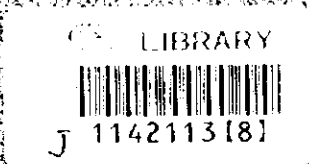


MINISTRY OF PUBLIC WORKS
THE REPUBLIC OF INDONESIA

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR URGENT PREVENTIVE
IRRIGATION RESTORATION IN THE DROUGHT
AFFECTED MARGINAL AREAS
IN
THE REPUBLIC OF INDONESIA

MARCH 1998



JAPAN INTERNATIONAL COOPERATION AGENCY
PACIFIC CONSULTANTS INTERNATIONAL

GRO
CR(2)
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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for the Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study from January 11 to January 31, 1998.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team returned to Japan, further studies were made, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the teams.

March, 1998



Kimio Fujita

President

Japan International Cooperation Agency

March, 1998

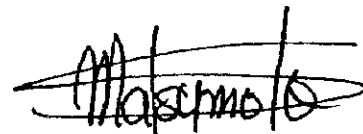
Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas in the Republic of Indonesia.

This study was conducted by the Pacific Consultants International, under a contract to JICA, during the period from January 9 to March 31, 1998. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

A handwritten signature in black ink, appearing to read 'Matsumoto', is written over a horizontal line. The signature is stylized and somewhat cursive.

Shinichiro Matsumoto

Project Manager,

Basic Design Study Team on
the Project for the Urgent Preventive
Irrigation Restoration in the Drought
Affected Marginal Areas

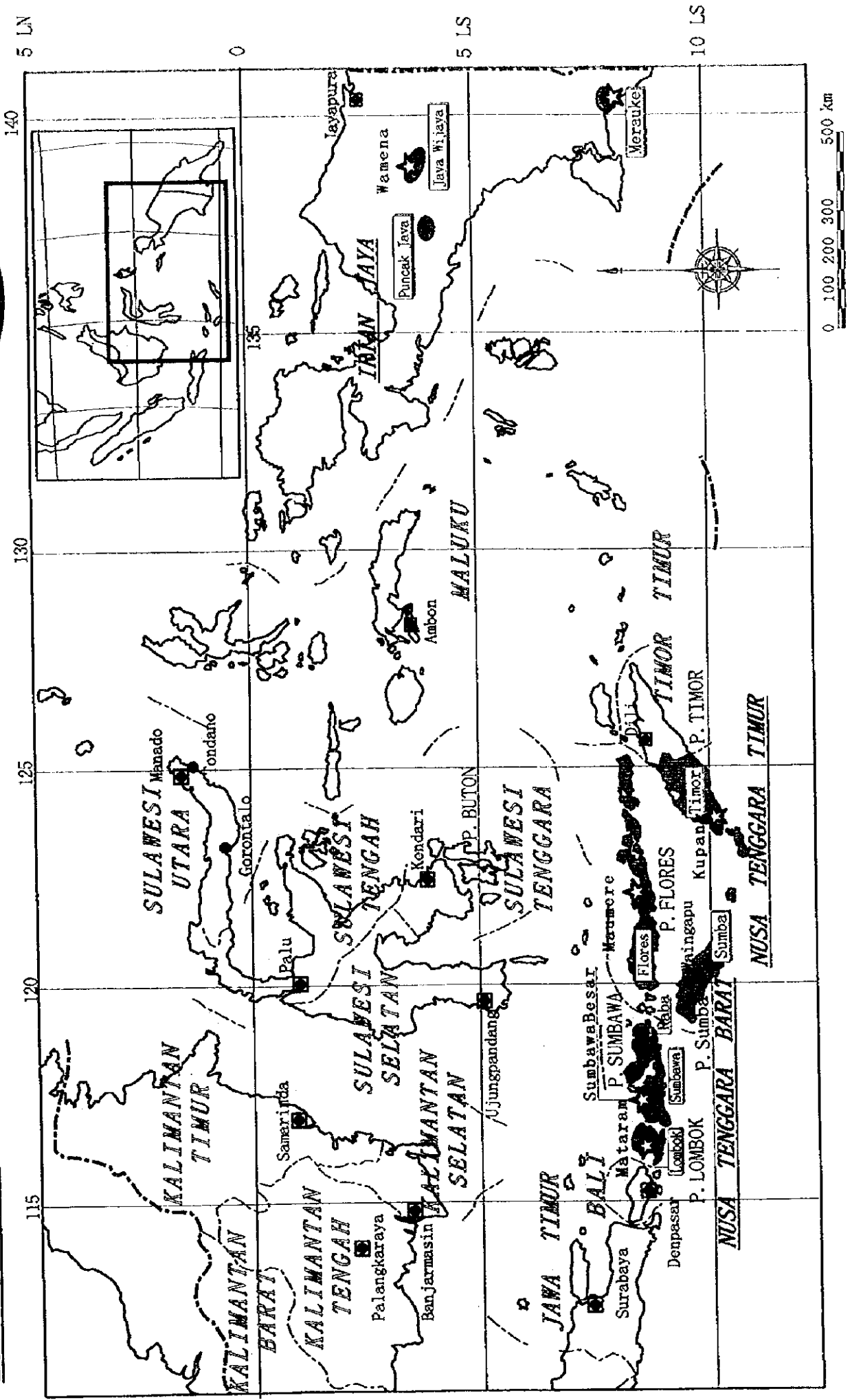
Pacific Consultants International

LOCATION MAP

★ Proposed Unloading Port

Merauke

Study Area



ABBREVIATIONS

ADB	Asia Development Bank
APBN	National Budget of Government of Indonesia
DGWRD	Directorate General of Water Resources Development
GOJ	Government of Japan
GOI	Government of Indonesia
NTB	West Nusa Tenggara
NTT	East Nusa Tenggara
OECD	Overseas Economic Cooperation Fund
P3A / WUA	Water User's Association
PAT	Groundwater Sub-project Office
PJP-II	The 2 nd National 25-year Long Term Development Program
Repelita-VI	The 6 th National 5-year Development Plan
SSIMP-I	Small Scale Irrigation Management Project - I
2KR	Second Kennedy Round

THE PROJECT FOR URGENT PREVENTIVE IRRIGATION RESTORATION IN THE DROUGHT AFFECTED MARGINAL AREA

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Chapter 1 Background of the Project

CHAPTER 1 BACKGROUND OF THE PROJECT

The Government of Indonesia (GOI) has given priority to the rural development in which the agricultural development is essential, and has proceeded with irrigation development to achieve a stable food supply to the people, since its establishment in 1969. Due to the progress of the groundwater irrigation development, agricultural production has been improved remarkably and Indonesia temporarily achieved self-sufficiency in rice production in 1984. However, rice supply at present is unstable due to the land diversion of superior agricultural land to industrial land use and the high population growth ratio in recent years.

A semi-arid climate is prevalent in the Study Area and it restricts the surface water usage due to the long dry season. Thus, the groundwater development for irrigation and domestic water supply is required immediately in the Area. Furthermore, the groundwater development in the Area which is classified as a poverty area in the country has a high priority from the aspect of the reduction of poverty and the correction of regional differences in socio-economic conditions. Developed countries and international cooperation organizations started to support GOI to procure drilling rigs at the second half of the 1970's, and drilling rigs have been supplied mainly by Japan's 2KR project after in 1984.

The Directorate General of Water Resources Development (DGWRD) under the Ministry of Public Works which is responsible for the implementation of groundwater development requested for grand aid for the Project for Supply of Equipment for Irrigation in Eastern Area to the Government of Japan (GOJ) on 1995. The GOJ entrusted the primary study and the basic design study for that project to the Japan International Cooperation Agency (JICA) in 1996, and established the procurement plan of 9 drilling rigs by 2 stages as shown below. The Phase I of the Project started on May of 1997 and 6 drilling rigs are planned to be delivered on March of 1998. The detail design for Phase II is planned to be implemented on March of 1998 and will supply 3 drilling rigs.

Outline of the Project for Supply of Equipment for Irrigation in Eastern Area

Phase	Province	Number of rigs to be supplied
Phase-I	East Nusa Tenggara (1), North Surawesi (2), Southeast Surawesi (2), Irian Jaya (1)	6
Phase-II	East Nusa Tenggara (1), Southeast Surawesi (1), Irian Jaya (1),	3
Total		9

In 1997, Indonesia suffered extreme drought in which the rainfall depth was less than 30% of that of an average year; as a consequence, agricultural production was reduced due to a lack of irrigation water and people suffered shortage of drinking water. In addition to the water shortage, they suffered from forest fires caused by drought. The number of drought-related deaths was more than 400 and more than 90,000 people were threatened by famine in Irian Jaya. Especially in the Irian Jaya, East Nusa Tenggara and West Nusa Tenggara Province, the damages to agricultural production were huge. On the other hand, inhabitants of the Area suffered infectious diseases caused by lack of drinking water and their living conditions became very poor. The drought did not abate after the rainy season started making necessary to urgently improve the infrastructure to support the living conditions of the inhabitants.

To cope with this serious situation, GOI requested to GOJ on October of 1997 for grant aid for the Project for Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas, which aims to an effective use of surface water and the groundwater development in the Provinces of Irian Jaya, East Nusa Tenggara and West Nusa Tenggara.

The major components of the request by GOI and the components of the request were modified based on the results of discussion with DGWRD are shown in Table 1.1.

Table 1.1 CONFIRMATION OF CONTENTS OF REQUEST

ITEM	SITE	REQUEST BY GOI		AFTER MODIFICATION		REMARKS
		SPEC./CONT.	Q'ty	SPEC./CONT.	Q'ty	
Drilling Rig	Merauke	Drilling Rig (Drilling cap.:300m)	1	Drilling Rig Mud Pump Air Compressor Logging Test Eq. Cargo Truck	1 1 1 1	Addition of supporting equipment for drilling rigs
	Sumba	Drilling Rig (Drilling cap.:150m)	1	Drilling Rig Mud Pump Air Compressor Cargo Truck	1 1 1	
Portable Water Treatment Unit	8 Sites	Filer type water treatment unit	500	Filer type water treatment unit	0	Canceled
		Reverse osmosis treatment unit	20	Reverse osmosis treatment unit	0	Canceled
Portable Pump	Jaya Wijaya	2, 3, 4 inch pump	45	2, 3, 4 inch pump	45	Puncak Jaya is excluded due to the difficulty of fuel supply for pumps at site and the lack of farmer's experience for irrigation.
	Merauke	"	45	"	45	
	Puncak Jaya	"	45	"	0	
	Timor	"	55	"	55	
	Sumba	"	65	"	65	
	Flores	"	55	"	55	
	Lombok	"	45	"	45	
	Sumbawa	"	45	"	45	
sub-total			400		355	
Removable Pump		4 inch pump	2	6 inch pump	6	Change of No. and spec.
Hand Tractor Pump	Merauke	3 inch pump	1	3 inch pump	0	Canceled
	Timor	"	1	"	0	
	Sumbawa	"	1	"	0	
	sub-total		3		0	
Vertical Turbine Pump	Timor	1,200&1,800 liter/min	5	900, 1,200 & 1,800	5	Specifications are to be determined based on the conditions of existing wells and hydrogeology at site.
	Sumba	"	6		6	
	Flores	"	6		6	
	Lombok	"	7		7	
	Sumbawa	"	6		6	
sub-total			30		30	

Chapter 2 Contents of the Project

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 Objectives of the Project

The 6th National 5-year Development Plan, which aims to increase food production to cope with rapid population growth, to increase job opportunity in the rural area and to achieve the regionally balanced development, makes a priority target the reduction of poverty and the correction of regional differences in socio-economic conditions. In the water resources and irrigation development sector, it is determined as one of the target to establish the water resources development and conservation plan to enable irrigation systems to supply water on a continuous basis. Under the above mentioned development policy, GOI establishes the groundwater development plan and the irrigation development plan to improve the agriculture relying natural rainfall which has an unstable and low productivity in the Eastern Indonesia Region.

The Project aims to supply irrigation water by supplying drilling equipment necessary for the above mentioned development plan and supplying irrigation pumps necessary for proceeding irrigation development and effective usage of surface and groundwater.

2.2 Basic Concept of the Project

2.2.1 Policy of Cooperation

The project input has 2 objectives, i.e., the supply of drilling equipment to improve the executing agency's capability of groundwater development and the supply of irrigation pumps to enhance surface and groundwater irrigation.

The groundwater development is also to be implemented by GOI, and the Project supports GOI by supplying drilling equipment which at present is not enough for implementing their groundwater development plan.

The irrigation development is to be implemented by GOI, and the Project supports GOI by supplying irrigation pumps necessary for implementing their pump irrigation development plan.

The number and arrangement plan of drilling equipment supplied by the Project are to be decided in consideration of the existing equipment of executing agencies

and their arrangement plan in future, so that the equipment works optimum for the implementation of the groundwater development plan.

The number and arrangement of irrigation pumps supplied by the Project are to be decided in consideration of the pumps to be supplied by Japan's 2KR project in the 1997/98 fiscal year. In this way, pumps supplied by both projects will be considered as complementary to each other within the irrigation development plan of the executing agencies.

2.2.2 Study on Contents of Project

The contents of the procurement plan of GOI modified based on the results of discussions are summarized as below:

CONTENTS OF PROCUREMENT PLAN

ITEMS	SITE	CONTENTS OF GOP'S PLAN		THE PROJECT
		Equipment/Spec.	Q'ty	Q'ty
Drilling Equipment	Merauke	Drilling rig	1	1
		Mud pump	1	1
		Air compressor	1	1
		Logging test equipment	1	1
		Cargo truck	1	1
	Sumba	Drilling rig	1	1
		Mud pump	1	1
		Air compressor	1	1
Portable Pump	Jaya Wijaya	2, 3, 4 inch pump	45	45
	Merauke	"	45	45
	Timor	"	55	33
	Sumba	"	65	43
	Flores	"	55	44
	Lombok	"	45	24
	Sumbawa	"	45	16
	Sub-total			355
Removable Pump		6 inch pump	6	5
Vertical Turbine Pump	Timor		5	5
	Sumba		6	6
	Flores		6	6
	Lombok		7	7
	Sumbawa		6	6
	Sub-total			30

1) Drilling Equipment (Number and Arrangement)

GOI intends to accelerate the groundwater development from 1999/2000 fiscal year to cope with the drought which occurred in 1997. The number of annual wells construction per drilling rig unit is 12.5 in Merauke and 10 in Sumba according to the operation records made at the sites. The number of necessary drilling rigs is estimated in the following table, and is 2 units each in Merauke and Sumba on 1999/2000. One drilling rig has already been installed in Merauke

by Japan's 2KR, and another is planned to be supplied in Sumba by Japan's grand aid, the Project for Supply of Equipment for Irrigation in Eastern Area Phase-I, of this fiscal year. Thus, one drilling rig is necessary for both sites after 1999/2000.

