: 1) The above organizational chart of Ali-Bairamli Mechanical and Repair Center was produced assuming the department or section that will carry out the maintenance work for the procured equipment.
- 2) Overhauls or heavy repair works are carried out by Ali-Bairamli Mechanical and Repair Center
- 3) Periodic checks and maintenance are carried out by each management office

**Figure 2.4-1 Maintenance Organization**

Organization charts of CAWF and the Ali-Bairamli Mechanical and Repair Center are shown in Figure 2.4-2 and 2.4-3, respectively.

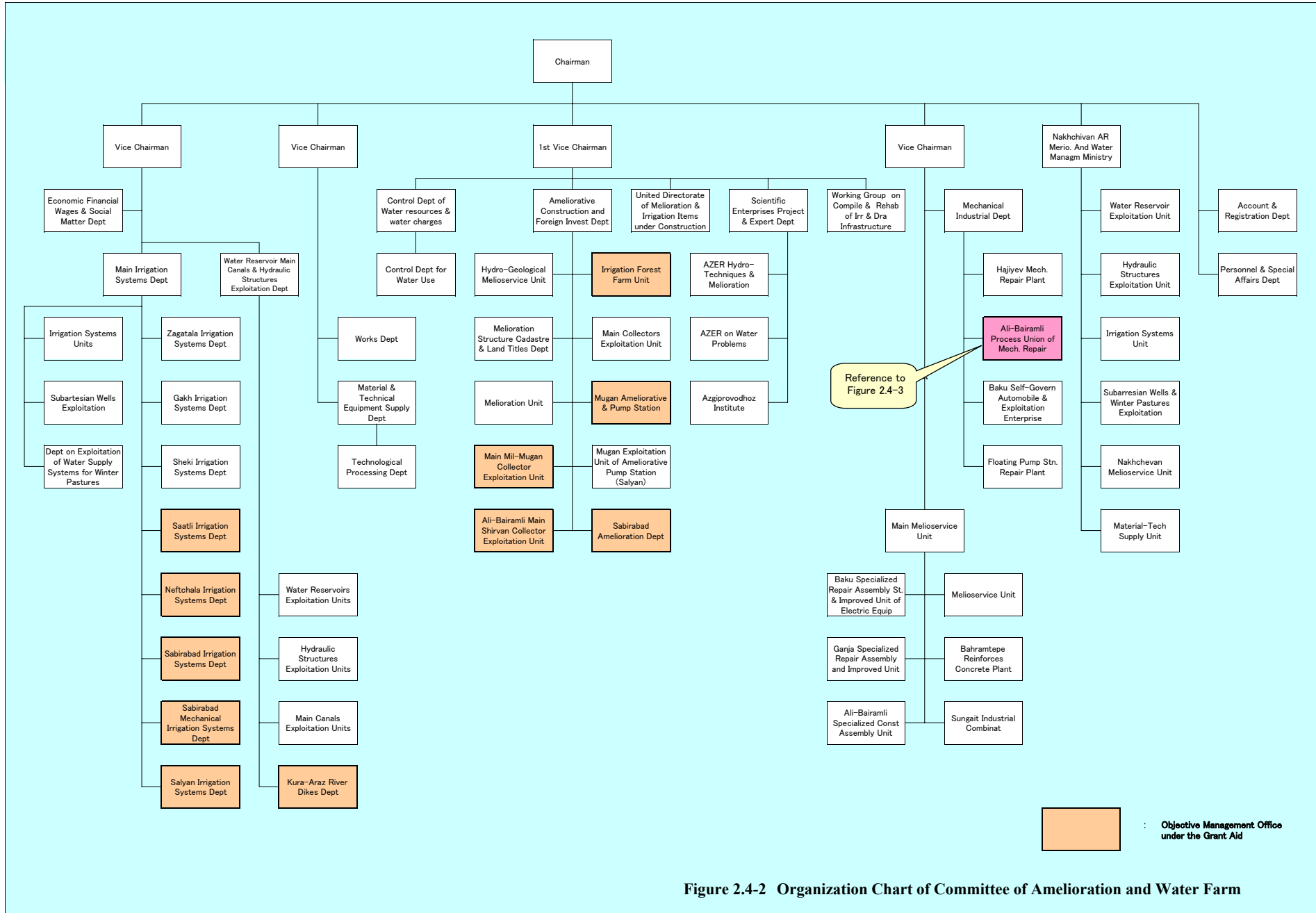


Figure 2.4-2 Organization Chart of Committee of Amelioration and Water Farm

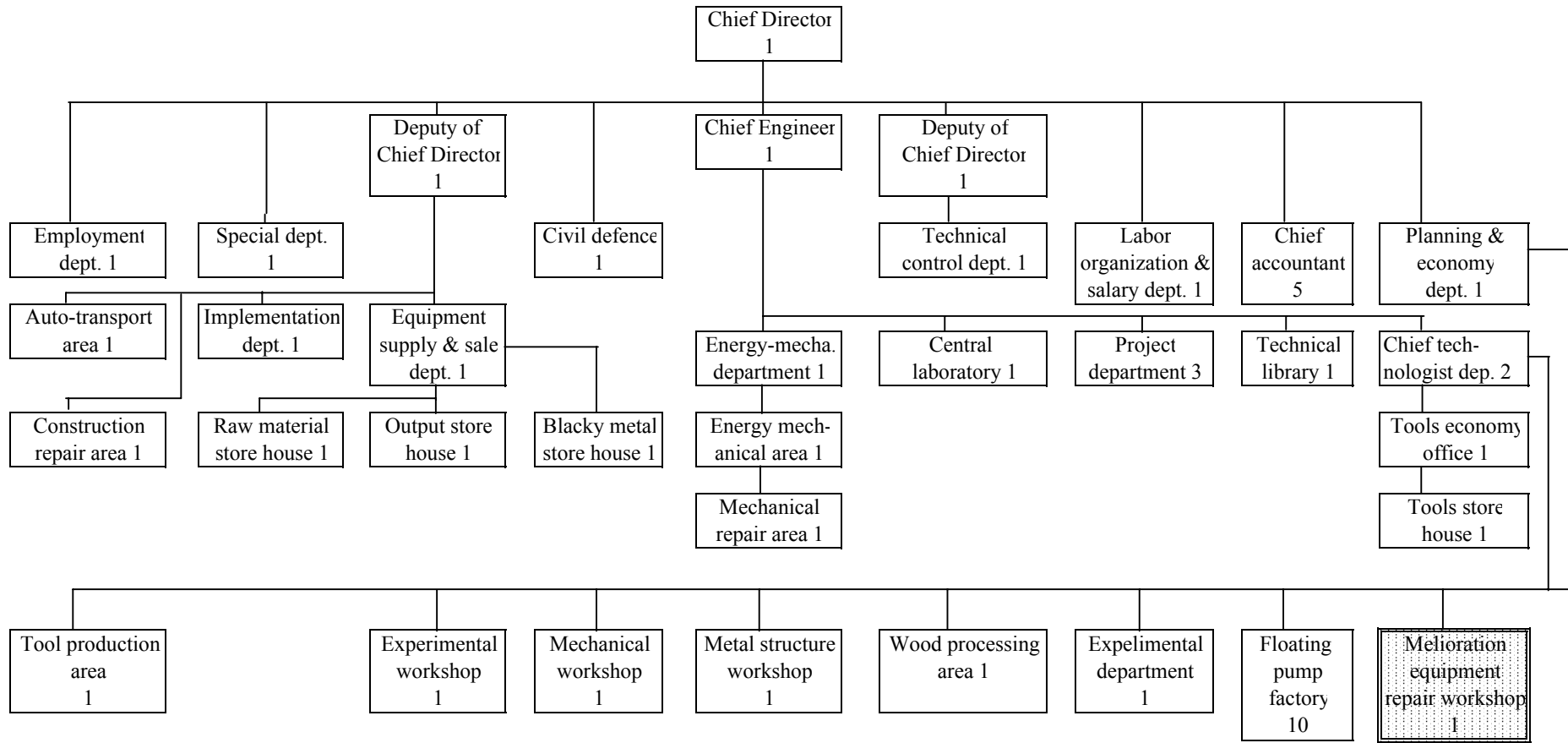


Figure 2.4-3 Organization Chart of Ali-Bairamli Mechanical and Repair Center

The Ali-Bairamli Mechanical and Repair Center is a state enterprise under the control of the mechanical and industrial department of CAWF. The mechanical and industrial department has six (6) personnel.

