附属資料　5.

IESC計画の協力内容に関する水資源開発総局からの提案書

PROPOSAL

IRRIGATION ENGINEERING SERVICE CENTER
(IESC - PROJECT)

JAKARTA, AUGUST 28, 1993

REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

C O N T E N T

IRRIGATION ENGINEERING SERVICE CENTER PROJECT
(I E S C PROJECT)

I. INTRODUCTION

1. Indonesia is an archipelago consisting of about 13,677 islands, of which about 931 or 6.8 % inhabited, located 6° North to 11° South latitudes and 95° to 141° East longitudes.
It has a total area of 9.6 million seq. km., 1.9 million seq. km. of which is land area. The total population according to 1980's census was about 147.5 million people and the population growth is about 2.3 % annually.

Tabel 1. Land Size, Population and Population Density.

Island	Area (seq.km.)	%	Population (mill.)	%	Density Person/seq.km.
Sumatera	473,600	24.7	28.0	19.0	59
J a v a	132,200	6.9	91.3	61.9	690
Kalimantan	539,500	28.0	6.7	4.6	12
Nusa Tenggara	88,500	4.6	8.5	5.7	96
Sulawesi	189,200	9.9	10.4	7.0	55
Irian Jaya	496,500	25.9	2.6	1.8	5
Indonesia	1,919,500	100	147.5	100	77

Source : Statistical Pocketbook of Indonesia 1982.

Since Indonesia is located along the equator, it has a tropical monson climate and the difference between the longest and shortest day is very small though out the islands, hence the duration of sun's radiation is quite uniform. The temperature varies from 20° C to 33° C with an overall average of about 26° C, and average humidity varies from 75% to 85%. Two seasons govern the hydrology cycle. The rainy (wet) season from October to March, and dry season from April to September, with very little variation through out the country.
Annual rainfall ranging from 1,000 mm to 3,000 mm, averaging 2,190 mm or 1,530 mm or 70% of which occur in the 6 month wet season from October to March.
Due to the tropical monson climate, soil in Indonesia tend to be highly laterized. There are two types of soils which are very important to water resources development, i.e alluvial soils cover about 16.8 million hectares or nearly 4% of the total area, and the second swampy soil about 38 million hectares or 9% of the total area.

2. The main staple food crops grown in Indonesia are rice, maize, cassava, and other cereal crops.

Consumption of rice has grown more rapidly than that of other food crops.
Rice is grown mainly during the wet season when the rainfall is adequate for a single crop. However, even in the wet season, dry days without rain could occur, especially during the critical stage of plant growth, and therefore supplemental water supply through irrigation is necessary to ensure optimal yields. During the dry season a second crop could be grown in areas with irrigation facilities depending on water availability.

3. Due to the high population growth and also due the increase in rice consumption per capita, the Government of Indonesia has a high burden in providing the necessary food especially rice. Therefore, efforts in increasing the agricultural product (rice) became a major program in the Development Program of the Republic Indonesia.

4. According to the Law an Water Resources Development, water resources development is the control and administration of water resources, either in their natural state or as exploited by human, and including the natural inoganic riches contained therein.
So, the meaning of water resources development in this law is not only water supply and regulatian to support agricultural purpose. Water supply and regulation to support agricultural purposes is called irrigation.

5. Water resources development cover the utilization and control of water resources ,to fulfil various livelihood required among other are :

   a. Water supply for house hold.
   b. Water supply and control for irrigation.
   c. Water supply for industry.
   d. City flushing.
   e. Electric power generation.
   f. Water quality control.
   g. Transportation.
   h. Fishery.
   i. Flood control.
   j. Land and water conservation.
   k. Swamp reclamation.

6. Because the law on Water Resources Development is simply formulated but complete to cover all aspect of water resources management, in its basic principles it should be supplemented with Subsidiary Law, called Government water management; Government Regulation on Irrigation; Government regulation on Rivers; Government Regulation on Swamp.

From those regulations, it can be summarized as follows :

a. The Government Agency who in charge of water affair is the Directorate General of Water Resources Development, Ministry of Public Works.
b. The main task of the Directorate General of Water Development is :
   1) Development and supply of irrigation water.
   2) Development of swamp area for agriculture.
   3) Development of river basin.
   4) Flood control.
   5) Water supply for house hold.
   6) Water supply for electric power.
   7) Water supply for industry.
   8) Water supply for city flusing.
   9) Water quality control.
c. Arising from the main tasks mentioned above, the Directorate General of Water Resources Development has the following functions :
   1) To formulate technical policies, to give guidance, supervise and license in accordance with policies given by the Minister of Public Works and in accordabce with cuurent government law and regulation.
   2) It can be divided broadly into three functions:
      a) Protection / Conservation;
      b) Utilization;
      c) Development.

7. Irrigation net work in Indonesia could be divided into :
   - Conveyance system and
   - Drainage system
     or
   - Main system comprising of
     - Dam, head work
     - Primary canals/drainage and structures
     - Secondary canal/drainage and structures
   - On Farm system (tertiary system)
     - Tertiary canal/drainage and structures
     - Quaternary.

   Irrigation water management covers management of the irrigation net work and irrigation water.
   Water management activities in the main system and in the tertiary canals is called "Water distribution/ drainage management". While water management in the quaternary canals and application of water to the crops is called "On farm water management".

8. Operation and mantenance of irrigation network in the main system is under the Provincial Government responsibility through the Provincial Public Works Service. While the tertiary system is under the farmers responsibility.

Teble 2. Irrigation Status in Indonesia.

Irrigation Status	Area (ha.)	O & M Responsibility Main system	Tertiary system
Public Works Irrigation	4,387,761	Provincial Gov. Farmer (Prov. P.W.)	(Water Users Association)
Village Irrigation	1,036,613	Farmers/Village Administration	ditto

9. The Provincial Public Works, comprising of the 3 (three) division (Water Resources, High Ways, and Building) is sub divided into Section Offices.
The Provincial Public Works obtain guidance in technical matters from the Ministry of Public Works through the Respective Directorate, and the Ministry's Regional offices in the respective province.

10. For water management in the tertiary system which have to be done by the farmers, the Government has the responsibility to give guidance :
a. Through the Provincial Public Works on design, construction, and maintenance of the system.
b. Through Agriculture Extension Service on water application and the use of the agriculture inputs.

11. To ensure effective and efficient use of irrigation water to support agricultural practices by the farmers, and for the use of irrigation water by different parties, Irrigation Committees are established.
There are two levels of the committee namely Provincial Irrigation Committee and Kabupaten (District) Irrigation committee.
The composition of these committees is as follows :

a. The Provincial Irrigation Committee :

1. The Governor, Head of the Provincial autonomous region as Chairman and member.
2. Chief of Water Resources Development Division of Provincial Public Works, as Secretary and member.
3. Chief of other provincial agency concerned as a member. (such as : Agrarian, Agriculture, Policeman etc.)

b. The District Irrigation Committee :
1. The Bupati, Head of the District autonomous region, as Chairman and member.