Groundwater Development Plan

Site	Item	1997/98	1998/99	1999/ 2000	2000/ 2001
Irian Jaya / Merauke	Irrigation development plan (ha)	150	150	300	300
	Number of well construction	14	12	25	25
	Number of well construction / rig	10.7	12.5	12.5	12.5
	Number of necessary rigs	1	1	2	2
NTT / Sumba	Irrigation development plan (ha)	120	150	200	200
	Number of well construction	12	15	20	20
	Number of well construction / rig	10.0	10.0	10.0	10.0
	Number of necessary rigs	1	1	2	2

The existing drilling equipment in East Indonesia and the projected equipment quantity are as follow.

Region	Drilling Equipment		Total	Observation
	Settled	Projected		
North Surawesi Pr.	3*		3	
Central Surawesi Pr.	4		4	
South Surawesi Pr.	2		2	
Southeast Surawesi Pr.	4*		4	
East Nusa Tenggara Pr.	6	1	7	
Timor	(3)		(3)	1 out of function
Flores	(2)*		(2)	
Sumba	(1)*	(1)	(2)	
West Nusa Tenggara Pr.	9		9	
Lombok	(4)		(4)	
Sumbawa	(5)		(5)	
Irian Jaya Pr.	3	1	4	
Merauke	(1)	(1)	(2)	
Jayapura	(1)*		(1)	
Selong	(1)*		(1)	
Maruku Pr.	2		(2)	
TOTAL	35	2	37	

remarks: * Includes the planned equipment for the East Indonesia Irrigation Equipment Installation Project.

The well drilling equipment number already settled was taken from the "Basic Design for the Project for Supply Equipment for Irrigation in Eastern Area Report".

The present supply of one set of well drilling equipment for Sumba in East Nusa Tenggara Province and another one for Merauke in Irian Jaya Province are valid,

considering the national balance of the groundwater development, where the number of this equipment is not enough in the Eastern Area.

(Contents and Specification)

To determine the amount, type and use of the equipment to be provided, the irrigation and groundwater development plan of the executing agencies, site natural conditions, existing installations and equipment were taken into consideration.

In the procurement plan of GOI, only drilling rigs are mentioned as requested drilling equipment. According to the results of the discussion with DGWRD and study on existing equipment of the executing agency and their development plan, the following supporting equipment for drilling rig was decided to be included in the Project for an effective use of the rigs. The logging test equipment for Sumba is excluded from the Project because this equipment is planned to be installed in the site by the Project for Supply of Equipment for Irrigation in the Eastern Area. The equipment is scheduled to be delivered on March, 1998 which can be used collaboratively by 2 drilling rigs at the site.

Province / Site	Necessary supporting equipment
Irian Jaya Province Merauke	Mud pump, Air-compressor, Logging test equipment, 4WD cargo truck
NTT Province Sumba	Mud pump, Air-compressor, 4WD cargo truck

For Merauke District in Irian Jaya, the selected equipment type was A (drilling capacity 300m); for Sumba District in East Nusa Tenggara it as B (drilling capacity 150 m).

- Merauke Site

The target aquifer of the site is the elastic limestone of the Klamogun Formation, which is located below 200m depth. The existing wells taking water from the aquifer at the site have the depth of around 250 m. Thus, the drilling capacity of 300 m class is applied to the drilling rig distributed to the Merauke site.

- Sumba Site

The target aquifers of the priority area of Sumba site are the Marly Limestone of

the Waikabubak Formation and the Porous Coral Limestone of the Kaliangga Formation. The water level of the existing wells varies from 6 to 30 m, and the thickness of aquifer is estimated from 50 m to 100m. Thus, the drilling capacity of 150 m class is applied to the drilling rig distributed to the Sumba site.

The contents of the well drilling equipment to be installed in Merauke and Sumba are as follow.

Province / Site	Equipment	Specification	Qty	Purpose
Irian Jaya Pr. Merauke	1. Drilling rig (Type A)	Drilling capacity: 300m Tractor-mounted type DTH direct air/mud circulation type	1	Well drilling
	2. Mud pump (Type A)	Trailer-mounted Discharge: 730 liter/min Pressure: 34kg/cm ²	1	Installation of well protection material
	3. Air Compressor (Type A)	Discharge: 14 m ³ /min, Pressure: 12 bar	1	Well cleaning
	4. Logging test equipment (Type A)	Relative resistance, Natural electric potential, gamma layer evaluation Logging depth: 300 m	1	Water level evaluation and casing localization selection
	5. Cargo truck	4 wheel drive Loading capacity: 5,000kg Crane capacity: 3,000kg	1	Transportation
NTT Province Sumba	1. Drilling rig (Type B)	Drilling capacity: 150m Tractor-mounted type DTH direct air/mud circulation type	1	Well drilling
	2. Mud pump (Type B)	Trailer-mounted Discharge: 1,050 liter/min Pressure: 24kg/cm ²	1	Installation of well protection material
	3. Air Compressor (Type B)	Discharge: 15 m ³ /min, Pressure: 10 bar	1	Well cleaning
	4. Cargo truck	4 wheel drive Loading capacity: 5,000kg Crane capacity: 3,000kg	1	Transportation

- a) Drilling Equipment (Tractor Mount Type): type A - 1 set
type B - 1 set

The drilling equipment must be able to drill non-developed layers and hard rocks, and must be able to fit the direct circulation, down the hole hammer and

rocks, and must be able to fit the direct circulation, down the hole hammer and air flash methods. The maximum drill depths are 300 m for type A and 150 m for type B. A 4WD trailer was selected to be mounted with the drilling equipment

- b) Mud Pump: type A - 1 set
type B -- 1 set

The mud pump is going to be a trailer-mounted multi parallel 2 piston pump moved by a water-cooled diesel engine. The type will be selected according to the utilization objective.

- c) Air Compressor: type A - 1 set
type B – 1 set

Utilized for well cleaning well, it will be a portable pump with oil compressed rotary screw, including the finishing materials. The type will be selected according to the utilization objective.

- d) Logging Test Equipment: 1 set

It will be utilized to collect data for water level evaluation, casing localization selection, relative resistance/natural electric potential/gamma layer evaluation. The relative resistance must be able to be checked by 2 ways between the poles. Now, there is a plan to supply the same equipment in Sumba Area in East Nusa Tenggara Province by a Japanese grant aid cooperation in the Project for Supply of Equipment for Irrigation in East Area. So this site will be excluded from the Project.

- e) Cargo Truck with Crane: 2 sets

The cargo truck will be utilized for transportation and casing settlement, and must have a capacity for 5 tons with 3 tons crane on it. To elevate the mud pump, the truck must be equipped with an elevation system. And, considering the land conditions, road circumstances, the truck must be 4WD.

2) Portable Pump

(Number and Arrangement)

As a result of the field study, it was confirmed that the proposed pump irrigation area covers 116 sites and 6,339 ha in the irrigation development plan of the executing agency.

The contents of the development plan are shown in Attachment-7 and the basic plan for each district is as follow.

Jaya Wijaya:	All surface water utilization by 3 inches portable pump (20 ha/pump);
Merauke:	The surface water utilization will be by 3 inches portable pump (approximately 20 ha/pump);
Timor:	All shallow well groundwater utilization by pumps that will be selected according to the well discharge (2 inches pump – 9 ha/pump; and 4 inches pump – 27 ha/pump);
Sumba:	Shallow well portable pump – 2 inches for 9 ha/pump; Surface water portable pump – 3 inches for 15 ha/pump;
Flores:	The surface water will be utilized by using 3 inches portable pump (20 ha/pump);
Lombok:	The surface water will be utilized by using 3 inches portable pump (approximately 20 ha/pump);
Sumbawa:	All surface water portable pump – 3 inches (20ha/pump); All well portable pump – 3 inches (20ha/pump).

The number of necessary pumps for covering the plan is estimated to be 384 based on the proposed pump irrigation plan, the area covered by each pump (average 16.4 ha), and the possible discharge at the site. GOI requested 355 portable pumps for the Project Area while the estimated necessary pumps are 384. During the discussions, it was confirmed that GOI has decided the number of pumps in consideration of the development priority of each site and the project cost necessary for the related facilities and O/M.

The pump irrigation plan of executing agencies, the number of necessary pumps and the arrangement plan of pumps are shown below:

Site	Area of pump irrigation (ha)	Number of necessary pumps	Number of requested pumps	Pump arrangement plan		Proposed water resources
				2KR	The Project	
Jaya Wijaya	850	45	45		45	Surface water
Merauke	815	45	45		45	Surface water
Timor	550	55	55	22	33	Groundwater
Sumba	750	65	65	22	43	Groundwater / Spring water
Flores	1,100	55	55	11	44	Surface water
Lombok	794	45	45	21	24	Surface water
Sumbawa	1,480	74	45	29	16	Surface / Groundwater
Total	6,339	384	355	105	250	

The pumps mentioned above will be operated and maintained by the water user's associations (WUAs) at each site in the pump irrigation development plan of executing agencies. It was confirmed during the Field Study that WUAs have enough experience on irrigation and pump operation.

The total number of pumps to be arranged was decided based on the results of above study. The required pumps are planned to be supplied through the joint pumps' supply of the Japan's 2KR project in this fiscal year which consists of 105 pumps for the Area, and by the present Project .

As a result of the field study in Puncak Jaya, Irian Jaya Province, it was confirmed that diesel for pump engine is difficult to be supplied at the site and that irrigation pumps are not expected to be used appropriately due to lack of experience, recognition and practice by the farmers. Thus, it is concluded that it is not suitable for the Project to arrange portable pumps in Puncak Jaya and thus this item shall be excluded from the Project. As a result, the total number of sites for portable pumps changes from 8 to 7 sites (Jaya Wijaya, Merauke, Timor, Sumba, Flores, Lombok and Sumbawa).

(Contents and Specifications)

It will be utilized to develop the groundwater resources by shallow wells and surface water for irrigation from rivers. The groundwater pump was selected according to the pumping head of each well, and the surface water pump was selected according to the discharge presented in the irrigation plan elaborated by the executing agencies.

The portable pump type of the Project is divided into an integrated air-cooled diesel engine pump and divided air or water-cooled diesel engine pump. Considering that the transportation/operation/maintenance will be carried on by the association farmers of WUAs, it must be light (making it possible to transport it by human power) and easy to operate and maintain. The above mentioned factors determined the selection of the integrated air-cooled diesel engine.

The standard of the surface water portable pump was selected from the irrigation project elaborated by the local agency; it was 3 inches (1,200 l/min, 28m for the head). The pumps for groundwater in existing shallow well were selected as shown below, considering the collected data and irrigation project elaborated by the local agency.

- For Surface Water Irrigation (3 inch)

The average coverage of each pump is 16.4 ha and the unit water requirement of field is 1 liter/sec regarding the irrigation plan of the executing agencies. Thus, the required pump capacity is determined as around 1,000 liter/min. On the assumption of 10 m of the total head, the specification of the portable pump for surface irrigation is determined to be [maximum capacity 1,200 liter/min X maximum head 28 m].

- For Groundwater Irrigation (2 inch and 4 inch)

The confirmed well conditions, i.e., design well capacity and dynamic well water level (D.W.L), of the shallow wells in Timor and Sumba site are shown in Table 2.4. Regarding the table, the D.W.L. varies from 3 m to 7 m, the average of Timor site is 4.7 m and the average of Sumba site is 3.3.m which meet the maximum suction capacity of portable pumps of 7 m. The most of the well capacity are around 500 liter/min while some of them indicate 1,200 liter/min. Thus, the well capacity of shallow wells in the Project are determined to be 500 liter/min, except for some well indicating the large capacity more than 1,000 liter/min. On the assumption of 10 m of total head including the distribution losses, the specification of the portable pump for 500 liter/min class is determined to be 2 inch [maximum capacity 600 liter/min X maximum head 28 m], and 4 inch [maximum capacity 1,800 liter/min X maximum head 28m] for

1,200 liter/min class.

Portable Pump

Diameter (inch)	Qmax (liter/min)	Total Head (m)	Engine Type
2	600	28	4 cycle air cooled diesel engine
3	1,200	28	Same
4	1,800	28	Same

The details of the selected pumps are shown in the Annex --7. The number of pumps to be installed is as follows.

Portable Project Installation Project

Items	2 inches	3 inches	4 inches	Total	Location
	for shallow wells	for surface water irrigation	for shallow wells		
Site					
Jaya Wijaya	-	45	-	45	Wamena
Merauke	-	45	-	45	Merauke
Timor	30	-	3	33	Kupang
Sumba	37	6	-	43	Kupang
Flores	-	44	-	44	Maumere
Lombok	-	24	-	24	Mataram
Sumbawa	-	16	-	16	Sumbawa Besar
Total	67	180	3	250	

3) Removable Pump

The removal pump utilization is for drought emergency situations, taking water from rivers, swamps, lakes and other surface water sources. For this purpose, a big pump size (head and discharge) will be selected. The site conditions show that the elevation head is between 20 m to 35 m (maximum). It is projected to allocate 1 pump per irrigation office. But in Lombok Area (already has been provided with 2KR equipment) and Jaya Wijaya Area (transportation network not completed), it will not be supplied because the utilization results are not expected to be efficient. So it will be installed in the remaining 5 sites (Merauke, Timor, Sumba, Flores and Sumbawa).

4) Vertical Turbine Pump

(Number and Arrangement)

In the arrangement plan of pumps, vertical turbine pumps are proposed to be installed at the site where a well has been constructed but the pump is not yet installed or existing pump is out of order. The installation plan of vertical turbine pump is confirmed based on the Field Study, well inventory and discussion with the executing agencies as shown in Attachment-8. The number of candidate wells for installation of vertical turbine pumps identified in the Field Study is bigger than the one requested from GOI. However, the number of vertical turbine pumps to be supplied by the Project was decided to be the same as the one requested from GOI because GOI decided the number of pumps in consideration of the construction plan of related facilities.