The number of staff of the Ali-Bairamli Mechanical and Repair Center is approximately 170 personnel including designers, manufacturing workers, repair workers, common workers, managers and directors.

It is clearly indicated in the restructuring plan of the Ali-Bairamli Mechanical and Repair Center that it should be provided with a sufficient number of staff and facilities for the maintenance of the equipment procured through the Japan's Grant Aid System. (Refer Attached Minutes of Discussion ANNEX-IV).

Each management office has the responsibility of periodic maintenance and minor repair for the equipment used for the dredging works. Each management office shall organize technical, human resources and construction department. The construction department is to perform dredging work by using its own equipment. Accordingly, this department continues dredging work and maintenance of equipment, including the equipment procured through the Japan's Grant Aid System. The number of staff in each management office is about 200 personnel.

#### **2.4.5 Implementation Organization**

The equipment procured under the Project will be delivered to CAWF (The equipment will belong to CAWF.) and will be allocated to the Ali-Bairamli Mechanical and Repair Center and eleven management offices by CAWF.

The excavators and bulldozers are allocated to each management office which is to conduct the dredging work through the Ali-Bairamli Mechanical and Repair Center. The supporting equipment (truck crane, cargo truck, tractor with trailer and mobile workshop with repairing equipment and tools) and spare parts are allocated to the Ali-Bairamli Mechanical and Repair Center. Table 2.4-1 shows the allocation list of equipment to be procured under the Project.

**Table 2.4-1 Number of Equipment Allocated to Each Organization**

Name of Management Office	Excavators			Bulldozers<1		Supporting Equipment <2	Spare Parts
	1.4m <sup>3</sup>	0.8m <sup>3</sup>	0.5m <sup>3</sup>	21 t	15 t		
Ali-Bairamli Mech. & Repair Center	-	-	-	-	-	4	1 set
Salyan Irrigation Management Office	-	2	1	-	-	-	-
Neftchara Irrigation Management Office	-	2	-	-	1	-	-
Sabirabad Irrigation Management Office	-	2	-	-	1	-	-
Sabirabad Mech. Irrigation Management Office	-	2	1	-	-	-	-
Kur-Araz River Dike Protection Management Office	4	2	-	2	2	-	-
Saatli Irrigation Management Office	-	2	-	-	1	-	-
Mugan Pump Amelioration Management Office	-	2	-	-	1	-	-
Main Mil Mugan Collector Management Office	-	1	-	-	1	-	-
Sabirabad Amelioration Management Office	-	2	-	-	1	-	-
Main Sirvan Collector Management Office	-	1	-	-	1	-	-
Mugan-Salyan Forest & Amelioration Management Office	-	1	-	-	1	-	-
<b>Total</b>	<b>4</b>	<b>19</b>	<b>2</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>1set</b>

Note: 1) In combination with the excavator. Refer to M/D ANNEX-II.

2) Supporting equipment is composed of a truck crane, a cargo truck, a tractor with trailer and a mobile workshop with repairing equipment and tools. .

Physical operation and maintenance works of the equipment will be carried out as described below.

- Equipment operation for dredging work : Each management office
- Periodic maintenance and minor repair : Each management office
- Heavy repair and overhaul : Ali-Bairamli Mechanical and Repair Center
- Store and supply of spare parts : Ali-Bairamli Mechanical and Repair Center

It is concluded that the procured equipment will be operated and maintained properly by the Ali-Bairamli Mechanical and Repair Center and respective management offices based on the following grounds:

- The equipment can be maintained daily and monthly by the respective management offices, by using existing maintenance tools and facilities.
- Existing tools and facilities at the Ali-Bairamli Mechanical and Repair Center can be utilized for yearly maintenance, overhaul and heavy repair of the equipment to be procured.