2. Chief of Water Resources Development Section of Provincial Public Works Branch in the District, as Secretary and member.
3. Chief of other District agency concerned as a member. (such as : Agrarian, Agriculture, Policeman etc.)

The irrigation coordinating activities usually can be handled by the District Irrigation Committee, because most of the irrigation system are generally located in one District.
Only if an irrigation system is large and its irrigation service area is located in more than one District, problems should be solved at the Provincial Irrigation Committee.

II. WATER RESOURCES STUDY AND IRRIGATION DESIGN GUIDELINES, CRITERIA AND STANDARDS (SID)

2.1. General

Numerous guidelines, criteria and standard are used for the planning, design and construction of irrigation, and drainage, ground water and flood control projects in Indonesia. Documents which provide general guidelines and standard have been prepared for the design and construction of various types of water resources development works. Design criteria manuals have also been prepared for spesific irrigation and flood control projects.

An inventory of existing water resources and irrigation design, guidelines, manuals, and standard document are given in the table. The documents have been prepared or endorsed by Ministry of Public Works (DEP. PU), Directorate General of Water Resources Development (DGWRD) : Directorate of Planning and Programming (DPP), Directorate of Irrigation (DOI), Directorate of Swamps (DOS), Directorate of River (DOR) and Research Institute of Water Resources Development (RIWRD).

The manuals or guidelines for SID which has already developed by the concern institution are sometime difficult to apply in the project site and the results are not appropriate. Some review for this existing manual or guideline and the establishment of the new manual/guidelines are therefore should be made, in order to conduct the SID easily.

Some documents listed in the table 1 are designated as "Standar Konsep Standar Nasional Indonesia" (SKSNI) and "Standar Nasional Indonesia" (SNI), which means that they are the National Standards in Indonesia. SKSNI represents an initial version of SNI. The SKSNI documents are authorized by Minister of Public Works Decree, whereas SNI documents are authorized by Public Works Regulation which by law takes precedence over ministerial decrees.

However the available standards are not covered the whole SID activities in the DGWRD ; therefore the Consultant for the SID usually apply their own standards which are not always appropriated with Indonesian condition. The standards have to be established conducted to the priority as shown on Table SI.2.

2.2 Table SI 1. List of Existing Criteria in the Field of Investigation, Planning, and Design

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
1	Guideline of Water Resources Studies (Pedoman Studi Pengairan or PSA)	March,1985 English		Established by the IBRD's cooperation
1.1	Studies for Water Resources Projects (PSA 001)	ditto	Introduction, Survey and Mapping, Soil and Land Capability, Agriculture, Land and Water Conservation and the Environment, Hydrology, Water Quality, Ground Water, Engineering and Costing, Economic Studies, Domestic and Industrial supplies, Hydro-electric power, Agricultural, Acknowledgements.	DGWRD
1.2	Management of Hydrological Data Collection	ditto	Need for Hydrological Data, The Existing Hydrological Data Collection System, Current Data Limitations, Management Considerations.	DGWRD
1.3	Estimation of Water Availability	ditto	Introduction and Objectives, Activities Sequence for the Assesment of Water Availability.	DGWRD
1.4	Introduction to "Flood Design Manual for Java and Sumatera"	ditto	Background, Estimation of the Mean Annual Flood, Estimation of the T Year Flood.	DGWRD & RIWRD
1.5	Design Floods	ditto	Sequence of Activities for Estimation, An Example for an Irrigation Weir.	DGWRD
1.6	Maximum Recorded Floods in Indonesia	ditto	Introduction, Table and Figure of Maximum Recorded Flood in Indonesia.	DGWRD
1.7	Dam Flood Savety	ditto	Introduction, Dam Flood Savety, List of Dam Details, Spillway Design Floods, Routings and Spillways/Freeboard Details; General Procedures for Ensuring Dam Flood Savety Criteria, Flood Peaks, Flood Routing and Volumes, Free Board.	DGWRD

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
1.8	Land Evaluation for Water Resources Studies in Indonesia	March,1985 English	Background, Stages in Land Evaluation for Irrigation Studies, Calculation of Time Inputs for Land Evaluation Studies, Collection and Review, The Development of Marginal and Problem Soils, Conservation and Management, Land Evaluation, Supervision and Appraisal of Land Evaluation Studies.	DGWRD
1.9	Water Requirements for Sawah Land Preparation	ditto	Background, Calculation and Measurement of Water Requirements for Sawah Land Preparation, Method of Measuring Soil Infiltration Rates in Puddles Soils Conclusion and Recommendations.	DGWRD
1.10	Crop Water Requirements for Padi and Other Crops	ditto	Crop Water Requirement for Padi, Water Requirement for Palawija and Sugar, Water Requirement for Agriculture, Water Quality Requirements for Crops.	DGWRD
1.11	Groundwater Evaluation for Water Resources Projects	ditto	Introduction, General Management, Selection of Groundwater Potential, Assessment of Viability of Groundwater Development Acknowledgements.	DGWRD
1.12	Strengthening Appraisal of Water Resources Studies & Projects List of Contents	ditto	Introductions and Guidelines, Appraisal of Studies, Appraisal of Project, Brief Studies for Appraisal.	DGWRD
1.13	Monitoring and Evaluation for Water Projects	ditto	Introduction, Definitions of Terms used in the Guideline, Conceptual Framework for PME, Procedures, Methodology, Project Completion Report, Institutional Requirements.	DGWRD
1.14	Preparation of Invitation Documents for International Competitive Bids for Consulting Services	ditto	Preamble, Preparation of Invitation Document, Letter of Invitation, Annexes to Guideline.	DGWRD
1.15	Evaluation of Technical Proposal for Consulting Service	ditto	Introduction, Preparation, Evaluation.	DGWRD