Site	Number of pump	Site	Number of pump
Timor	5	Lombok	7
Sumba	6	Sumbawa	6
Flores	6	Total	30

(Contents and Specifications)

The vertical turbine pump driven by diesel engine and diesel engine generator plus submersible pump are possible for deep well. Considering the facts that the farmers are accustomed to operate/maintain them, and that the operation/maintenance can be easily done with no electrician needed, and the high durability for sand in the water, the vertical turbine pump driven by a diesel engine was selected. The details of both pumps are as follow.

Comparison Between Vertical Turbine Pump and Submersible Pump

Item	Vertical Turbine Pump	Submersible Pump
1. Motor	Diesel Engine	Generator + Electric Motor
2. Rotation	1,800 rpm	3,000 rpm
3. Fuel Efficiency	High (Controlled Rotation)	Low (Always Full Rotation)
4. Durability	8 – 10 years (Engine)	3 – 5 years (Motor)
5. Price	High	Low
6. Electric System Problems	No	Yes
7. Operation/Maintenance	Easy	Need of Electrician
8. Noise	High	Low
9. Head	300 m	600 m
10. Utilization	Rural Water Supply, Irrigation	Urban Water Supply, Drinking Water
General Evaluation	Selected for the Project. Despite the initial cost is high, the durability, operation / maintenance can cover this negative point.	

The pumps were divided in 900 liter/min, 1,200 liter/min and 1,800 liter/min class, to be selected according to the required discharge. The conditions of the existing wells are different in each site, the dynamic water level varies from G.L.-3.6 m to 30.2 m. Thus, 35 m of the design pump head is applied to all pumps because it is advantageous to O/M of pumps to install same specification. Indonesia has the 2KR assistance project involving the same equipment, and considering the interchangeability of the parts, and water users associations' experience in their operation, it seems to be the best to select the same existing equipment type.

The details of the vertical turbine pump are as follows.

Well Diameter	Discharge (liter/min)	Head (m)	Engine Type
8 inches	900	35	4 cycle air-cooled diesel engine
10 inches	1,200	35	The same
10 inches	1,800	35	The same

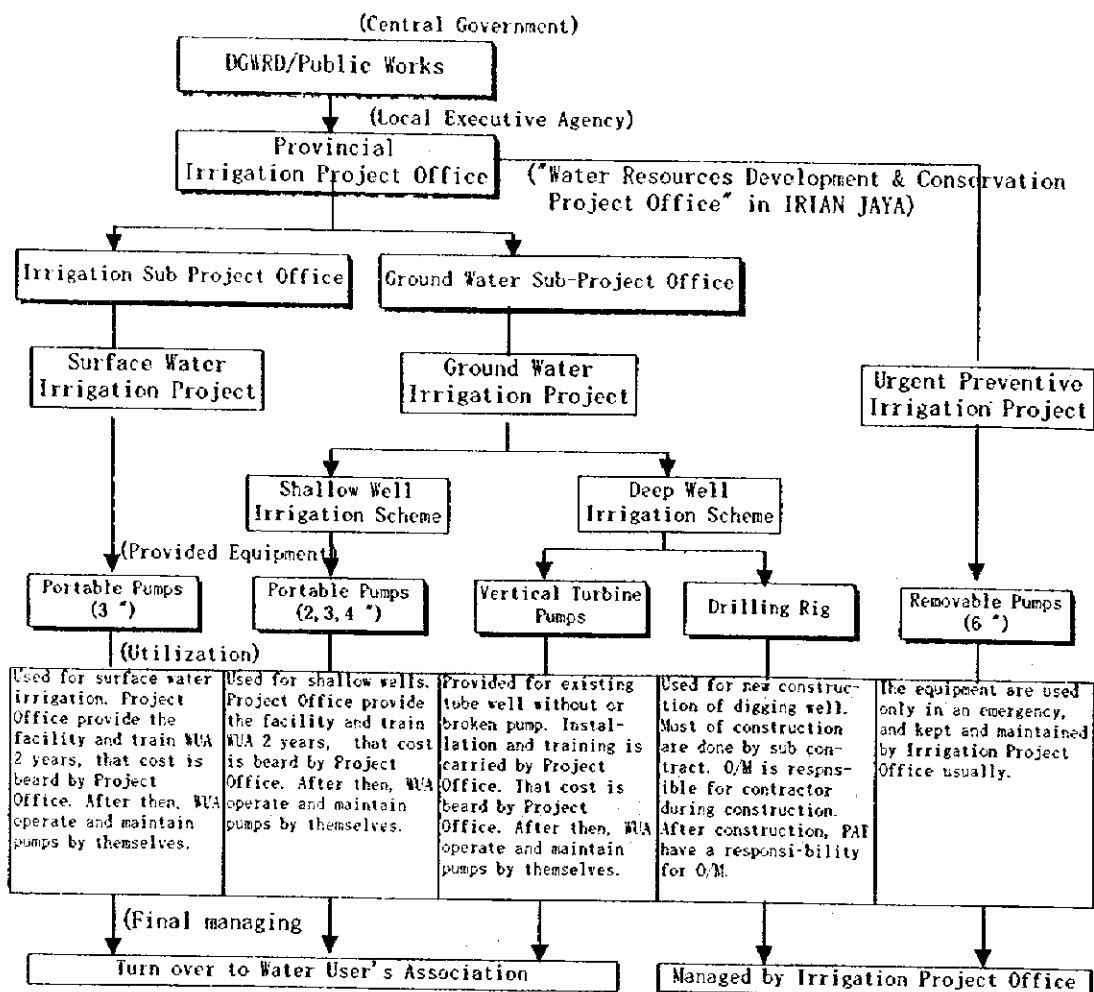
The details of the pump selection are showed in Annex -8, and the quantity is as follows:

Site	900 liter/min	1,200 liter/min	1,800 liter/min	Total	Local
Timor	4	1	-	5	Kupang
Sumba	-	5	1	6	Kupang
Flores	4	2	-	6	Maumere
Lombok	-	6	1	7	Mataram
Sumbawa	-	6	-	6	Sumbawa Besar
Total	8	20	2	30	

2.2.3 Basic Concept of the Project

As a result of above study, the basic concept of the project was determined as to supply drilling equipment necessary for improving the groundwater development capability of executing agencies and to supply irrigation pumps necessary for enhancing irrigation development using surface and groundwater effectively. Those equipment will be supplied in order to improve agricultural production system which was easily affected by the drought due to the dependence on natural rainfall in 7 sites in the provinces of Irian Jaya, East Nusa Tenggara and West Nusa Tenggara. The basic concept of the Project is outlined as below:

BASIC CONCEPT of PROJECT for IRRIGATION EQUIPMENT



The components to be supplied by the Project are summarized as below:

Province	Site	Equipment to be supplied		Remarks	
Irian Jaya	Jaya Wijaya	Portable pump	45pcs	3"-45 pcs	
	Merauke	Drilling rig	1pc	Drilling capacity --	300 m
		Portable pump	45pcs	3"-45 pcs	
East Nusa Tenggara	Timor	Portable pump	33pcs	2"-30 pcs	4"-3 pcs
		Removable pump	1pc	6" -1 pc	
		Vertical turbine pump	5pcs	900-4 pcs	1,200-1 pc
	Sumba	Drilling rig	1pc	Drilling capacity --	150 m
		Portable pump	43pcs	2"-37 pcs	3"-6 pcs
		Removable pump	1pc	6"-1 pc	
		Vertical turbine pump	6pcs	1,200-5pcs	1,800-1 pc
	Flores	Portable pump	44pcs	3"-44 pcs	
		Removable pump	1pc	6"-1 pc	
Vertical turbine pump		6pcs	900-4 pcs	1,200-2 cs	
West Nusa Tenggara	Lombok	Portable pump	24pcs	3"-24 pcs	
		Vertical turbine pump	7pcs	1,200-6pcs	1,800-1 pc
	Sumbawa	Portable pump	16pcs	3"-16 pcs	
		Removable pump	1pc	6"-1 pc	
	Vertical turbine pump	6pcs	1,200-1 pc		

2.3 Basic Design

2.3.1 Design Concept

(1) Concept for Hydro-geological Conditions

The groundwater development areas are situated in the areas of volcanic mountain foot, coastal plains and inland basins. Their major aquifers are consisted of consolidated limestone layers such as coral limestone and clastic limestone as well as unconsolidated materials such as volcanic breccia, sand and gravel. For the groundwater exploration, test borings and geoelectrical surveys have already been conducted in the areas except for Irian Jaya where currently under investigation. Based on these data and the data of existing wells, the specifications of the equipment are studied.

According to the data of existing wells in the Merauke area, Irian Jaya, the average depth is 250m and the aquifers are underlain at 150–230m below ground surface. Thus, the drilling rig requires the drilling capacity of 300 m. The groundwater is confined and free flowing from the wells, therefore pumps for deep well (vertical turbine pumps) are not needed for the wells.

In Sumba Island, the average well depth is approx. 100m and the aquifers are located at 70–130m below ground surface. Thus, the drilling rig requires a

drilling capacity of 150m.

(2) Consideration of Natural Conditions

The Eastern Indonesia Region is one of the most drought-affected area in the country; the area receives less than 1,000 mm of annual rainfall. Irrigation development has been implemented in order to increase agricultural production in the area. During the irrigation development, a large part of water resources depends on groundwater which is costly to develop and exploit, because water resources for large scale development are limited. As a result, the progress of irrigation development in the area is slower than other area such as Java, and this situation is notorious in the eastern part of the area where the surface water resources are limited and agricultural production is severely affected by the drought in 1997. The plan for supply of portable pumps is determined taking into consideration the above conditions.

(3) Consideration of Social Conditions

There are many sites in the Eastern Indonesia Region where irrigation using groundwater has been introduced; those irrigation systems are operated and maintained by WUAs. Farmers in the area have enough experience on the irrigation practice and the collaborative operation of irrigation facilities such as pumps. Water charge for irrigation has been successfully collected by WUAs from almost all members even though there are some special cases. Irrigation pumps supplied by the Project is planned to be managed by the executive agencies and will be transferred to WUAs after a period during which they will be managed by executive agencies. In consideration of the present conditions of WUAs' management, it is expected that WUAs will effectively operate and maintain irrigation facilities including pumps.

As a special case for WUAs, irrigation facilities in Flores area have not yet been transferred from executing agencies to WUAs after the planned period of official management of 2 years. The reason why the transfer has been postponed is that the Flores area is, so far, recognized to be in the path of recovery from the damages of the earthquake of 1982. The executing agency plans to start to transfer facilities to WUAs in the same way as in other areas, in the next fiscal year when the Flores Reconstruction Program will be completed. According to the plan of the executing agency, 17 facilities will be transferred in 1998 and 14

will be transferred in 1999.

(4) Concept for Technical Guidance

Drilling rig is the most expensive equipment supplied by the Project and it can be used for more than 10 years on condition of receiving an appropriate operation and maintenance. To introduce appropriate operation and maintenance of drilling rigs, technical guidance by the equipment manufacturer and consultant is planned to be conducted at site during the Project. The technical guidance for drilling rig is planned to train the staff in charge in regards to the necessity and method of the daily preventive maintenance; this will allow to create adequate conditions for a long useful life of the equipment and to keep low maintenance costs. It will also make the staff aware of the necessity of stock management of spare parts.

(5) Concept for Determination of Specifications

For the drilling equipment, tractor-mounted type drilling rig and 4WD type cargo truck shall be adopted in consideration of the road condition, the access to the construction sites and the mobility of equipment. Furthermore, the road conditions worsens during the rainy season and there are many wooden bridges which have small loading capacity. Considering the above conditions, a separate trailer-mounted mud pump should be adopted.

(6) Equipment Transportation Concept

The proposed port of entry to Indonesia is Surabaya in consideration of the convenience of custom clearance, and the closeness to the nearest local port of each executing agency. The transportation cost from Surabaya to the local ports is included in the Project. The transportation cost from the local ports to the workshop of each executing agency is proposed to be responsibility of GOI; this will not be a problem because the road conditiond are good and the distance is from 5 to 10 km. The proposed unloading port for Sumba Area is Kupang Port in Timor Island where the executing agency is located, and the transportation from Kupang to Waingapu of Sumba Island is to be taken care by GOI. For the Jaya Wijaya area of Irian Jaya Province, the transportation from the local port of Jayapura to the Wamena Airport in Jaya Wijaya is proposed to be included in the Project. There is no inland access from Jayapura to Jaya Wijaya and equipment should be transported by air, and it is difficult to be taken care by GOI.

The proposed unloading ports for each site are shown below:

Province	Site	Equipment to be supplied	Port	Remarks
Irian Jaya	Jaya Wijaya	Portable Pump	Wamena (via Jayapura)	Regular cargo liner, Regular flight
	Merauke	Drilling Rig, Portable Pump	Merauke	Charter cargo
NTT	Timor	Portable Pump, Vertical Turbine Pump	Kupang	Regular cargo liner
	Sumba	Drilling Rig, Portable Pump, Vertical Turbine Pump	Kupang	Regular cargo liner
	Flores	Portable Pump, Vertical Turbine Pump	Maumere	Regular cargo liner
NTB	Lombok	Portable Pump, Vertical Turbine Pump	Mataram	Regular cargo liner
	Sumbawa	Portable Pump, Vertical Turbine Pump	Sumbawa Besar	Regular cargo liner

(7) Concept for Implementation Schedule

Due to the restriction of the Duration of Exchange of Note, the reception, hand over and technical guidance activities should be finished by the end of March, 1999. The required period to manufacture major equipment is about 6 months for drilling rig and 3 months for irrigation pumps. After manufacturing, 1 month for ocean freight is also counted. Irrigation pumps, i.e., portable pump, removable pump and vertical turbine pump, are proposed to be delivered prior to the drilling equipment in consideration of their urgency as a countermeasure for the drought.