- The Ali-Bairamli Mechanical and Repair Center has committed to procure all the necessary additional equipment for the existing facility for the yearly maintenance, overhaul and heavy repair within the year 2004.
- Engineers and technicians at the Ali-Bairamli Mechanical and Repair Center have basic knowledge and skill. The skills can be increased through the training programmed when the equipment is delivered.
- Spare parts for one and a half years consumption can be distributed to the management offices through the procedures of CAWF.
- The two-storied building in front of the Center has enough space for the training.
- Repair works for the equipment to be procured are expected to be performed by the existing staff of the Ali-Bairamli Mechanical and Repair Center.
- It is also expected that the knowledge learned through the repairing of procured equipment will revitalize the activities of the Ali-Bairamli Mechanical and Repair Center.

## **2.5 Project Cost**

### **2.5.1 Project Cost of Japan's Grant Aid**

Project cost for procurement of the equipment under the Japan's Grant Aid has been estimated on the conditions mentioned below. The total cost of the Project is estimated at 625 million yen consisting of 624 million yen of the cost borne by the Government of Japan (GOJ) and 1 million yen of the cost borne by the Government of Azerbaijan (GOA).

Conditions of Cost Estimate:

- 1) Cost estimate point: January 2004
- 2) Exchange rate:  
 US\$ 1 = 111.19 Yen  
 AZM = 0.023 Yen (Azerbaijan National Bank, average rate of previous 6 months)  
 (Yen 1 = 43.48 AZM, US\$ = 4,972.17 AZM)
- 3) Implementation schedule: Refer to 2.2.4 (6)
- 4) Others: The project is carried out in accordance with regulation of the Japan's Grant Aid.

Breakdowns of the cost borne by GOJ and it borne by GOA are respectively mentioned below.

(1) Cost Borne by GOJ

Cost that is borne by GOJ is shown in Table 2.5-1.

**Table 2.5-1 Cost Borne by GOJ**

Item of Expenditure for Equipment			Cost (Million Yen)	
Equi- pment	Dredging Equipment	Wheel type hydraulic excavator, 1.4 m <sup>3</sup> (heaped) 4 units	86	530
		Wheel type hydraulic excavator, 0.8 m <sup>3</sup> (heaped) 19 units	257	
		Wheel type hydraulic excavator, 0.5 m <sup>3</sup> (heaped) 2 units	21	
		Bulldozer, 21 ton 2 units	40	
		Bulldozer, 15 ton 10 units	126	
	Supporting Equipment	Hydraulic type truck crane, 20 ton or more 1 unit	18	58
		Cargo truck, 14 ton or more 1 unit	7	
		Tractor with semi-trailer, 40 ton or more 1 unit	14	
		Mobile workshop with repairing equipment and tools 1 unit, 1set	19	
	Spare parts 1set		20	20
Detailed Design • Supervision of Procurement • Technical Guidance			16	16
Total				624

This cost estimate is provisional and would be further examined by GOJ for the approval of the Grant.

(2) Cost Borne by GOA

Cost that is borne by GOA is the transportation cost from Baku city to the Ali-Bairamli Mechanical and Repair Center. The cost is 1.1 million Japanese yen.

**2.5.2 Operation and Maintenance Cost**

Operation and maintenance cost of the canal dredging works by CAWF should be prepared. Amount of monthly cost is estimated as shown in Table 2.5-2.

**Table 2.5-2 Monthly Operation and Maintenance Cost**

Item	Unit	Quantity	Unit Cost <sup>1)</sup> (AZM)	Total Cost <sup>2)</sup> (AZM)
1.Operator <sup>3)</sup>	person	41	1,988,000	81,508,000
2.Assistant Operator <sup>3)</sup>	person	41	1,491,000	61,131,000
3. Fuel <sup>3)</sup> (for 41 units of equipment)	liter	112,000	800	89,600,000
4. Maintenance and Repair <sup>4)</sup> (Spare parts are included)	lump sum	1		176,255,000
Total				408,494,000

(Note1) Unit Price as of January 2004

(Note2) Fractions are rounded off to obtain number with unit of thousand.