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
1.16	Penyusunan Program dan Anggaran Pembangunan Direktorat Jenderal Pengairan (Budgeting and Programming of Directorate General of Water Resources Development)	Maret 1985 Indonesian	Pendahuluan, Penyusunan Program, Penyusunan Anggaran. (Preface, Programming, and Budgeting.)	DGWRD
2	Pedoman Survey Perencanaan Teknis Persungaian (Survey Guideline of River Design)	Indonesian	Pegangan dalam melakukan survey untuk membuat perencanaan teknis persungaian. (Guideline in surveying for river planning.)	RIWRD
3	Pedoman Perencanaan Teknis Pengaturan Alur Sungai (Design Guideline of Embankment Arrangement	Indonesian	Pegangan dalam melakukan survey untuk membuat perencanaan teknis mengenai pengaturan alur sungai. (Guideline in technical planning for river line arrangement.)	RIWRD
4	Pedoman Perencanaan Teknis Pengedalian Banjir (Design Guideline of Floods Control)	Indonesian	Pegangan dalam perencanaan teknis untuk pengendalian banjir. (Guideline in technical planning for flood control.)	RIWRD
5	Pedoman Perencanaan Teknis Pengendalian Erosi (Design Guideline of Erosion Control)	Indonesian	Pegangan dalam perencanaan teknis untuk pengendalian erosi. (Guideline in technical planning for erosion control.)	RIWRD
6	Pedoman Penanggulangan Banjir	Indonesian	Pegangan dalam melakukan pengendalian terhadap bahaya banjir.	DOR

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
7	Guideline on Flood Fighting	1991 English	Guideline on flood control.	DEP. PU
8	Tatacara Perencanaan Hidrologi dan Hidraulik untuk Bangunan di Sungai (Procedure of Hydraulic and Hydrological Design for Structure in the River)	1989 Indonesian	Desain bangunan di sungai (bangunan pemanfaatan, konservasi dan silang) yang memenuhi persyaratan hidrologi dan hidraulik untuk pelestarian dan peningkatan keandalan bangunan di sungai. (Structural design in the river which satisfied the hydraulic and hydrological requirement for structural saving in the river.)	DEP. PU SNI-1724-1989-F
9	Tatacara Keamanan Bendungan (Dam Savety Procedure)	1989 Indonesian	Desain, konstruksi, operasi dan pemeliharaan, serta penghapusan bendungan untuk menjamin keamanan bendungan dan lingkungannya. (Design, construction, operation and maintenance, dam elimination for ensure dam safety and it's environment)	DEP. PU SNI-1731-1989-F
10	Metode Pengukuran Debit Sungai dan Saluran Terbuka (Method of Discharge Measurement of River and Open Channel)	1991 Indonesian	Pengukuran debit sungai dan saluran terbuka, yang tidak terpengaruh arus balik atau aliran lahar pada saat muka air rendah sampai tinggi, yang masih tertampung di dalam alur sungai atau saluran terbuka. (Discharge measurement of river and open channel which not influenced by back-current and lava flow at low water level until high water level, which still in the river and open channel capacity.)	DEP. PU SNI 03-2414-1991
11	Metode Perhitungan Debit Banjir	1991 Indonesian	Metode ini digunakan dalam perencanaan bangunan air untuk menentukan debit banjir rencana yang andal dan terpercaya.	DEP. PU SNI 03-2415-1991

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
	(Method of Design Flood Calculation)		(This method is used in water structure planning to obtain the reliable design flood.)	
12	Metode Pengukuran Debit Sungai dan Saluran Terbuka dengan Alat Ukur Arus Tipe Baling-Saling (Method of Discharge Measurement of River and Open Channel Using Rotor Type Water Current Meter.	1991 Indonesian	Metode dalam mengukur debit sungai dan debit pada saluran terbuka dengan menggunakan alat ukur yang bekerja karena putaran baling-baling akibat arus air. (Method of discharge measurement in the river or open channel using water current meter through measurement of rotor rotation caused by water flow.)	RIWRD SKSNI M-06-1992-03
13	Metode Perhitungan Tinggi Muka Air Sungai dengan Cara rumus Manning (Calculation Method of River Water Elevation based on Manning Equation)	1991 Indonesian	Acuan perhitungan tinggi muka air sungai sepanjang daerah hitungan tertentu dengan cara pias berdasarkan (Calculation of river water elevation based on Manning equation.)	RIWRD SKSNI M-15-1991-03
14	Tatacara Perencanaan Umum Krib di Sungai (Design Procedure of River Crib)	1990 Indonesian	Penanggulangan kerusakan sungai akibat arus dan pelestarian bangunan di sungai. (Avoiding river destruction caused by water stream and structurral maintenance in the river.)	RIWRD
15	Metode Perhitungan Debit Sungai Harian (Method of Daily River Discharge Calculation)	1982 Indonesian	Acuan penghitungan debit sungai harian pada lokasi yang tidak terpengaruh oleh peninggian muka air atau aliran lahar. (Calculation of daily river discharge in the location which are not influenced by water level arising and lava flow.)	DEP. PU SKSNI M-12-1992-03

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
16	Metode Perhitungan Debit Puncak Sungai dengan Cara Tidak Langsung (Method of Maximum Discharge Calculation)	1992 Indonesian	Metode ini dimaksudkan sebagai acuan dalam pengukuran untuk mendapatkan data debit puncak sungai pada lokasi yang tidak terpengaruh oleh peninggian muka air atau aliran lahar. (This method is used as measurement guideline to obtain data of river peak discharge in the locations which are not influenced by water level arising or lava flow.)	RIWRD SKSNI M-13-1992-03
17	Metode Pengambilan Contoh Muatan Sedimen Layang di Sungai dengan Cara Integrasi Kedalaman berdasarkan Pembagian debit (Sampling Method of Suspended Sediment with Depth Integration Procedure Basad Discherge Devision)	1992 Indonesian	Acuan dan pengangan dalam pengambilan contoh muatan sedimen layang di sungai untuk memperoleh contoh air yang mengandung muatan sedimen melayang di sungai (Guideline of sampling of suspended sediment in the river for obtaining water sample which contains load of suspended sediment in the river.)	RIWRD SKSNI M-17-1992-03
18	Tatacara Perencanaan Teknis Bendung Penahan Sediment (Design Procedure of Sedimen Embankment	1991 Indonesian	Perencanaan teknik bendung penahan sedimen yang baik dan berfungsi sebagai mestinya. (Design of sediment embankment which functioning well.)	DOR SKSNI T-19-1991-03
19	Metode Perhitungan Tiang Pancang Beton pada Krib di sungai (Calculation Method of River Concrete Piling)	1991 Indonesian	Acuan desain tiang pancang beton pada krib di sungai yang aman dan berfungsi semestinya. (Design criteria of well functioning river crib concrete piling.)	DEP.PU SKSNI M-14-1991-03
20	Urban Sector Drainage and Floor Protection Study (IUIDP Guidelines for Urban Drainage and Urban Flood Protection).	English	Study about good drainage and low land protection in urban area.	DOR