2.3.2 Basic Design

(1) General Plan

The Project supply drilling equipment, portable pumps, removable pumps and vertical turbine pumps. The basic concept of equipment arrangement and major utility of equipment are as below:

a. Drilling Equipment

The drilling equipment will be arranged at the site of Merauke in the Irian Jaya Province and the site of Sumba in the East Nusa Tenggara Province. The equipment is supplied as to enhance the capability of groundwater development of the executing agencies. The supporting equipment such as mud pump, air

compressor, logging test equipment and cargo truck in addition to drilling rig. The logging test equipment will be arranged only at the site of Merauke.

b. Portable Pump

The portable pumps are supplied for the utility of surface water irrigation and groundwater irrigation with shallow wells as to accelerate irrigation development by executing agencies. They are arranged at the site of Jaya Wijaya, Merauke, Timor, Sumba, Flores, Lombok and Sumbawa, and the location of arrangement on the site will be decided based on the irrigation plan of each executing agency.

c. Removable Pump

The removable pumps will belong to each irrigation project office and the utilization is for drought emergency situations, taking water from rivers, swamps, lakes and other surface water sources. The sites of removable pump are Merauke, Timor, Sumba, Flores and Sumbawa.

d. Vertical Turbine Pump

The vertical turbine pump is supplied as to accelerate irrigation development with deep wells. They are installed at the site where a well has been constructed but the pump is not yet installed or existing pump is out of order. The sites of them are Timor, Sumba, Flores, Lombok and Sumbawa, and the location of arrangement on the site will be decided based on the irrigation plan of each executing agency.

(2) Equipment Plan

The equipment supplied by the Project is summarized below. The delivery plan, outline drawing of major equipment and specification of major equipment are shown in Attachment – 9, 10 and 11.

MAJOR EQUIPMENT LIST

ITEM	SPECIFICATION/CONTENTS	QUANTITY	Distribution Plan						
			Irian Jaya		East Nusa Tenggara			West Nusa Tenggara	
			Jaya Wijaya	Merauke	Timor	Sumba	Flores	Lombok	Sumbawa
1. Drilling Rig (Type A)	Drilling capacity : 300 m Tractor mounted type	1		1					
2. Drilling Rig (Type B)	Drilling capacity : 150 m Tractor mounted type	1				1			
3. Mud Pump (Type A)	Trailer mounted type Discharge : 730 Liter/min Pressure : 34 kg/cm ²	1		1					
4. Mud Pump (Type B)	Trailer mounted type Discharge : 1,050 Liter/min Pressure : 24 kg/cm ²	1				1			
5. Air Compressor (Type A)	Discharge : 14 m ³ /min Pressure : 12 bar	1		1					
6. Air Compressor (Type B)	Discharge : 15 m ³ /min Pressure : 10 bar	1				1			
7. Logging Test Equipment	Logging depth range : 300 m Relative resistance, Natural electric potential, Gamma layer evaluation	1		1					
8. Cargo Truck	4 wheel drive Loading capacity : 5,000 kg Crane capacity : 3,000 kg	2		1		1			
9. Portable Pump (2 inch)	Diameter : 2 inch Max. discharge : 600 Liter/min Max. head : 28 m	67			30	37			
10. Portable Pump (3 inch)	Diameter : 3 inch Max. discharge : 1,200 Liter/min Max. head : 28 m	180	45	45		6	44	24	16
11. Portable Pump (4 inch)	Diameter : 4 inch Max. discharge : 1,800 Liter/min Max. head : 28 m	3			3				
12. Removable Pump	Diameter : 6 inch Max. discharge : 5,000 Liter/min Max. head : 35 m	5		1	1	1	1		1
13. Vertical Turbine Pump (900 liter/min)	Diameter : 8 inch Discharge x head : 900 Liter/min @ 35 m head	8			4		4		
14. Vertical Turbine Pump (1,200 liter/min)	Diameter : 10 inch Discharge x head : 1,200 Liter/min @ 35 m head	20			1	5	2	6	6
15. Vertical Turbine Pump (1,800 liter/min)	Diameter : 10 inch Discharge x head : 1,800 Liter/min @ 35 m head	2				1		1	

TABLE 2.1 OUTLINE OF THE PROJECT AREA

Province/District	Area (km ²)	Population ('000)	Household ('000)	No. of Person in household (No.)	No. Farm Household ¹ ('000)	Area of Cultivated Land ² (ha)	Cultivated Land per farm household (ha)
Irian Jaya	172,665	721	128	11.32	75	1,872,110	25.10
Merauke	119,749	300	52	5.81	30	495,448	16.49
Jaya Wijaya	52,916	421	77	5.51	45	1,376,662	30.92
NTT	47,350	3,439	652	5.28	379	437,122	1.15
Sumba Area	11,052	479	82	5.82	48	86,141	1.80
Sumba Barat	4,052	315	52	6.10	30	58,927	1.96
Sumba Timur	7,001	164	31	5.34	18	27,214	1.53
Timor Area	16,401	1,320	266	4.96	155	169,099	1.09
Kupng	7,339	549	111	4.92	65	65,278	1.01
T Selatan	3,947	363	73	4.96	43	58,730	1.38
T Utara	2,670	177	36	4.95	21	19,952	0.96
Belu	2,446	232	46	5.05	27	25,139	0.94
Flores Area	19,897	1,640	303	5.41	177	181,882	1.03
Alor	2,865	150	30	5.00	17	34,629	1.98
Flores Timur	3,079	270	55	4.90	32	13,587	0.42
Sikka	1,732	248	46	5.37	27	35,651	1.33
Ende	2,047	224	42	5.35	24	21,700	0.89
Ngada	3,038	208	36	5.78	21	18,503	0.89
Manggarai	7,136	540	94	5.74	55	57,812	1.05
NTB	20,153	3,646	860	4.24	501	280,146	0.56
Lombok Area	4,682	2,285	546	4.19	318	145,708	0.46
Lombok Barat	1,649	650	165	3.95	96	40,540	0.42
Lombok Tenga	1,428	716	186	3.85	108	53,561	0.50
Lombok Timur	1,606	919	196	4.70	114	51,607	0.45
Sumbawa Area	15,471	1,361	314	4.33	183	134,438	0.73
Sumbawa	8,493	481	102	4.72	59	57,378	0.97
Dompu	2,325	402	97	4.16	56	25,145	0.45
Bima	4,597	172	33	5.24	19	49,996	2.62
Kodya Mataram	56	306	83	3.68	48	1,919	0.04
Total	240,168	7,806	1,640	4.76	955	2,589,378	2.71

Source: Statistik Indonesia 1996

Statistik Irian Jaya 1996

Statistik Nusa Tenggara Timur 1996

Statistik Nusa Tenggara Barat 1996

1* Estimation

2* Excludes pasture land, estates and fallow fields.

3* Average excluding Irian Jaya.

TABLE 2.2 CONDITION OF THE DROUGHT ON 1997

Irian Jaya Province (Sorong)

(Unit: mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1990	101	107	132	178	202	139	171	277	257	426	70	101
1996	224	74	107	97	85	64	135	360	112	196	159	252
1997	112	187	42	124	123	21	120	0	3	97	362	-

East Nusa Tenggara Province (Kupang)

(Unit: mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	434	346	550	184	25	5	0	0	0	28	104	208
1996	268	488	156	53	11	0	0	0	0	42	137	501
1997	368	692	26	5	2	1	0	0	0	0	95	-

West Nusa Tenggara Province (Ampenan)

(Unit: mm)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1995	139	300	151	135	83	81	17	0	0	368	312	231
1996	158	345	210	17	62	99	17	30	0	409	285	250
1997	207	307	30	89	23	25	3	2	0	22	103	-

TABLE 2.3 DAMAGE CAUSED BY THE DROUGHT ON 1997

(Irian Jaya Province, Merauke Area)

No.	Village	Population in Hunger (person)	Drinking Water roblem (person)	People in Sick (person)	Animal Death (cow)
1	Waningapkay	102	1,288	-	45
2	Semangga Jaya	666	2,218	-	20
3	Kuprik	220	750	-	-
4	Sidomulyo	-	363	-	-
5	Kuper	240	-	-	-
6	Muramsari	450	1,294	5	-
7	Margamulya	317	1,407	-	30
8	Waninggapsay	1,125	1,542	11	3
9	Waninggap Mir	300	1,400	60	-
10	Yasamulya	265	1,411	-	17
11	Jabamaru	1,821	2,110	-	5
12	Hidupbaru	1,306	1,346	17	15
13	Isonambias	-	-	-	-
14	Sumber Harapan	920	1,304	15	5
15	Amunkay	194	1,144	-	-
16	Jagebob Raya	900	1,146	33	5
17	Komnasom	510	586	-	-
18	Mimibaru	437	901	-	10
19	Gurindajaya	1,195	-	15	4
20	Bersehati	395	962	-	-
21	Nggutibob	698	-	10	19
22	Sarmayam Inda	885	948	18	20
23	Angger Permegi	-	1,369	-	-
24	Makarti Jaya	244	326	-	-
25	Kartini	-	967	-	10
26	Jagebob IX	909	1,193	-	-
27	Nalkin	243	650	-	5
28	Tambat	430	430	-	-
29	Wasur	210	210	-	-
30	Yanggandur	368	-	-	6
31	Poo	380	-	-	-
	Total	15,730	27,265	184	219

(East Nusa Tenggara Province)

No.	Site	District	Paddy Field Affected (ha)	Plawija Affected (ha)	Total (ha)
1	Timor	Kupang	434	-	434
2		T.T.Selatan	16	8	24
3		T.T.Utata	372	1,936	2,308
4		Belu	946	-	946
5	Flores	Alor	-	16	16
6		Flores Timor	-	22	22
7		Sikka	1,753	454	2,207
8		Ende	181	340	521
9		Ngada	2,111	5,265	7,376
10	Sumba	Manggarai	739	726	1,465
11		Sumba Timor	1,617	846	2,463
	Total		8,169	9,613	17,782

Source : DGWRD

TABLE 2.4 CONDITION OF EXISTING SHALLOW WELLS FOR PORTABLE PUMP INSTALLATION IN TIMOR AND SUMBA

Site	Well No.	Water Level (D.W.L., GL-m)	Well Capacity (liter/min)	Remarks
Timor				
Kupang				
Kupang Timur	PSI-32	3.0	500	2 inch pump
Kupang Timur	PSI-33	3.3	500	2 inch pump
Kupang Timur	PSI-140	5.8	450	2 inch pump
Kupang Timur	PSI-145	4.8	1,200	4 inch pump
Kupang Timur	PSI-146	3.1	1,200	4 inch pump
Kupang Timur	PNI-149	7.0	400	2 inch pump
Subu Timur	PSB-10	3.5	500	2 inch pump
Subu Timur	PSB-03	4.8	500	2 inch pump
TTU				
Biboki Utara	KTW-08	4.0	500	2 inch pump
Biboki Utara	UVPI-02	3.8	1,200	4 inch pump
Belu				
Maleka Barat	BBWI-7	6.9	420	2 inch pump
Maleka Barat	BBWI-8	6.2	540	2 inch pump
Maleka Barat	BBWI-10	2.2	400	2 inch pump
Maleka Barat	BBWI-13	7.0	400	2 inch pump
Average		4.7		
Sumba				
Sumba Barat				
Katikutana	WMI-8	3.3	300	2 inch pump
Katikutana	WMM-13	3.3	500	2 inch pump
Katikutana	WWM-10	2.3	500	2 inch pump
Katikutana	WWM-07	4.3	400	2 inch pump
Katikutana	WWM-18	3.0	500	2 inch pump
Loli	WKM-1	3.3	300	2 inch pump
Average		3.3		

Chapter 3 Implementation Plan

CHAPTER 3 IMPLEMENTATION PLAN

3.1 Implementation Plan

3.1.1 Implementation Concept

The Project purpose is to supply necessary equipment for GOI and executing agencies, to develop the surface and groundwater resources, being the Indonesian Government responsible for the construction of wells installation of irrigation systems. Therefore, the construction of accessory installations and equipment installation works will not be included in the present project. But, the expected long-term use and the high cost of the well drilling equipment to be supplied and installed, make it necessary the assistance of a technician for the operation and maintenance works.

Shipment will be done up to the site port, and the responsibility for internal transportation, storage and distribution from it will be of the executing agency. But, in the case of Jaya Wijaya Area in Irian Jaya Province, as the transportation infrastructure does not permit it, transportation will be done using a local commercial flight from Jayapura. This local transportation cost, to Wamena airport (main airport) in Jaya Wijaya, will be included in the project cost, because it is expected to be difficult to the GOI to bear the costs. Now, the equipment, which has Sumba Island as final destination, will be responsibility of the Timor-Sumba Irrigation Project Office in Timor, as the equipment will be sent to Kupang in Timor Island. The destination and receiving agency for each equipment are as follows and the organization chart of DGWRD and Irrigation Project Office are shown in Fig. 3.1 and 3.2:

Province	District	Local Executing Organism	Deliver Site
Irian Jaya	Jaya Wijaya	Irian Jaya Water Resources Development and Conservation Office	Wamena
	Merauke		Merauke
East Nusa Tenggara	Timor	Timor-Sumba Irrigation Project Office	Kupang
	Sumba		Kupang
	Flores	Flores Irrigation Project Office	Merauke
West Nusa Tenggara	Lombok	Lombok Irrigation Project Office	Mataram
	Sumbawa	Sumbawa Irrigation Project Office	Sumbawa Besar

3.1.2 Procurement Plan

1) Well Drilling Equipment

The existing drilling equipment has been imported from Japan and England, as it is not produced in Indonesia. There are 61 drilling equipment in Indonesia, but

only 22 (20 made in Japan) are fit for operation. Considering the experience of the local operator and workshop staff in the use of the Japanese equipment, parts interchangeability with the existing one and existence of equipment makers service agency, the Japanese equipment was selected for the Project.

2) Portable Pump

The following local and imported products are possible to be supplied, considering the sale/service network and DGWRD experience with the equipment. But, the total head of these equipment does not meet the required level and they are not treated with pumps coupled with small air-cooled diesel engines which are easily transported by hand. So, the decision was to supply Japanese equipment.

Equipment	Series	Capacity (liter/min)	Head (m)	Engine Power (HP)	Origin Country
2 inches Portable Pump	XA40/I3-S175	360	17	6.0	China
	DC-3-R50U	360	17	6.5	Indonesia
	NS-02-R175N	360	17	6.5	China -- Indonesia
3 inches Portable Pump	XA50/I3-S185	660	17	10.0	China
	GT03R-R50U	660	15	10.0	Indonesia
	NS-03-D180	660	15	8.0	China -- Indonesia
4 inches Portable Pump	XA65/I3-S195	1,080	17	12.0	China
	GT04-I-R100C	1,200	15	12.0	Indonesia
	NS-04-S19F	1,200	15	13.5	China -- Indonesia

3) Removal Pump

As a result of the field study, it was realized that local firm suppliment of removable pumps is not possible. So, the preference was on the Japanese one.