(Note3) Costs for the operator and the assistant operator have been obtained from hearing. Each one operator and with one assistant operator should be placed for one unit of equipment.

(Note4) Source: “Depreciation Cost of Construction Machinery, Fiscal Year 2004, Japan”

Therefore, the monthly operation and maintenance cost, which should be borne by CAWF, is estimated at about 408 million AZM, and the annual operation and maintenance cost is estimated at about 4.9 billion AZM (4,901,928,000 AZM).

The canal dredging works should be carried out for three (3) years in consideration of its urgency. The above operation and maintenance cost has been estimated only for the objective equipment, and its cost is not for existing equipment.

As a result of the canal dredging work with use of the equipment to be procured by the Project, not only the original functions of irrigation and drainage canals could be recovered, but also the actual operation and maintenance cost of equipment could be reduced to improve the financial condition of CAWF.



## ***CHAPTER 3***

# ***PROJECT EVALUATION AND RECOMMENDATIONS***

## **CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS**

### **3.1 Project Effect**

#### **3.1.1 Target of Project**

In the existing irrigation and drainage canals in the four (4) regions that are the Project Sites, serious reduction of flow capacity has been caused due to sedimentation and weed growth. In such a situation, it is judged that urgent rehabilitation of such canals with dredging is indispensable.

The rehabilitation work, consisting of dredging using equipment to be procured by the Project, would be executed for i) 15 secondary irrigation and drainage canals and ii) the Girdiman floodway with the aim of recovery of their flow capacities. The purpose of this rehabilitation work is to recover the original functions of the irrigation and drainage canals with the aim of recovering the agricultural production in the Project Sites.

The target of the Project is to properly procure necessary equipment for the dredging work of the objective canals and floodway. It is noted that the dredging work for the Girdiman floodway would partly be executed in combination with existing equipment.

#### **3.1.2 Expected Effects**

##### **(1) Direct Effect of Improvement**

As mentioned in the above, CAWF would implement the rehabilitation work for the selected canals with the use of equipment to be procured by the Project. The present problems, possible countermeasures, and the effects of improvement from the Project are summarized in Table 3.1-1.

**Table 3.1-1 Problems, Countermeasures and Direct Effect of Improvement**

Present Conditions and Problems	Countermeasures in This Project	Direct Effect of Improvement
<p>Due to shortage of equipment, the required dredging work for the irrigation and drainage canals are stagnated. Therefore, the functions of irrigation and drainage have been reduced. As a result, the agricultural production has been reduced due to the shortage of irrigation and poor drainage (creating salinization damage) is caused.</p> <p>At present, the 11 management offices are using 16 draglines (for large canals) and 26 excavators (for medium and small canals). The required new equipment to be procured is estimated to be 120 draglines and 160 excavators. It means that amount of equipment in operation is in shortage.</p> <p>Further, it is noted that the equipment in operation has become superannuated and needs to be replaced with new equipment</p>	<p>The equipment to be procured by this Project for the dredging to recover the functions of the 15 secondary irrigation and drainage canals and the 1 floodway of the Girdiman are as follows:</p> <ul style="list-style-type: none"> <li>- Hydraulic excavator                      25 units</li> <li>- Bulldozer                                      12 units</li> <li>- Hydraulic type truck crane              1 unit</li> <li>- Cargo truck                                    1 unit</li> <li>- Tractor with semi-trailer                 1 unit</li> <li>- Mobile workshop with repairing equipment and tools                      1 unit, 1set</li> <li>- Spare parts                                    1 set</li> </ul> <p>With use of the above equipment, the dredging work would be executed for 271 km, which is a part of the whole secondary irrigation and drainage canals and the Girdiman floodway. It is noted that the work for the Girdiman would be executed jointly with the existing draglines.</p>	<p>With completion of the dredging work for the objective irrigation and drainage canals and the Girdiman floodway, the irrigation and drainage functions of the 271 km of canals would be recovered. It would make it possible to improve the condition to provide the required irrigation water and drain the excess water in the 202,000 ha of irrigation field in the four (4) regions of the Project Sites.</p>

(2) Indirect Effect of Improvement

In addition, the following indirect effects are expected with this Project.