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
21	Design Guidelines for River Management on Design Guidelines for Surveying	Indonesian & English	River management design guidelines used on design guidelines for surveying.	DEP. PU
22	Irrigation Design Standards, Design Criteria	March,1985 Indonesian & English		DGWRD
22.1	Irrigation System Design (KP 01)	ditto	Collecting Data, Survey, Investigation for Irrigation Design, and Engineering Design.	ditto
22.2	Headwork (KP 02)	ditto	Diversion Structures, Intake and Scouring Sluice, Sediment Trap Design, and Appurtenant Works.	ditto
22.3	Canals (KP 03)	ditto	Unlined Earthen Canals, Lined Canals, Tunnel and Closed Canal, and Drainage Canal Design.	ditto
22.4	Structures (KP 04)	ditto	Design of some Structures.	ditto
22.5	Tertiary Units (KP 05)	ditto	Layout of Tertiary Units, Design of Canals,and Division Boxes.	ditto
23	Irrigation Design Standard, Technical Spesifications	Dec, 1986 Indonesian & English		DGWRD
23.1	Irrigation System Design (PT 01)	ditto	Preliminary Design, Survey and Investigation, and Detailed Design of Irrigation and Drainage Canal, Structures, Headworks.	ditto
23.2	Topographical Survey Survey (PT 02)	ditto	Aerial Photographic	ditto

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
23.3	Geological Investigation (PT 03)	Dec, 1986 Indonesian & English	Geological Mapping, Drilling, Ground Water Measurement Records, Standard Penetration Test, Parker Test and Pressure Test, Sampling of Soil Material, Geo-electric Investigation.	DGWRD
23.4	Hydraulic Model Testing (PT 04)	ditto	Hydrological, sediment, and geotechnical data collection; The Hydraulic Model and Hydraulic Model Test.	ditto
24	Flood Control Guidance	May,1987	Application of flood control.	DGWRD
25	Metoda Pengambilan Contoh Kualitas Air (Method of Taking Water Quality Sample)	1991 Indonesian	Metoda ini dimaksudkan sebagai pegangan dalam pengambilan contoh air di lapangan untuk uji kwalitas air. (This method is as a guideline in water sampling in the construction site for water quality testing.)	DEP. PU SNI 06-2412-1991
26	Metoda Pengujian Kualitas Fisika Air (Testing Method of Water Physics Quality)	1991 Indonesian	Metode ini digunakan dalam pengujian fisika air di lapangan dan laboratorium, untuk memperoleh hasil uji sifat fisika air. (This method is used for water physical testing in the construction site, to obtain water physics test result.)	DEP. PU SNI 06-2413-1991
27	Metoda Pengujian Kualitas Kimia Air (Testing method of Water Chemical Quality)	1990 Indonesian	Metode ini digunakan dalam pengujian kimia air di lapangan dan di laborarium, untuk memperoleh hasil uji sifat kimia air. (This method ia used for water chemical testing in the construction site, to obtain water chemical test result)	DEP.PU SNI 06-2420-1991 SNI 06-2421-1991 SNI 06-2422-1991 SNI 06-2423-1991 SNI 06-2424-1991 SNI 06-2425-1991 SNI 06-2426-1991 SNI 06-2427-1991

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
				SNI 06-2428-1991
				SNI 06-2429-1991
				SNI 06-2430-1991
				SNI 06-2431-1991
				SKSNI M-16-1991-03
				SKSNI M-19-1991-03
				SKSNI M-20-1991-03
				SKSNI M-21-1991-03
				SKSNI M-22-1991-03
				SNI 06-2462-1991
				SNI 06-2463-1991
				SNI 06-2464-1991
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				SNI 06-2497-1991
				SNI 06-2498-1991
				SNI 06-2499-1991
				SNI 06-2500-1991
				SNI 06-2501-1991
				SNI 06-2502-1991
				SNI 06-2503-1991
				SNI 06-2504-1991
				SNI 06-2505-1991
				SNI 06-2506-1991
				SNI 06-2507-1991
				SNI 06-2508-1991
				SNI 06-2509-1991

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
				SNI 06-2510-1991 SNI 06-2511-1991 SNI 06-2512-1991 SNI 06-2513-1991 SNI 06-2514-1991 SNI 06-2515-1991 SNI 06-2516-1991 SNI 06-2517-1991 SNI 06-2518-1991 SNI 06-2519-1991 SNI 06-2520-1991 SNI 06-2521-1991 SNI 06-2522-1991 SNI 06-2523-1991 SNI 06-2524-1991 SNI 06-2525-1991
28	Metode Pemilihan Lokasi Pos Duga Air di Sungai (Method of Selecting the Location of River Water Measurement)	1990 Indonesian	Metode ini digunakan dalam pemilihan lokasi pos duga air di sungai yang tidak terpengaruh oleh aliran yang dapat mempengaruhi kecermatan hubungan antara tinggi muka air dan debit dengan memperhatikan jenis, tipe dan ukuran bangunan pos duga air yang akan dipakai. (This method is used to select the location of water measurement points which are not effected by water stream which influence the relationship between discharge and water elevation in accordance with tipe and dimension of measurement building.)	DEP.PU SNI 03-2526-1991
29	Tatacara dan Persyaratan Ijin Penggunaan Air dan atau Sumber Air (Procedure and Requirement Permit of Water and or Water Sources Use)	1990 Indonesian	Tatacara dan persyaratan untuk mendapatkan ijin dalam penggunaan air atau sumber air seiring dengan usaha kita menciptakan lingkungan yang sehat. (Procedure and requirement permit in water or water sources use in accordance with our healthy environment.)	PERMEN PU

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
30	Kriteria Penetap Sepadan sungai (River Freedom Criteria)			
31	Petunjuk Teknis Analisa Dampak Lingkungan Proyek Bendungan (Guideline of Inveronmental Analysis of Dam Project)			PERMEN PU
32	Tata Cara Penetapan Banjir Desain dan Kapasitas Pelimpah untuk Bendung (Procedure of Estimating Design Flood and Spillway Capacity for Dam)	1992 Indonesian	Tata cara ini dimaksudkan sebagai acuan dalam menetapkan debit banjir desain suatu bendungan untuk menjamin keamanan bendungan, tepi waduk, dan bangunan lainnya terhadap banjir. (This procedure is to estimate design flood to ensure dam savety, reservoir wall, and other structures.)	DEP.PU SKSNI T-04-1992-03
33	Metode Pembuatan Lengkung Debit dan Tabel Sungai/Saluran Terbuka dengan analisa Grafis (Method of Making Discharge Curves and River or Open Channel Tabel by Grafic analysis)	1991 Indonesian	Metode ini dimaksudkan sebagai salah satu acuan dalam pembuatan lengkung debit sungai / saluran terbuka dengan analisa grafis untuk mendapatkan gambaran hubungan antara tinggi muka air dengan debit sungai / saluran terbuka. (This method is one of the procedure in making discharge curves of river or open channel by grafic analysis to obtain the relationship between water elevation and water discharge in the river or open channel.)	DEP.PU SKSNI M-07-1991-03