4) Vertical Turbine Pump

Considering the sale/services network and DGWRD experience with the pump, it is possible to supply the following local and imported products. The price difference between the Japanese and other makers' products is around 10 to 15%. But, considering the durability, operation/maintenance facilities, parts acquisition and after care structure, the Japanese vertical pump was selected.

Equipment	Series	Capacity (liter/min)	Head (m)	Engine Power (HP)	Origin Country
VTP-900	DWT-8RJHC	1,200	35	20	USA – Italy
VTP-1200	DWT-8RJHC	1,200	35	20	USA – Italy
VTP-1800	DWT-10RJLC SUN2103	1,800	35	30	USA – Italy
VTP-900	8V24/50-S1110	1,500	35	15	Italy – Indonesia
VTP-1200	8V24/50-S1110	1,500	35	15	Italy – Indonesia
VTP-1800	10V24-2105A3	1,800	35	24	Italy – Indonesia

3.1.3 Implementation Schedule

The E/N indicates that all inspection/delivery and technical guidance has to be finished on November of 1999. The production required time are 6 months for drilling equipment and 3 months for the pumps, taking 1 more month for ocean freight and customs process. Now, considering the pumps supply urgency as a drought countermeasure, all of them are going to be supplied before the drilling equipment, which takes more time to be produced.

So, the required time can be estimated as:

Entire Time (From the E/N Conclusion to the Delivery)	: 12.0 months
From E/N to Producer Contract	: 4.0 months
Payment Time (Producer Contract to Delivery)	: 8.0 months

The whole schedule is presented in Fig. 3.3.

3.1.4 Obligations of the Recipient Country

The obligations required from GOI for the project implementation are as follow:

- 1) Take the responsibility for the local transportation cost from the delivery port (Wamena in the Jaya Wijaya case) to the project site;
- 2) Be responsible for all required bank expenses;
- 3) Execution of all custom formalities and tax payment concerned to the equipment supplied by the project;
- 4) Authorize the Japanese staff entry and permission of stay in Indonesia;
- 5) Organize the responsible agency and select the staff in charge during and after the project execution;
- 6) Secure sufficient budget for the responsible agency during and after the project execution;

- 7) Charge the expenses that are not included in the grant aid fund, to the construction, acquisition, transportation and settlement of the equipment.

3.2 Project Cost Estimation

3.2.1 Cost Responsibility of the Recipient Country

The Recipient Country will be responsible for the costs estimated at US\$ 2,035,422.

It is divided as follow:

- 1) Local Transportation Cost (Sumba's Equipment Sea Transportation from Kupan in Timor Island to Waingapu in Sumba Island):
US\$ 11,640
- 2) Cost of Well Drilling Commission (Equipment and Staff Cost)
US\$ 1,778
- 3) Construction Cost of Irrigation Systems for Portable Pumps and Vertical Turbine Pumps:
US\$ 2,022,004

3.2.2 Operation and Maintenance Costs

(1) Drilling Equipment

The responsible for equipment supplied by the Project are the Irian Jaya Province Water Resources Development and Conservation Office in Merauke and Timor-Sumba Irrigation Project Office in Sumba. But the real management and operation/maintenance services will be done by the Merauke and Timor-Sumba Groundwater Sub-project Office, that are divisions of the above mentioned offices. Both Sub-project Offices have experience in the same kind of 2KR well drilling equipment supply, and can be considered that they have sufficient capacity observing the existing equipment conditions.

The budget necessary for the well drilling works comes from the Groundwater Sub-project Office. But the execution of the works are going to be done by a private constructor, borrowing the equipment conditioned to the Law of the Ministry of Public Works No. 585/KTPS/1988. So, in fact, a private firm executes the operation/maintenance services. Depending to the constructor's capabilities, the equipment can be borrowed alone or with operator.

- The constructor will be responsible of the operation, parts change and daily inspection costs;
- After the works end, the equipment must be returned in the same conditions before the borrowing expire date,
- An operation and maintenance monthly report must be prepared and submitted to PAT.

The well drilling cost is Rp 403,000/m, according to the Timor-Sumba Groundwater Sub-project Office experience. The operation/maintenance costs are included in this value. If a large scale cost correction occurs, the operation/maintenance costs will be treated as a separate item.

The drilling works are estimated to start between 1999 and 2000, at Merauke and Sumba Areas. The project operation/maintenance costs are estimated as follow.

Site	Plan	Annual Drilling Plan		Well Drilling Cost (Rp10 ⁶)
		Quantity	Depth (m)	
Merauke	Entire Office	25	4,500	1,814
	(Project)	(12.5)	(2,250)	(1,210)
Sumba	Entire Office	20	2,000	806
	(Project)	(10)	(1,000)	(403)

(2) Irrigation Pump

The irrigation system covered by the project pumps is going to be under the responsibility of the executing agency. The operation/maintenance services of the irrigation systems are going to be carried by the government for the first 2 years. From the 3rd year, it will be responsibility of the Water Users Association, and the costs will be covered by the water use charges collected from the beneficiaries.

a) Portable Pump

The portable pump accessories construction, management and operation / maintenance services costs will be responsibility of each irrigation sub-project office for 2 years (before the transfer of responsibility to the Water Users Association). The necessary costs for those first 2 years are as follows:

(Unit: Rp x10⁶)

Region	Pump Quantity	Cost of Installation			Manage / Operation / Maintenance Cost (2 years)	
		Unit Price		Value	Unit Price	
		Existing	New			Value
Jaya Wijaya	45	15	25	900	0.74	67
Merauke	45	15	25	900	0.74	67
Timor	33	15	25	660	0.74	49
Sumba	43	15	25	860	0.74	64
Flores	44	15	25	880	0.74	65
Ronboku	24	15	25	480	0.74	36
Sunbawa	16	15	25	320	0.74	24
TOTAL	250	105	175	3,000		370

b) Vertical Turbine Pump

The responsibility of the vertical turbine pumps for the first 2 years is the same of portable pumps. The estimated costs are as follow:

Region	Pump Quantity	Cost of Installation		Manage / Operation / Maintenance Cost (for the first 2 years)	
		Unit Price	Value	Unit Price	Value
Timor	5	60	300	1.94	19
Sumba	6	60	360	1.94	23
Flores	6	60	360	1.94	23
Ronboku	7	60	420	1.94	27
Sunbawa	6	60	360	1.94	23
TOTAL	30		1,800		116

(3) Project Cost in the Annual Budget (Including the Operation / Maintenance Costs)

The percentage that the Project costs represent in the annual budget of the local executing agency are as follows, and are estimated to be enough to cover the amount of required funds.

Local Executing Agency	1998/99		1999/2000		Estimated Annual Cost (Rp x10 ³)
	Costs (Rp x10 ³)	Percent (%)	Costs (Rp x10 ³)	Percent (%)	
Irian Jaya Water Res. Dev. Cons. Office	1,800	9.2	1,277	6.5	19,620
Well construction (inc. O/M cost)			1,210		
Irrigation facility construction	1,800				
O/M for irrigation facility			67		
Timor/Sumba Irrig. Proj. Office	2,180	7.9	480	1.7	27,519
Well construction (inc. O/M cost)			403		
Irrigation facility construction	2,180				
O/M for irrigation facility			77		
Flores Irrig. Proj. Office	1,240	5.7	45	0.2	21,897
Irrigation facility construction	1,240				
O/M for irrigation facility			45		
Lombok Irrig. Proj. Office	900	3.8	32	0.1	23,737
Irrigation facility construction	900				
O/M for irrigation facility			32		
Sumbawa Irrig. Proj. Office	680	1.8	24	0.1	36,922
Irrigation facility construction	680				
O/M for irrigation facility			24		

Remarks: The costs detail are: for 1998/99 only the construction costs for the pumps. For 1999/2000, wells / irrigation system construction costs, operation/maintenance costs of the pumps installed one year before for Merauke and Sumba, and for the other districts only the operation/maintenance costs of the pumps installed one year before.

(4) Costs Charged by the Water Users Association

From the 3rd year after the irrigation system begins to work, it is planned to collect water use charge from the beneficiaries, by the Water Use Association, to cover the management/operation/maintenance costs. The annual cost for the installations for portable and vertical turbine pumps are respectively Rp 740,000 and Rp 1,940,000. The average beneficiaries' expenses are going to be Rp 64,000 and Rp 167,000 by family. These values are similar to those for the existing well usage, and it is expected that there will be no problems in the future concerning water use charge collection.

Fig. 3.1 ORGANIZATION CHART OF DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