- As the 25 hydraulic excavators would be newly procured by this Project, the existing hydraulic excavators could be transferred to other canals than the objective canals of this Project in the four (4) regions of the Project Sites. Then, the irrigation and drainage functions of the said other canals would be improved. Therefore, this is recognized as one of the indirect effects. The whole farm household population of 130,000 in the four (4) regions is considered as the indirect beneficiaries.
- The agricultural production would be increased with the improvement of the irrigation and drainage conditions in the four (4) regions owing to the recovery of the functions of the objective canals and the said other canals. The increase of agricultural production in the four (4) regions would contribute to the activation of the agriculture sector in the marketing, distribution, agricultural processing, etc. These are also recognized as indirect effects of improvement of the Project.

### 3.1.3 Beneficial Effects and Indices of Effect

Through the rehabilitation work, the 271 km of objective canals should be dredged. Then, the original canal section, or the flow area, would be recovered. The average discharges, or the flow capacities, of the objective canals at present and those after the rehabilitation are shown in Table 3.1-2 for the irrigation canals, the floodway and the drainage canals, respectively.

**Table 3.1-2 Indices of Effect of the Project and Rehabilitation Work**

Index of Effect	Present Condition (2003)	Target Year (2008)
Rehabilitated length of objective canals	0 km	271 km
Average discharge (flow capacity) of objective irrigation canals	2.6 m <sup>3</sup> /sec	3.4 m <sup>3</sup> /sec
Average discharge (flow capacity) of objective floodway	10.7 m <sup>3</sup> /sec	35.1 m <sup>3</sup> /sec
Average discharge (flow capacity) of objective drainage canals	1.4 m <sup>3</sup> /sec	2.0 m <sup>3</sup> /sec

## 3.2 Recommendations

### (1) Restructuring of Ali-Bairamli Mechanical and Repair Center

The restructuring plan is as shown in ANNEX-V attached to the Minutes of Discussions on the Basic Design Study (January 22, 2004). CAWF has submitted the plan to the Basic Design Team to express their intention to secure the budget and assign sufficient staff for smooth and effective operation and maintenance of the equipment to be procured by the Project. It is recommended to properly and surely achieve the restructuring activities in consideration of the importance of maintenance of the equipment of the Project for the smooth and timely execution of the rehabilitation work with dredging of the objective canals.

### (2) Proper Implementation of the Project

The Project is to procure the equipment required for the canal dredging for the rehabilitation of the objective canals. In the course of the procurement process, GOA would be in charge of the customs clearance at the Baku Chief Customs Committee and the inland transportation from Baku to the Ali-Bairamli Mechanical and Repair Center. It is recommended that CAWF would adequately arrange the smooth achievement of the procedures in consideration of the necessity for timely completion of the Project under the Japan's Grant Aid.

- (3) **Proper Implementation of Rehabilitation of Objective Canals with Dredging**  
In consideration of the present serious sedimentation condition and the necessity for the urgent rehabilitation of the objective canals, the dredging work of the canals should be properly executed with effective operation of the equipment. It is recommended that CAWF would adequately arrange the budget and the staff of the 11 management offices, who are directly in charge of the dredging work, in the four (4) regions, or the Project Sites, for the smooth and timely achievement of the rehabilitation of the objective canals within three (3) years. It would be necessary for CAWF to monitor the quality and the progress of the work regularly and take proper countermeasures as required.
- (4) **Rehabilitation of Main and On-farm Canals Concerned**  
The objective canals are the 15 secondary irrigation and drainage canals and the Girdiman floodway. As for the secondary irrigation canals, the effect of the dredging works would be influenced by the condition of the main canal from which the objective secondary canal branches and the condition of the on-farm canals to which the objective canal diverts the water. A similar relationship exists in the secondary drainage canals. In order to attain greater effect from the rehabilitation work with the equipment of the Project, it is necessary to execute the dredging work for the concerned main and on-farm irrigation and drainage canals simultaneously with the objective canals. Therefore, it is recommended for CAWF to give priority in allocation of the existing equipment over those main and on-farm canals.