Continued

Number	Title	Year Published & Language	Content	Remarks Authors/Agency (Regulation)
34	Tatacara Perencanan Umum Bendung (General Design Procedure of Dam)	1991 Indonesian	Tatacara ini dimaksudkan untuk mendapatkan desain bendung yang memenuhi persyaratan hidraulik dan struktur serta persyaratan pelaksanaan secara benar dan aman sesuai pola pembangunan berwawasan lingkungan. (This procedure is to make dam design which satisfied the hydraulic and structure requirement and also satisfied construction and environment requirement.)	DEP. PU SNI 03-2401-1991

2.3 Table SI 2. Criteria that Need to be Established in the Field of Investigation, Planning, and Design

Number	Item	Content	Sequence of Priority
1	Guideline for Investigation Works		
1.1	Topo survey	Aerial photographic.	5
1.2	Geology investigation	Geological data.	1
1.3	Water requirement investigation	Water requirement for paddy and crops.	2
1.4	Soil and pedological investigation	Soil suitability data.	3
1.5	Land consolidation investigation	Land capability. Land consolidation for agricultural needs.	4
1.6	Others	Artificial rainfall by chemical substances, tidal river survey.	6
2	Guideline for the Project Planning		
2.1	Irrigation system for the paddy	Efficient and effective irrigation canal.	3
2.2	Irrigation system for upland	Pumping and micro irrigation for upland.	1
2.3	Drainage system for lowland area	Drainage canal for the lowland area. (see the synopsis)	2
2.4	Small irrigation		6
2.5	Fish pond irrigation		6
2.6	Computerization for inventory program in swamp irrigation infrastructures	Criteria and manual of operation & maintenance.	4
2.7	Guidelines for operation & maintenance environment (RKL & RPL)	Criteria and manual of operation & maintenance.	4

Continued

Number	Item	Content	Sequence of Priority
3	Design standards and its manual		
3.1	Open channel/canal	Lined canal, tunnel, steady and non steady (tidal) flow.	5
3.2	Headworks	Diversion structures, free intake and scouring sluice, sediment trap, appurtenant works, barrage, tyroll, rubber dam, tidal gate.	2
3.3	Reservoir/Dam	Small dam and large dam (earth dam, rock-fill dam, concrete dam), coastal reservoir	1
3.4	Pipe line channel	Manual of pipe line channel.	4
3.5	Pumping station	Manual of pumping station.	3
3.6	Structure for small scale irrigation	Small scale irrigation.	6
3.7	Brackish water for aqua culture	Manual of brackish water.	7
3.8	Others	Micro hydro power on the irrigation system	8

VIII LIST OF EQUIPMENT & BUDGET NEED

8.1 THE FIELD OF INVESTIGATION, PLANNING AND DESIGN.

Number	Discription & Specification	Quantity	Unit Price 3 (Rp.x 10)	Sub Total 3 (Rp.x 10)
1	Water Quality Test Equipment			
1.1	Water Quality Checker EA.440.200	1 set	12.500	12.500
1.2	Spectro photo meter EL525-140	1 unit	43.725	43.725
1.3	Conducto meter EL525-180	1 unit	10.468	10.468
1.4	PH meter EL525-057	1 pcs	4.508	4.508
1.5	Turbidi mtr compleier with accessories (Paquafilter) EL521-013	1 set	39.177	39.177
1.6	Balancer (digital) EL592-543/01	1 pcs	21.246	21.246
1.7	Refrigerator EL548-555/01	1 unit	7.143	7.143
1.8	Do meter EL521-042	1 unit	6.137	6.137
1.9	Water Proof Digital Thermometer EA.520-452	1 unit	16.750	16.750
			Sub Total	161.654
2	Survey Equipment			
2.1	Dig. Vane Anemometer EA.503-060	3 units	7.500	22.500
2.2	Current Meter EL.520-260	10 units	25.226	252.260
2.3	Water Level Recorder EL.520-040	10 units	36.317	363.170
2.4	Hook Gauge & Staff EL.506-250	10 units	8.530	85.300
2.5	Lycimeter	1 set	4.950	4.950
2.6	Standar Rain Gauge EL.502-012	1 set	578	578
2.7	Piezometer EL.514-330	1 set	3.791	3.791

Continued

Number	Discription & Specification	Quantity	Unit Price 3 (Rp.x 10)	Sub Total 3 (Rp.x 10)
2.8	Copper Ring Sampler	1 set	1.650	1.650
2.9	Soil Moisture Tester EL.514-050	1 set	5.021	5.021
2.10	Ordinary Thermometer EA.504-010	20 units	250	5.000
2.11	Portable Soil Thermometer EA.504-024	10 units	200	2.000
2.12	Over Drier Sampler & Cup	1 set	6.325	6.325
2.13	Plate For Scale EL.502/050	1 set	6.404	6.404
2.14	Sampler Extender	1 set	4.125	4.125
2.15	Rollmeter (Stainless Steel)	1 set	825	825
2.16	Survey staff SKT 3 M	1 unit	297	297
2.17	Instrument Distance Meter Sokkia APS 13	2 units	23.760	47.520
2.18	Water Pass (autolevel) Sokkia C40	2 units	3.080	5.160
2.19	Theodolith (Electronic Digital) Sokkia DT4	2 units	22.000	44.000
2.20	Camera	2 units	1.200	2.400
2.21	Drawing Facilities	2 units	10.700	21.400
2.22	Planimeter Unchida/Kens	2 units	913	1.826
2.23	Measuring Tape	2 units	405	810
2.24	Drafting Machine EP 4	2 units	2.979	5.958
			Sub Total	394.270
3	Internal Equipment			
3.1	Personal Computer + Printer - PC Komputer IBM 8530-F31 - Printer 8512 - Visual 4208-022	2	12.000	24.000

Continued

Number	DISCRIPTION & SPECIFICATION	QUANTITY	UNIT PRICE 3 (Rp.x 10)	SUB TOTAL 3 (Rp.x 10)
3.2	Portable PC + Printer 40 MB	2	8.000	16.000
3.3	Facsimile for 22 Provinces Xerox	22	3.000	66.000
3.4	Word Processor	2	5.500	11.000
3.5	Mobile Storage system filling cabinet Elite	1	4.000	4.000
3.6	Filling Cupboard (steel) Daiichi	4	1.000	4.000
3.7	Filling Cabinet (4 drawers) Elite	6	750	4.500
3.8	Working Desk + chair 1,4 x 0,8 m	6	400	2.400
3.9	Typing Desk 0,4 x 0,6 m	4	250	1.000
3.10	Book Selves 1,20 x 2,40 m	6	1.000	6.000
3.11	Over Head Projector Direct Priject OP - 10	1	6.500	6.500
3.12	White Board	2	150	300
3.13	Stabilizator Izumi 500 VA	3	650	1.950
3.14	Retrix Filling AP.9000	6	40.000	240.000
3.15	Filming Photo Processing	1	20.000	20.000
3.16	Filming Reader Printer A2	1	80.000	80.000
			Sub Total	487.650
		T O T A L		1.543.574

2.4. Synopsis of Drainage Canal for the Lowland Area.

A prime requirement for succesfully irrigated agriculture is the development and maintenance of a soil zone in which the moisture-oxygen-salt balance is favorable for plant growth. Plants require both moisture and oxygen to live. When a saline water table rises and remains in the root zone longer than about 48 hours, resulting in an abnormally high saline moisture condition, agricultural production is usually seriously affected.