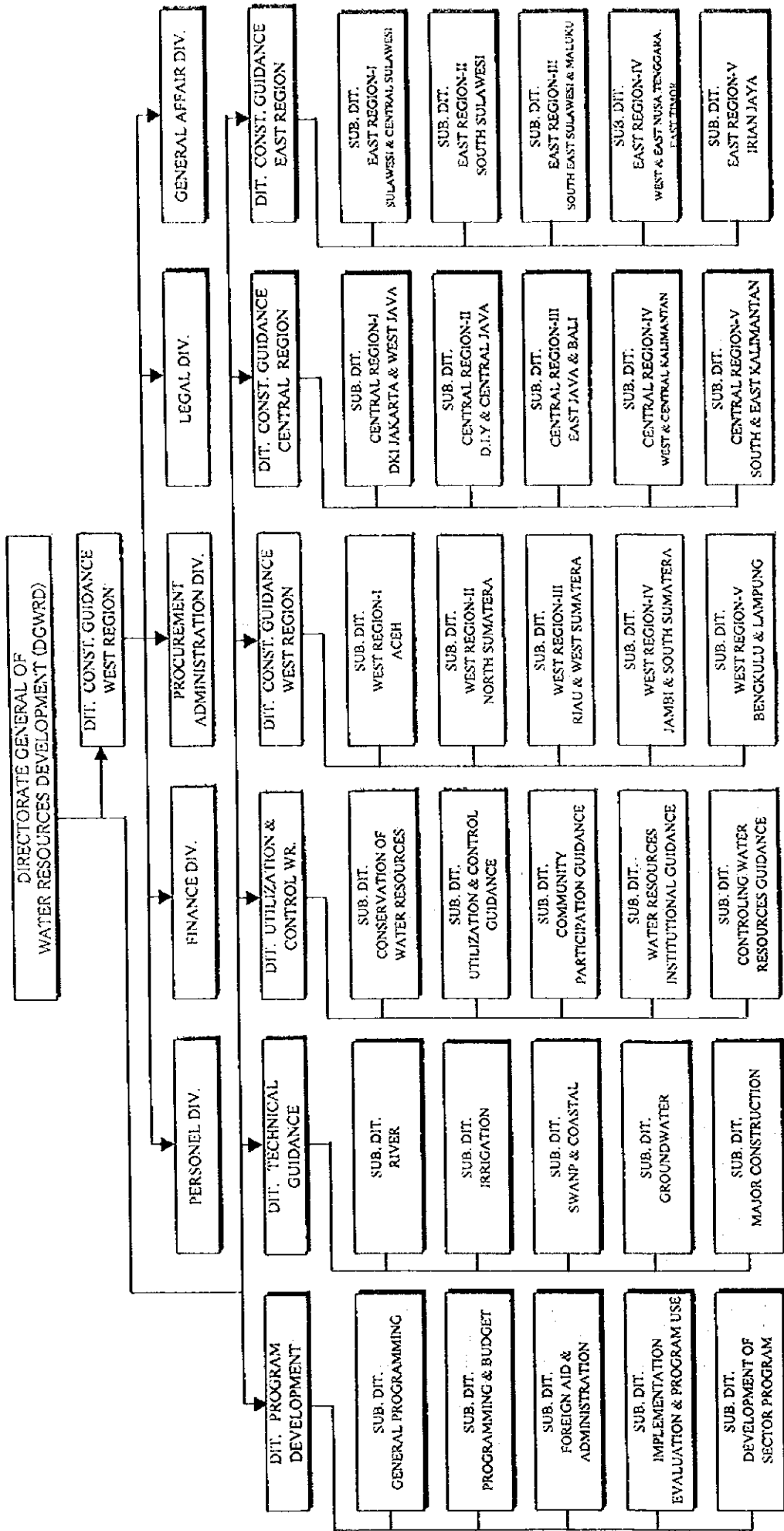


FIG. 3.2 ORGANIZATION CHART OF IRRIGATION PROJECT

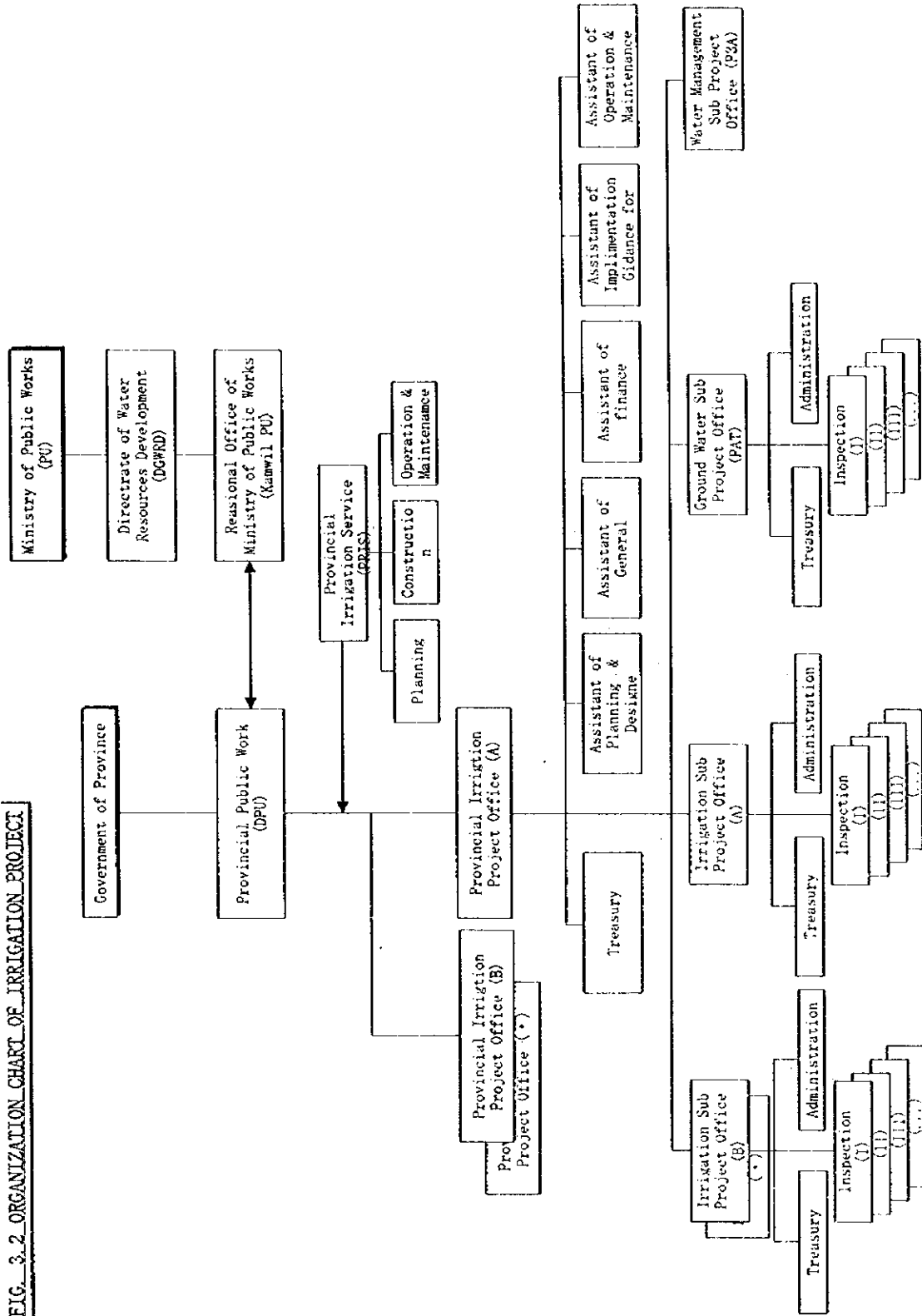
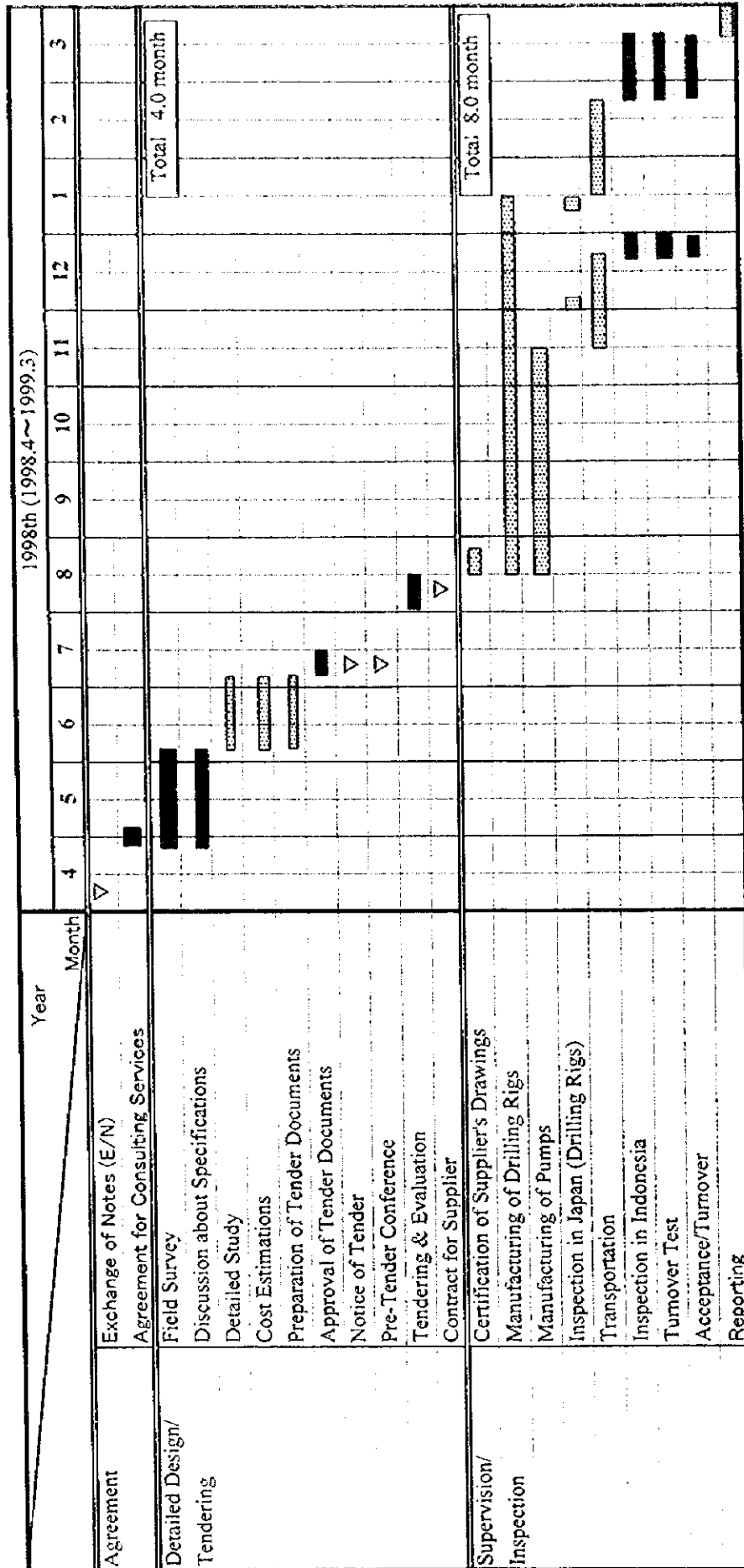


FIG. 3.3 WORK SCHEDULE



Chapter 4 Project Evaluation and Recommendation

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATION

4.1 Demonstration / Verification of the Project's Validity and Benefits

(1) Demonstration / Verification of the Project's Validity

The Project is valid for a Japanese grant aid co-operation for the following reasons.

1) The Project's Beneficiaries are Mainly People below the Poverty Line

The Project site is located in the east region of Indonesia, and it is characterized as a region suffering from poverty. In descending order of poverty, the Irian Jaya Province is placed 3rd, the East Nusa Tenggara, 4th, and the West Nusa Tenggara, 6th within the existing 27 provinces.

Worst 6 Provinces According to Percentage of Population Below the Poverty Line in 1996

Province	Population below the Poverty Line	Percentage (%)	National Ranking
East Timor	267,806	31.2	1
West Kafi Mantan	820,490	22.0	2
Irian Jaya	427,827	21.2	3
East Nusa Tenggara	748,974	20.6	4
Meraku	417,047	19.5	5
West Nusa Tenggara	653,026	17.6	6

Source : Statistics Year Book of Indonesia, 1996

(Reference)

The Indonesian Central Statistics Bureau (BPS), after considering several factors, established an annual income level for this poverty line classification, calculating the related population as follows.

Year	Poverty Line (Rp)		Percentage of Population below the Poverty Line (%)			Population of Population below the Poverty Line (million persons)		
	Urban	Rural	Urban	Rural	National	Urban	Rural	National
1996	38,246	27,413	9.7	12.3	11.3	7.2	15.3	22.5

Source : Statistics Year Book of Indonesia, 1996

2) The Project will Contribute to Stabilize the Public Welfare of the Affected Farmers by the 1997 Drought and Improve the Inhabitants Living Conditions

This Project will be an urgent grant aid co-operation for provinces as Irian Jaya, East and West Nusa Tenggara, that were heavily affected by the 1997 drought.

3) The Indonesian Finance and Human Resources / Techniques must be able to Maintain / Manage / Administrate the Project

It is necessary for the groundwater development that the WUAs' capacity to operate and maintain the irrigation system after its conclusion and the techniques they possess for the wells drilling, should be adequate. The groundwater resources development was initiated in the decade of the 80's in this arid region. Each island has their own irrigation projects office, that has a Groundwater Resources Sub-project office (PAT), where the technicians have an extensive experience in this kind of works. The supervision and management capabilities of those technicians are sufficient to adequately carry on well drilling works. For the irrigation facilities, the existing irrigation projects include the technical training (2 years by a government budget) of the water use association for operation/maintenance services. The Project also includes the said training, expecting no kind of problems concerning the technicians' capabilities.

4) The Project Adequacy to the National Development Program

The agricultural development in the 6th National 5 Years Development Program aims to increase the rice production to meet the demand of a growing population; decrease the poverty and regional differences between the 27 states by a balanced development. The program emphasizes the development of the East Indonesia Region. The Project will focus the regions with a high priority included in the National Development Program, increasing the agricultural productivity by irrigation systems; and contributing to the national economy by decreasing poverty and correcting the regional differences which are the objectives of the National Development Program.

5) No Environmental Negative Impact

The land subsidence and dry up are the most important problems to be faced by a large scale pumping up operation using groundwater resources. But this project has a maximum discharge of 20 liters/second for each well, and each site has only 10 wells drilled per year, meaning that the scale is small; the project will not face the problems mentioned above if a primary study and appropriate monitoring activities for the wells are carried out.

(2) Benefits

The following benefits from the Project implementation are expected, and will

contribute to improve the agricultural production system easily affected by drought; will increase the production level; positively affect the national economy; and will help to achieve the objectives of the National Development Program.

1) Direct Results

a. Improvement of Agricultural Production System Easily Affected by the Drought

The project site is located in a semi-arid region. The regional agriculture depends on natural rainfall, making cultivation during the dry season very difficult. Even during the rainy season, there is need of irrigation in some regions, because the agriculture has a very fragile structure creating a constraint against a stable production. Utilizing the supplied equipment, and by an efficient use of surface water and groundwater development, the irrigation all through the year will be possible, strengthening the weak agricultural structure to overcome drought conditions. It is estimated that the Project will directly benefit 6,700 ha of irrigable area, 11,300 agricultural families and 62,000 persons.

Site	Equipment/ Quantity	Irrigation Area (ha)	Average Farmer's Land (ha)	Families Benefited by Irrigation	Average Number of Person per Family (Person/Family)	Population Directly Benefited (Persons)
Jaya Wijaya	PP 45	850	0.66	1,288	5.51	7,097
Merauke	PP 45	816				
	DE 1	1,000				
	Sub-total	1,816	0.66	2,752	5.81	15,989
Timor	PP 33	330				
	DWP 5	100				
	Sub-total	430	0.45	956	4.96	4,741
Sumba	PP 43	496				
	DWP 6	120				
	DE 1	1,000				
	Sub-total	1,616	0.45	3,591	5.82	20,899
Flores	PP 24	880				
	DWP 7	120				
	Sub-total	1,000	0.63	1,587	5.41	8,585
Romboku	PP 24	423				
	DWP 7	140				
	Sub-total	563	0.93	605	4.19	2,534
Sunbaku	PP 16	307				
	DWP 6	120				
	Sub-total	427	0.84	508	4.33	2,534
		6,702		11,287		62,044

Remarks.: PP=Portable Pump; DE=Drilling Equipment; DWP=Deep Well Pump

The East and West Nusa Tenggara Provinces are the most arid regions in Indonesia. The rainy season extends from December to March, which is period when the farmers utilize the rain water for irrigation. In the dry season, most of the rivers dry up, making it impossible to produce all through the year without irrigation. The precipitation varies from year to year, causing damages to the rain-dependent agriculture in drought years. The mentioned two provinces (East/West Irian Jaya) that have a relatively high amount of precipitation, suffered in 1997 from an abnormal drought, when 430 persons died in Jaya Wijaya, 74 in Meranke and more than 600 in Irian Jaya province, according to the newspaper "Jakarta Post" of November 29th, 1997. As mentioned before, with the equipment supplied by this project, an efficient utilization of the surface water will be achieved and the groundwater resources will be developed, strengthening the weak agriculture structure of the region. A smooth implementation of the Project, in spite of not being able to supply the required pumps by the dry season in 1998 (April to November), will make possible the settlement of the pumps, at site, in December of 1998. This will allow the paddy fields irrigation at the rainy season, at least. And, after the introduction of the pumps, the farmers in the region will not need to worry about future droughts.

b. Agricultural Productivity Increase and Products Diversification

The introduction of pumps will make it possible to obtain three annual harvests: one from paddy field in the rainy season, and two from upland fields during the dry season. The agricultural production will be largely increased by the improvement of the land use efficiency and by the positive effects of irrigation. Furthermore, the cultivation period can be settled according to the market's demands and high-return cash crops can be introduced.

According to the Field Study, the farmers obtain only one harvest per year, in the rainy season, with a mean productivity of 2.25 ton / ha of unhulled rice. The broker buys it from the farmers at Rp 400 / kg. So, one farmer that owns 1 ha earns in average Rp 900,000. But as the production cost is estimated as Rp 450,000, the net income is about Rp 450,000. With a three-times-per-year harvest made it possible by using the surface and groundwater resources according to the necessities, it will be possible for the farmers to earn Rp

850,000 (Rp 1,700,000 minus 50% of production costs), meaning that the net income will be duplicated.

Paddy Field in Rainy Season = 2.75 ton/ha (with irrigation)xRp400/kg=	Rp 1,100,000
First Upland Crop (Maize)=1.6ton/ha x Rp 250/kg =	Rp 400,000
Second Upland Crop (Vegetables) =	Rp 200,000
<hr/>	
Total	Rp 1,700,000

2) Indirect Effects

a. Poverty Reduction and Regional Differences Correction

The farmers income will be increased by the agricultural productivity improvement and products diversification, making it possible to achieve the National Development Program objectives mentioned before.

b. Improvement of the Rural Inhabitants Living Conditions

The PAT utilizes good quality groundwater not only for irrigation, but to supply drinking water too. Mainly in the Irian Jaya Province, the expectation of the inhabitants life conditions improvement due to increased supply of drinking water.

c. Formation of the Water User's Association and Rural Inhabitants Independence

After the end of the well drilling works and the irrigation system construction, technical assistance will be provide to the farmers for the formation of water use association. The associations will contribute to the independence of the farmers.

d. Contribution for the Activation of the Regional Economy

With the increase in production expansion and the improvement of the farmers economy, an increase of sales of agricultural equipment and the creation of new agricultural jobs are expected, activating the regional and surrounding economies.

e. Influence on Neighboring Regions and Promotion of Continuous Irrigated

Agriculture

The demonstration effects on the neighbouring regions of the usage of groundwater in the dry season will be high. It will stimulate the introduction of groundwater resources irrigation, and promote a continuously-irrigated agriculture.

4-2 Recommendation

Even though a huge impact is expected from the Project, but the following items are required from the GOI for its smooth implementation.

(1) Required Budget

The preparation of the required budget from the Ministry of Public Works will be a key point for the project implementation. The actual economic situation makes it very difficult, but as an emergency project for drought-effects reduction, an urgent preparation of an adequate budget is required.