The presence of oxygen in the interstices of the soil in the root zone is as necessary as water for both seed germination and plant growth. The oxygen content of soil is governed by the rate of diffution of oxygen through the soil pores. Also, the oxygen content is markedly affected by the moisture content of a soil. Soils with initially low moisture content normally can be expected to have relatively open pore structures between soil particles, allowing oxygen to freely permeate through the interstices. As the moisture content increases, air in the pores is displaced by water, thus forcing the air upward and subsequent expulsion to the atmosphere. However, once the oxygen has been expelled, the oxygen content recovery rate is extremely slow in a soil that is in transition from a moist or wet state to a drier state. This is because of the inherenly slow rate of diffusion of gases through such soils and the phenomenon of capillary stresses which develop in soils when the water content does not completely fill the voids., The proper balance between soil moisture and oxygen is maintained to a considerable extent by adequate drainage.

A simple but comprehensive definition of adequate drainage is the removal of excess water and salt from the soil at a rate which will permit normal plant growth. Adequate drainage also may be defined as the amount of drainage necessary for agriculture to be maintained succesfully and perpectually . This does not , however, necessarily imply complete and perfect drainage. Such is generally not feasible because the cost of preventing occasional damage to crops may not be justified solely by the amount of the damage. The aspect of economic justification must then be reconciled. The prime objective should be to design and construct a drainage system which has optimum integration of soils, crops, irrigation, and drainage.

Drainage can be either natural or

artificial. Most lands have some natural survace and subsurface drainage. When natural drainage is inadequate to handle the water reaching the land by either natural or artificial means, manmade or so-called "artificial" drainage is required. Artificial drainage thus fills the gap between that provided by nature and the established need. This is ussually done by supplementing existing natural systems. For example, natural watercourses can be deepened or, where no suitable ones exist, new watercourses can be constructed. Almost every physical aspect and condition of lands, as well as man's potential agriculture use of them, will affect the ultimate drainage requirement. In humid areas where salt movement into the root zone is not a problem, shallow, closely spaced drains provide for a rapid lowering of the water table in the spring, permiting earlier preparation of seedbeds and earlier planting. In arid irrigated areas , the water table is ussually lowest in the spring and starts rising as a result of the snowmelt, spring rains, and early irrigations. This rising water table can be saline, and if allowed to permeate into the root zone , both seed germination and plant growth will be affected. Drains in arid areas must be designed deep enough and spaced close enough to provide sufficient head midway between drain to move the ground water to the drains without allowing the ground water to rise into the root zone at any time during the growing season. Capillary rise of salty ground water into the root zone during the growing season usually does not occur under good irrigation practices. Regulated irrigations and the resulting deep percolation are frequent enough to keep the root zone soils leached of salt and also provide sufficient moisture content to prevent appreciable upward capillary movement.

The term "soil" in this synopsis is loosely used to denote that part of the Earth's mantle above bedrock and includes the materials defined by the soil scientist as soil, subsoil, and substrata.

III. OPERATION AND MAINTENANCE (O&M)

3.1. General

3.1.1. Government Policy on Operation and Maintenance of Irrigation Systems.

a. Water resources development, especially in the field of irrigation, both new construction and rehabilitation, within the context of increasing food production by the Government of Indonesia has already been carried out with satisfactory results. Such investment have Primalily been financed from the GOI (rupiah) budget and foreign assistance.
The completion of construction is followed by the next stage of management and care of the irrigation systems through what is commonly knows as operation and maintenance (O&M).

Operation	consists of activities to optimize the utilization of the irrigation infrastructure.
Maintenance	consists of activities to care for the infrastructure, so that it can function as desired for operation and retain also a neat and tidy appearance.

Both activities should be carried out continuously, and supported by adequated budget, skilled personnel and proper facilities for their efficient implementation, as well as to aim for increased quality of intensified agricultural food production.
Irrigation development during Pelitas I to IV concentrated on rehabilitation (repair and improvement) of existing system and construction of new schemes.
During the letter part of Pelita IV and approaching the begining of Pelita V, the time has come to give greater emphasis to O&M activities.

b. According to Water Law of the Republic of Indonesia No.11, Year 1974, Section 12 and Government Regulation of The Republic of Indonesia No.23, Year 1982, about Irrigation, Section 35 para (2), the budget for O&M of irrigation networks and related structures and facilities should be borne by the Provincial Government.

Recognizing that Provincial Governments were still unable to provide the required budget for O&M, the Central Government has, since the fiscal year 1974/1975 provided subsidies for irrigation O&M through INPRES DATI I (APBD).

Since 1984/ 1985 some particular irrigation areas which are considered most vital and have been rehabilitated receive Operation and maintenance (O&M) funds directly from the Central Government through the APBN. This policy has been applied because the O&M funds subsidized by the Central Government through the Inpres Dati I usually cannot reach timely the irrigation service office incharge of irrigation O&M, beside the fact that those funds usually insufficient. The inadequate O&M budget, personnel, equipment and facilities will lead to rapid deterioration of the condition of the irrigation systems and affect their performance thus reducing food production, especially rice.

c. The problem which is now encountered is how to provide adequate O&M budget in accordance with actual needs of each irrigation system; this will necessitate an increase in the budget to be provided for O&M.
It is necessary to mobilize new sources other than the present Central Government allocation, in the effort to increase the O&M budget, namely :

1) From Real Property Tax (PBB)
This may not be a dependable source, because the revenues from PBB are required for regional and local development, especially in District level.

2) From the beneficiaries of irrigation development in the form of an "Irrigation Service Fee".
The immposition of a fee is in keeping with Water Law No.11/1974, section 12 and Government Regulation No.23/1982, Section 35, para (3).
This is more appropriate and dependable source since it will be collected solely for meeting the O&M budget.

d. Besides mobilizing the sources mentioned in para c above, especially for smaller system with an area of less than 500 ha, the responsibility for O&M maybe entrusted to the Water Users Association.

This is posible, because there are already a large number of such systems managed by the villagers, designated as village irrigation or communal irrigation systems. In this way, the responsibility assumed by the community can be further developed, while reducing the number of schemes managed by the Government and more attention can be paid to large and medium scale systems which cannot be managed by the community.

e. By the end of 1987, the Government has formulated a set of policies which address six fundamental issues related to the financing of O&M and other expenditure in the irrigation subsector.

These Government Policies are ':

1) Funding of Operation and Maintenance;
Government recognized that one of the reasons for present inadequacy of O&M is the shortage of funds.
Future policy to ensure efficient O&M will require greater funding.' In addition, it is recognized that in order to realize the full potential of irrigation systems and to maximize the contribution of existing investments to agricultural production goals, expenditure on O&M will be applied in line with the actual needs of irrigation systems.
One of the objectives of this policy is that within a certain period of time, to gradually turn over the government irrigation systems of less than 500 ha each to the WUAs. As a first step, over the period of Repelita V, government irrigation systems less than 150 ha in size would be turned over to WUAs.

2) Cost Recovery for Operation and Maintenance;
Under present circumstances, the Government will not consider recovering from beneficiaries the capital investment costs of irrigation facilities. The beneficiaries will gradually finance O&M costs of main irrigation systems.

3) Irrigation Service Fee;

In order to directly recover the O&M costs from irrigation beneficiaries in relation to the benefits they receive from a regular

and assured supply of water, Government will introduce a mechanism of collection from the beneficiaries which will be established after a Pilot Scheme period. The ultimate mechanism might be through Irrigation Service Fee or other scheme which are expected to gradually reduce the need for Government funding subsidies and become the main source of efficient O&M budget for main irrigation system.

4) Institutional Development;
Government recognizes critical importance of effectively carrying out irrigation O&M, and will implement effective measures and reforms to strengthen O&M institution at all levels. This will be done to create adequate institutional capacity for improving the performance of the existing irrigation infrastructure and efficient utilization of increased O&M allocation, in order to continue to provide adequate irrigation service and reliable water supplies to farmers.

5) Programming and Budgeting for O&M;
Government will simplify and rationalize the present budget mechanism for O&M funding, by reducing the number of funding channels and improving O&M budget planning and administration.

6) Rationalization of Investment.
Government will rationalize expenditure programs in the irrigation subsector, and formulate and implement a more realistic irrigation investment strategy for Repelita V.

3.1.2. Water Management.

Operation and Maintenance in a narrow context means regulation of gates and control structures to tap water from its resources, distributing into canal systems and plots of rice field and subsequently drains out excess water into drainage canals.
In an extensive context operation of irrigation systems is water management i.e. integrated process of water in taking from its resources by controlling, measuring, distributing in the canals systems and drains out of water excess in a rational manner so as to :
- use an utilize available water effectively and efficiently;

- equitably distribute available water;
- distribute water into plots of rice fields according to crop growth (at the right time, quantity, and method); and
- evoid possible negative impact caused by water.

If we have a look towards agricultural aspects, hence water management is efforts to control water in such a way in order to make a proper combination amongst water and soil nutrition so that it is appropriate for crop growth to yield maximum production :

a. Golongan System.

Historical irrigation practices in a particular irrigation system, combined with the results of a water balance calculation, often indicate the need to subdivide an irrigation system to reduce water demand at the start of the wet season when large amounts of water are needed for land preparation for rice cultivation. This system of subdivision is called the golongan system; each golongan generally has about the same area and water supply to each golongan is introduced sequently to spread the planting dates and reduce peak water demand.
Where the source of water availability is become a constraint during the early stages of the wet season cropping, an irrigation area should be divided up into 3-5 golongans. However, it is recommended that if at all possible no more than three golongans are used, because with greater numbers, administration of the system becomes more difficult and land preparation times at the start of the wet season are lengthened.

The main advantages of the golongan system are as follow :

1) Reduction in peak irrigation requirements.
2) Demand for irrigation water can be better adapted to the available water supplies.
3) Better use is made of available manpower and animal power for land preparation.
4) The golongan system gives an instrument by which water distribution can be alternated each year (see below).
5) During the dry season only part of an area is permitted to grow rice officially. The golongans can serve as a basis for deciding which area receives the available supplies.

To establish a golongan system successfully, it is nesessary that the following minimum requirements are met :

1) The main system, should function properly without major losses.
2) Tertiary units are independent of each other for irrigation water supplies i.e each tertiary is able to offtake directly from the main system.
3) continous supervision of the diversion and offtake structures is provided.

The golongan system, where possible, should be practiced at tertiary level and rotation by primary or secondary canals should be avoided so that all main system canals carry some part of the available water supplies. In order to achieve this the scattered system of golongan subdivision is recommended even through it requires more vigilance and supervision on the part of the Irrigation Service field staff. However, until field staff have had experience in implementing the golongan system the vertical or horizontal golongan division should be practiced.
Golongan should be permanently demarcated. If possible they should initially be decided during the preparation of designs foe new schemes, rehabilitation, upgrading or special maintenance. Golongan baundaries should be chosen following consultations between the designer and Irrigation Service staff at the Cabang and Ranting Dinas levels. The boundaries should be confirmed by the Cabang Dinas following further discussion with the Pengamat and P3A groups and the divisions should then be endorsed by the District Irrigation Committee.
For schemes not included in design and implementation programs such as the WJIP and ISSP the Pengamat should recommend golongan boundaries to the Cabang Dinas following discussion with the P3A groups concerned, and the agreed division should then be endorsed by the District Irrigation Committee. Where irrigation systems cover more than one Ranting Dinas, golongan should initially be proposed by the Cabang Dinas.

b. Rotation of Golongan.

If an irrigation system is divided into 3-5 golongan subdivisions the water should be distributed each year in fixed rotation in

order that the farmers in each golongan have the same chance for early planting of the first rice crop. Rotation of golongans in this way will allow equitable distribution of available water and give farmers in all parts of the area the same advantages and disadvantages of early cropping during the year by year cycle.

An example of a suitable rotation for a 3 golongan system is presented in Table 5.

Table 5. Typical Golongan Rotation

Date Water Provided for Land Preparation	YEAR Year 1	Year 2	Year 3	Year 4
15 October	A	B	C	A
1 November	B	C	A	B
15 November	C	A	B	C

A,B and C = Golongan

c. Rotation in Water Distribution Planning and Implementation.
During periods of water shortage, whether in the wet or dry season, it is recommended that a system of water rotation be implemented. Rotation of the water supply is often required when the continuous discharge in a canal system is low compared with the design capacity. This cause high water losses and increased irrigation times. Rotation of the water supply can be beneficial as a means of conserving the water supply and reducing the time needed for irrigation.