(2) Systematization of the Portable Pump Utilization in Small Scale Surface Water Irrigation

The PATs have a long experience in well drilling acquired by using the equipment provided by the 2KR project: pump installation, construction of general irrigation systems (including groundwater), training of WUAs, etc.,. They already have a systemized execution/management structure, with a project with a very clear distribution of the required equipment.

On the other hand, the Irrigation Sub-project Office, responsible for surface water irrigation, mainly improves large scale irrigation systems. It has, compared to the PAT, low experience in portable pumps for small scale irrigation systems. So, from the equipment supply point of view, there is the necessity to promote the systematization of the execution/management of small scale irrigation works by portable pumps. It includes the construction of the irrigation system (including the pumping house and water distribution system), portable pump operation training and other necessary items.

(3) Strengthening the Inhabitants Participation

The farmers participation is essential for the agricultural sector success. The participation of the water use association in planning, execution and operation /

maintenance will stimulate their conscience on the importance of management and operation/maintenance of the irrigation system. The need for sistematization of the farmers participation on portable pump use in surface irrigation is high, when compared to the groundwater irrigation.

(4) Strengthening the Operation/Maintenance Structure

The supplied equipment durability depends exclusively on the operation/maintenance provided by the water use association (human resources and budget). A transformation of the way of thinking of the users, periodic inspection of the engine and pump, human resources formation to strengthen the operation/maintenance structure are necessary for an adequate public property management.

The Irian Jaya Water Resources Development and Conservation Office has already moved from Merauke to Jayapura on 1997, and PAT still is in Merauke. There is a plan to also move Merauke PAT to Jayapura in the future. In that case, the Merauke Swamp Development Project Office under the Irian Jaya Water Resources Development and Conservation Office is planned to be responsible for the groundwater development in Merauke Area. So, there will be the necessity to create a new PAT structure to efficiently manage Jayapura, Merauke and Selong concerning the use of drilling equipment.

No PAT is located in the Sumba Island, being responsibility of Timor-Sumba Groundwater Sub-project Office, situated in Kupang, Timor Island. One drilling equipment is being programmed to be installed at Sumba region, as the first phase of the Project for Supply of Equipment for Irrigation in Eastern Area. With another one being programmed, 2 sets of equipment will be allocated for the groundwater development. So, it is necessary to construct a workshop and a PAT office (or an independent PAT) in Sumba Island.

ATTACHMENT

1. **The List of the Study Team Members -----Att-1**
2. **The Study Schedule -----Att-2**
3. **The List of the Personnel Concerned -----Att-3**
4. **Minutes of Discussions -----Att-4**
5. **Technical Notes -----Att-15**
6. **Delivery Plan of Portable Pumps -----Att-19**
7. **Delivery Plan of Vertical Turbine Pumps -----Att-25**
8. **Delivery Plan of Equipment -----Att-26**
9. **Outline Drawings of Major Equipment -----Att-32**
10. **Specifications of Major Equipment -----Att-39**

1. The List of the Study Team Members

インドネシア共和国灌漑機材整備計画基本設計調査

Basic Design Study on the Project for Urgent Irrigation Restoration in the Drought Affected Marginal Area in the Republic of Indonesia

調査団員名簿

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5. 機材計画：大野 孝之

Equipment Plan : Mr. Takayuki Ohno

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6. 積算/調達計画：土田 和弘

Cost Estimate & Procurement Plan: Mr. Kazuhiro Tsuchida

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Pacific Consultants International

2. The Study Schedule

The Study Schedule

Day	Day/Mon	Week Day	JICA Member		Consultant (①, ②, ③)		Consultant (④, ⑤)	
			Activity	Stay	Activity	Stay	Activity	Stay
1	11/Jan.	Sun	Move to JKT	JKT	Same as JICA Member (①, ②, ③)	JKT	Same as JICA member	JKT
2	12	Mon	Courtesy call/meeting at DGWRD, JICA Office and Japan Irrigation Project Office	JKT	ditto	JKT	ditto	JKT
3	13	Tue	Visit to Timor/Sumba Irrigation Project Office	Kupang	ditto (①, ②) Meeting at DGWRD (③)	Kupang JKT	ditto	Kupang
4	14	Wed	Visit to Floress Ground Water Sub-Project Office	Maumere	Same as JICA Member (①, ②)	Maumere JKT	Meeting at Timor/Sumba irrigation project office	Kupang
5	15	Thu	Site investigation in Floress	Maumere	Meeting at DGWRD (③) Same as JICA Member (①, ②)	Maumere JKT	Site investigation in Timor	Kupang
6	16	Fri	Visit to Lombok Irrigation Project Office	Mataram	Same as JICA Member (①, ②) Meeting at DGWRD (③)	Mataram JKT	Meeting at Sumba irrigation sub-project office	Waingap
7	17	Sat	Visit to P/U of West Nusa Tenggara Province and Site investigation	Mataram	Same as JICA Member (①, ②)	Mataram JKT	Site investigation in Sumba	Waingap
8	18	Sun	Move to JKT	JKT	Data Same as JICA Member (①, ②) Data preparation (③)	JKT	ditto	Waingap
9	19	Mon	Meeting at DGWRD (Minutes of Discussion)	JKT	Same as JICA Member (①, ②, ③)	JKT	Move to Flores ground water sub-project office	Maumere
10	20	Tue	Signing of M/D	Craft	Same as JICA Member (①, ②, ③)	JKT	Meeting at Flores irrigation project office	Maumere
11	21	Wed	Move to Japan		Move to Sumbawa Irrigation Project Office	Sumbawa B.	Site investigation in Flores	Maumere
12	22	Thu			Meeting at Sumbawa Irrigation Project Office	Sumbawa B.	Move to Flores Lombok irrigation project office	Mataram
13	23	Fri			Site Investigation in Sumbawa	Sumbawa B.	Meeting at Lombok irrigation project office	Mataram
14	24	Sat			Move to JKT	JKT	Site investigation in Lombok	Mataram
15	25	Sun			Data Arrangement	JKT	Move to JKT	JKT
16	26	Mon			Data Arrangement/Internal Meeting	JKT	Same as member (①, ②, ③)	JKT
17	27	Tue			Meeting at DGWRD (Technical notes)	JKT	ditto	JKT
18	28	Wed			Signing of technical notes	JKT	ditto	JKT
19	29	Thu			Report to JICA Office & Japan embassy	JKT	ditto	JKT
20	30	Fri			Data Arrangement	JKT	ditto	JKT
21	31	Sat			Move to Japan	Craft	ditto	Craft

3. The List of the Personnel Concerned

面会者リスト

- 1) 大使館 : Mon., January 12, 1998
河内 幸男 kawachi Yukio 一等書記官
- 2) JICA (JKT事務所) : Mon., January 12, 1998
諏訪 龍 Suwa Ryu JKT 事務所長
吉成 安恵 Yushinari Yasue JKT 事務所担当
- 3) JICA 専門家 : Mon., January 12, 1998
Nagata Satosi 水資源総局
Nakano Minoru 水資源総局
Totoki Keiji 人間居住総局
- 4) 水資源総局, JKT : Mon., January 12, 1998
Mr. Budiman Arief Director General, DGWRD
Mr. Chairil Abdini Abidin Sub-Director of General Planning and Programming, DGWRD
Mr. Sutardi Meng. Ph. D Chief of section for priority setting, DGWRD
Mr. Wahyu Hartomo Head of Sub-Director of Ground Water, DGWRD
Mr. Djoko Santoso Staff Sub-Directorate of Ground Water, DGWRD
- 5) KUPANG Irrigation Project Office, NTT : Tue., January 13, 1998
Mr. A. Hasanudin Project Manager, Timor-Sumba Irrigation Project
Mr. Krisno D. Herwantoko Sub-Project Manager, Timor PAT
- 6) Bupati Kepala Daerah Tingkat II Sumba Timor
Mr. Lukas MB. Kaborang Director
- 7) Pemimpin Bagian Proyek/Pembangunan Irigasi Sumba
Mr. Hastina Zulkarnain Project Manager
- 8) FLORES Irrigation Project Office (PAT), NTT : Wed., January 14, 1998
Mr. Tahjo Widiyanto. BE Sub-Project Manager, Flores PAT
Mr. Inengah Arta Staff, PAT
Mr. Nuwa Videlis Staff, PAT
- 9) KANWIL PU, NTB : Fri., January 16, 1998
Mr. Soenyoto MNRM KANWIL PU, NTB
Mr. Uki Basuki, MSc Project Manager Lombok Irrigation Project
Mr. Komardin Sub-Project Manager, Lombok PAT
Mr. K. Alifi Dipl.HE Staff, Lombok Irrigation Project Office (PIL)
Mr. Wayan Tjenk S. Staff, PIL
Mr. Sutedjo, BSc Staff, PIL
Mr. Soenyoto MNRN Staff, PIL
Mr. Masrukin Staff, PIL
Mr. Iris Juita K. Staff, PIL
- 10) Irrigation Project Office, Sumbawa NTB : Fri., January 22, 1998
Mr. Marsono Assistance of Implementation Guidance, Irigasi
Mr. Djoko Agus Triono Sub-Project Manager, Sumbawa PAT
Mr. A. Kaharkarim BAPPEDA, Sumbawa

4. Minutes of Discussions

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY ON
The Project for Urgent Preventive Irrigation Restoration in the Drought Affected Marginal
Areas
in
The Republic of Indonesia

In response to a request from the Government of the Republic of Indonesia, the Government of Japan has decided to conduct a Basic Design Study on the Project for Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a Basic Design Study Team (hereinafter referred to as "the Study Team"), headed by Mr. Hidetoshi Ishioka, First Project Management Division, Grant Aid Project Management Department, JICA, which is scheduled to stay in the country from January 11 to January 30, 1998.

The Study Team held a series of discussions on the Project with the officials concerned of the Government of the Republic of Indonesia and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets.

The Study Team will proceed to further works and prepare the Basic Design Study Report.

Jakarta, January 20, 1998



Mr. Hidetoshi Ishioka
Leader
Basic Design Study Team,
JICA



Ir. Hendratno Remiel Baswan MSc.
Director of Planning and Programming,
Directorate General of Water Resources
Development (DGWRD),
Ministry of Public Works

ATTACHMENT

1. Objective of the Project

The objective of the Project is to improve living condition of inhabitants by securing domestic and irrigation water in the area suffered serious drought. The requested equipment will contribute to supplement the equipment necessary to develop either surface or groundwater for supplement utility in the drought season.

2. Project Sites

The Project sites are located

- (1) Irian Jaya
- (2) East Nusa Tenggara
- (3) West Nusa Tenggara

These Project sites are shown in ANNEX-1.

3. Responsible and Executing Agencies

The Directorate General of Water Resources Development, Ministry of Public Works (hereinafter referred to as "DGWRD") is responsible for the Project. In East Nusa Tenggara, and West Nusa Tenggara, the Provincial Irrigation Project Offices are responsible for the execution of the Project. And in Irian Jaya, the Water Resources Development and Conservation Project Office is responsible for the execution of the Project.

4. Items requested by the Republic of Indonesia

After discussions with the Basic Design Study Team, the following items were finally requested by the Indonesian side.

- (1) Portable pumps
- (2) Drilling rigs
- (3) Vertical turbine pumps (well pumps).

However, the final components of the Project will be decided after further study.

5. Japan's Grant Aid System

- (1) The Government of the Republic of Indonesia has understood the system of Japan's Grant Aid explained by the Team, as described in Annex-2.
- (2) The Government of the Republic of Indonesia will take the necessary measures, described in Annex-3 for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

6. Schedule of the study

- (1) The consultants will proceed to future studies in the Republic of Indonesia until January 30.
- (2) JICA will complete the final report and send it to the Government of the Republic of

Indonesia by April, 1998.

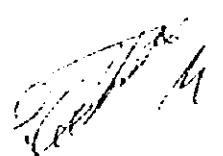
7. Other relevant issues

- (1) The following items requested by DGWRD are excluded.
 - a) Hand tractor with 3" pumps
 - b) Portable water treatment units

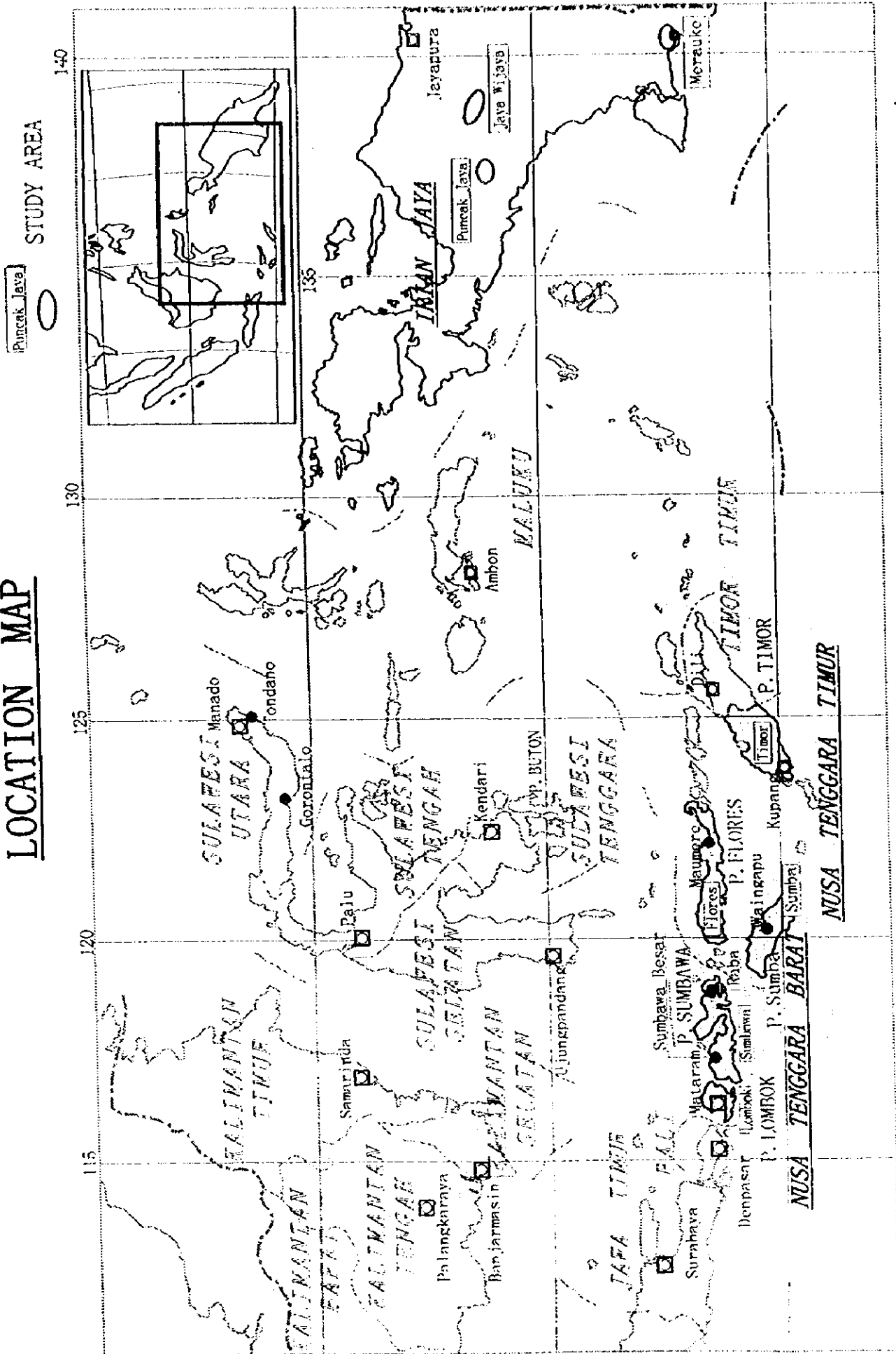
- (2) Accessories and supporting equipment for drilling rigs are requested by DGWRD additionally. The equipment requested by DGWRD consists only drilling rigs without any supporting equipment. But DGRWD expected "drilling rig unit" as same the level as previous project for "Supply of Equipment for Irrigation in eastern Area" including accessory and supporting equipment such as mud pumps, air compressors, cargo trucks and others.

- (3) DGWRD requested the inland transportation cost for portable pumps from Jayapura to Puncak Jaya and to Jaya Wijaya in Irian Jaya to be included in the project cost.

- (4) DGWRD requested counter-part training in Japan by the Technical Cooperation, for the maintenance of provided drilling rigs in this project. The study team answered to convey this request to the related agencies in Japan.



LOCATION MAP



ANNEX – 2 THE SYSTEM OF JAPAN'S GRANT AID

1. Grant Aid Procedures

1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid Project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the Study

The aim of the Basic Design Study (hereafter referred to as "the Study"), conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
- d) Preparation of a basic design of the Project
- e) Estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA select (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA. The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in

accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed. However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting constructing and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality).

5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

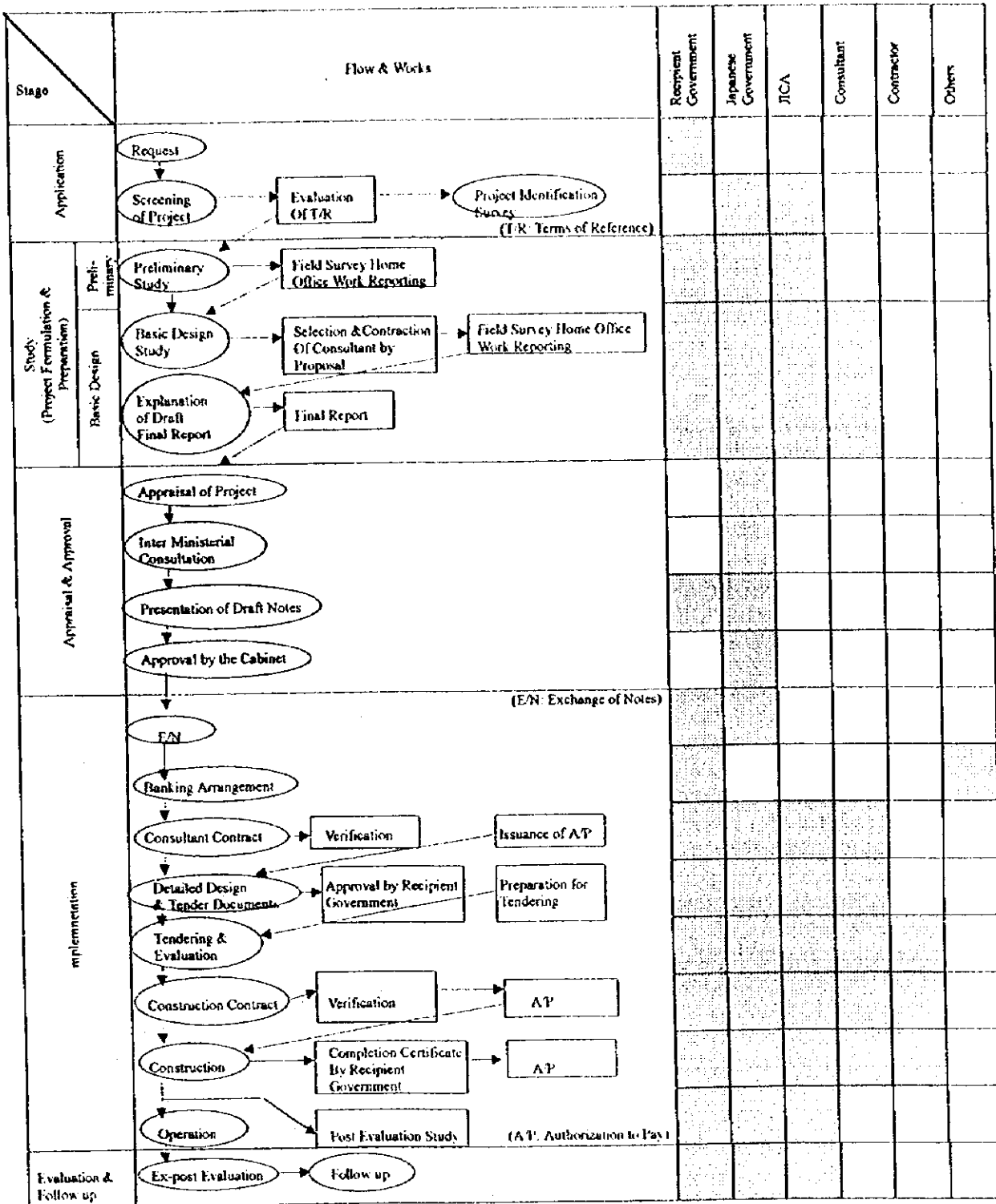
6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid Project the recipient country is required to undertake such necessary measures as the following:

- (1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.

- (2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- (3) To secure buildings prior to the procurement in case the installation of the equipment.
- (4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
- (5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- (6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.
- (7) "Proper Use"
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.
- (8) "Re-export"
The products purchased under the Grant Aid should not be re-exported from the recipient country.
- (9) Banking Arrangements (B/A)
 - a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
 - b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

Flow Chart of Japan's Grant Aid Procedures



Major Undertaking to be taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Site
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13	To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		●

**ANNEX - 3 NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT
OF INDONESIA IN CASE JAPAN'S GRANT AID IS EXTENDED**

1. To provide data and information necessary for the Project.
2. To bear two kinds of commissions to the Japanese foreign exchange bank for its banking services based upon the Banking Arrangement (B/A) namely,
 - the advising commission of the "Authorization to Pay (AP)" and
 - the payment commission.
3. To ensure prompt unloading, tax exemption and customs clearance at the port of disembarkation in Indonesia and prompt internal transportation therein of the materials and equipment for the project purchased under the Grant Aid.
4. To exempt Japanese nationals or a staff from a third country engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Indonesia with respect to the supply of the products and services under the verified contracts.
5. To accord Japanese nationals or a staff from a third country whose services may be requested in connection with supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into Indonesia and stay therein for the performance of their work.
6. To provide necessary permissions, licenses and other authorization for implementing the Project, if necessary.
7. To assign appropriate budget and staff members for proper and effective operation and maintenance of the equipment provided under the Project.
8. To maintain and use properly and effectively the equipment provided under the Project.
9. To bear all the expenses other than those to be borne by the Grant Aid within the scope of the Project.



5. Technical Notes

TECHNICAL NOTE
ON
THE BASIC DESIGN STUDY
ON

The Project for Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas
In The Republic of Indonesia

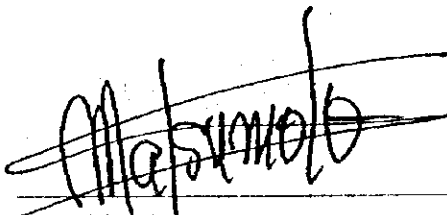
In response to a request from the Government of the Republic of Indonesia, the Government of Japan has decided to conduct a Basic Design Study on the Project for Urgent Preventive Irrigation Restoration in the Drought Affected Marginal Areas (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a Basic Design Study Team (hereinafter referred to as "the Study Team"), headed by Mr. Hidetoshi Ishioka, First Project Management Division, Grant Aid Project Management Department, JICA.

After Mr. Hidetoshi Ishioka; team leader of this Study Team left Indonesia, the Consultant Team; headed by Mr. Shinichiro Matsumoto, Pacific consultants International, continued a field survey at the study area and held a series of discussions on the Project with the officials concerned of the Government of the Republic of Indonesia in accordance with the **MINUTES OF DISCUSSION** dated in Jakarta, January 20, 1998.

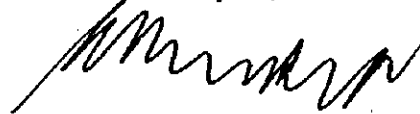
In the course of the discussions and field survey, both parties have confirmed the main items described on the ATTACHMENT-1.

The Study Team will proceed to further works and prepare the Basic Design Study Report based on this Note.



Mr. Shinichiro Matsumoto
Chief Consultant
Basic Design Study Team,
JICA

Jakarta, January 28, 1998



Ir. Hendratno Remiel Baswan MSc.
Director of Planning and Programming,
Directorate General of Water Resources
Development (DGWRD),
Ministry of Public Works

ATTACHMENT-1

RESULTS OF DISCUSSION BETWEEN CONSULTANT TEAM AND DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT (DGWRD)

- (1) The proposed equipment will be used for the objectives that is to improve the agricultural production of the Provinces of Irian Jaya, East Nusa Tenggara and West Nusa Tenggara, which is easily affected by drought.
- (2) The portable pumps are proposed to be used for both of surface water irrigation and groundwater irrigation development.
- (3) The local organization responsible for the proposed equipment and the proposed unloading port are as shown below. The site of Puncak Jaya is excluded from the Project because fuel for operation of the equipment is not available and agricultural practice of irrigation is not practiced at the site.

Province / Site	Equipment	Executing Agencies of the Local Government	Proposed Port for Unloading
Irian Jaya/Jaya Wijaya	P.P	Irian Jaya Water Resources Development & Conservation Project Office in Jayapura	Wamena
Irian Jaya/Merauke	D.R & P.P	Irian Jaya Water Resources Development & Conservation Project Office in Jayapura	Merauke
NTT/Timor	P.P & V.T.P	Timor-Sumba Irrigation Project Office in Kupang	Kupang
NTT/Sumba	D.R, P.P & V.T.P	Timor-Sumba Irrigation Project Office in Kupang	Kupang
NTT/Flores	P.P & V.T.P	Flores Irrigation Project Office in Ruteng	Maumere
NTB/Lombok	P.P & V.T.P	Lombok Irrigation Project Office in Mataram	Mataram
NTB/Sumbawa	P.P & V.T.P	Sumbawa Irrigation Project Office in Sumbawa Besar	Sumbawa Besar

Remarks : D.R=Drilling Rig with supporting equipment, P.P=Portable Pump, V.T.P=Vertical Turbine Pump

(4) Types, Specifications and Number of Proposed Equipment

a) Drilling Rigs

The proposed sites where drilling rigs are to be proquired are Merauke of Irian Jaya Province and Sumba of East Nusa Tenggara Province. In addition to the drilling rig itself including basic accessories, the following supporting equipment are to be included to the Project. The types and specifications will be decided based on the field survey in the consecutive study in Japan.

Merauke : Mud pump, Air compressor, Logging test equipment and 4WD-Cargo truck with crane

Sumba : Mud pump, Air compressor and 4WD-Cargo truck with crane

b) Portable Pumps and Vertical Turbine Pumps

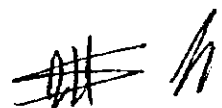
The types, specifications and numbers of proposed portable pumps and vertical turbine pumps will be decided under the discussion with the related agencies of GOJ and the further study in Japan with consideration of following aspects :

- The contents of the request from DGWRD
- The development priority of the sites under the national/regional master plan of the sector
- The irrigation development plan and the groundwater development plan of the organization at site
- The potential water resources able to develop by the Project
- The urgency of water resources development in the site, i.e. the seriousness of the drought impact
- The existing facility to be utilized to the Project such as constructed well without pump installation yet
- The budget preparation of the executing organization for the part of the Project to be implemented by them
- Technical assessment of the proposed equipment
- The proposed operation and maintenance scheme of the equipment

(5) During the discussion, DGWRD requested to the consultant team that;

- a) The equipment made in Japan is requested to the Project due to the quality, applicability of spare parts for existing equipment, the condition of after sales service by local agents, etc.,
- b) Submersible pump shall be considered for deep well as well as vertical turbine pump.

The Consultant Team answered to convey the request to the related agencies in Japan.



ATTACHMENT-2 ATTENDANT LIST

DGWRD

- 1 Mr. Chairil Abdini Abidin Sub-Director of General Planning and Programming,
- 2 Mr. Sutardi Meng. Ph. D Chief of section for priority setting
- 3 Mr. Wahyu Hartomo Head of Sub-Director of Ground Water
- 4 Mr. Djoko Santoso Staff of Sub-Directorate of Ground Water
- 5 Mr. Roehhadi Staff of Sub Directorate of Ground Water
- 6 Mr. Willy Firdaust Staff of Sub Directorate of Ground Water

JICA EXPERT

- 1 Nagata Satoshi GDWRD
- 2 Nakano Minoru GDWRD

CONSULTANT

- 1 Shinichiro Matsumoto Chief Consultant/Operation & Maintenance Plan, PCI
- 2 Gunjiro Ozawa Irrigation Plan, PCI
- 3 Seimi Mochizuki Ground water Development Plan, PCI
- 4 Takayuki Ohno Equipment Plan, PCI
- 5 Kazuhiro Tsuchida Cost Estimate & Procurement Plan, PCI