The principle behind the rotation system at times of water shortage is that losses are reduced if a larger discharge is put down a canal for a shorter time. In addition, with larger discharges farmers are able to irrigate their crops more quickly because the available supply will cover a wider area in a shorter time.

It has been suggested that the basis for deciding when to introduce rotations should be the design discharge of a system. Using this method rotation would start when the available discharge in a canal falls below 70% of design discharge.

However, it has been found that canals normally operate at around this level and current design criteria recomend that both canals and structures should be designed to operate at 100% and 70% of design discharge. Thus if rotations commence at 70% of design discharge rotation pro-cedures would be investigated for most of the year. This is obviously inefficient and it is therefore recommended that Factor "K" be used as the basis for deciding when to implement rotation procedures.
Factor "K" is calculated as the ratio of the available water supplies to the irrigation water requrements. It therefore appears to be a sound basis on which to introduce rotation because if irrigation requirements are higher than the supplies, Factor "K" will be less than unity. The decision of when, to start rotation will depend on the value of "K" above which no rotation is required. It is recommended that this value of "K" should be taken as 0,7 i.e. available supplies can fall to 70% of requirements before rotations are introduced.

Various levels of rotation are possible summarized as below :

1) Rotation at quarternary level.
2) Rotation at tertiary level.
3) Rotation at secondary level.
4) Rotation at primary level.

Logically, operation will be easier and crops will suffer less if rotation is kept at the lowest possible level of the canal system. It is recommended that rotation of supplies be confined to within the tertiary units at the quaternary level or by rotation of the tertiaries. Rotation of secondaries should only be considered in cases of a drastic reduction in supplies.

The following criteria are proposed :

1) Supplies to tertiary units should be maintained at a minimum of 20 l/s if at all possible and canals should be rotated to ensure this figure is available.

2) Quarternary canal rotations should be implemented when supplies fall into the range 50-70% of required discharge (i.e.K = 0.5 - 0.7).

3) Tertiary rotation should be implemented when supplies are 25-50% of required discharge (i.e.K = 0.25 - 0.5).

4) Secondary rotation should be implemented when supplies fall to less than 25% of required discharge (i.e.K < 0.25).

Quaternary level rotations are usually organized by the farmers and P3A group within a particular tertiary unit. Tertiary rotation is the commonest form of rotation, whilst secondary and primary rotation is only practiced in extreme water short periods. The latter three categories are the responsibility of the Irrigation Service.
The practical aspects of implementing rotations are not easy and are open to abuse. Very strict control by the field staff is necessary and strong P3A groups are required. It is common in water short periods for farmers in the lower reaches of canals to suffer the most. Within tertiary blocks cooperation between farmers can be good. However, between respective tertiary blocks it is more difficult as the farmers are often from different villages. The introduction of any system of rotation, therefore, requires the full knowledge and cooperation of the P3A groups if it is to be successful. Failure to obtain their agreement will simply result in damaged structures and frustrated farmers who will lose respect for the Irrigation Service.

3.1.3. The Existing Agricultural Area.

The Existing agricultural area (paddy field) in Indonesia up to the last Five Year Development Plan (Pelita V)/ the First longterm Development Plan (PJPT II) is as follows :

Number of scheme : 20.416

a. Technical Irrigation	4091	=	2.708.649 ha
b. Semi Technical Irrigation	4841	=	1.133.720 ha
c. Simple Irrigation	11484	=	698.570 ha
d. Village Irrigation		=	900.000 ha
e. Swamp		=	1.098.722 ha
f. Rainfed		=	3.700.000 ha
T o t a l		=10	.139.661 ha

The most problem which is hampering in the site is the low irrigation efficiencies as approximately 50%.

This problem is occur so far due to the following :

1. Physical Condition;
2. In adequate O&M Personnel;
3. In adequate O&M Manual;
4. In adequate Irrigation Facilities and Budgeting.

The Existing guidelines in the field and guideline/Technology that need to be established of O&M are as follow :

3.2. EXSISTING GUIDELINES IN THE FIELD OF O & M

DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

NO	T I T L E	YEAR PUBLISHED	C O N T E N T	REMARK
1	2	3	4	5
1	O&M Of Head Work.	1974 Apr.	- Operation Procedure - Inspection. - Maintenance and Rehabilitation.	
2	O & M Guidance of Logung Irrigation.	1990 Jun.	- Operation Method of Irrigation facilities. - Maintenance Procedure. - Special Condition. - Organisation. - Monitoring. - Budget Allocation Method	
3	Guideline of Operation Prosedure.	1991 Jun.	- Collecting data of Hydrologi. - Tentative Schedule of Plantation. - Water Distribution Plan. - Monitoring and Evaluation. - Management.	
4	Water Distribution Plan.	1992 Mar.	- Water distribution plan. - Form of water distribution. - Prosedure of water distribution.	Draft.
5	Guideline of : - Corp plan, - Group plan, - Water Distribution plan.	1992 Nov.	- Corp plan. - Group plan. - Water Distribution Plan.	Draft.
6	Guideline of Pumping Irrigation System.	1993 Jan.	- Data Collection. - Tentative Schedule of Plantation. - Water Distribution Plan. - O&M of Pumping. - Monitoring and Evaluation. - Management.	Draft.

1	2	3	4	5
7	O & M Methode Of Headwork. (Weir)	1993 Mar.	- Description. - Technic Standards. - Manual of O&M.	Trial of Applied in Site (Published by CGSC, Bekasi.
8	O & M GUIDANCE OF: - Sampean Dam. - Seuseupan Headwork, West Java. - Kelambu Kanan Irrigation Central of Java.		General : - Description. - Technical Data. - Organisation. - Facilities. - Manual of O&M.	
9	O & M MANUAL OF : - Argoguruh Headwork, Lampung. - Jatimlerek Headwork, East Java.		General : - Description of Facilities. - Guideline of Power Plan Use. - Manual of O&M of Gate. - Manual of O&M Turbine.	
10	GUIDANCE OF SURVEY FOR O & M : - Special Maintenance of Central of Java Irrigation. - Simple Prosedure of Operation, South Sulawesi. - Investigation and Design of Laeordi Irrigation, North Sumatera.		- Introduction. - Organisation of O & M. - O & M Manual.	
11	FLOOD CONTROL GUIDANCE.	1987 May.	Aplication of flood control.	
12	O & M OF RIVER.	1993 Mar.	Implementation of Goverment Law No. 35/1991.	Proposal Concept.
13	MANUAL FOR GATES OPERATING AND MAINTENANCE.			
14	MANUAL FOR CANALS MAINTENANCE.			
15	HANDBOOK FOR O&M SUPERVISORS.			
16	HANDBOOK FOR O & M JURU PENGAIRAN.			

1	2	3	4	5
17	GUIDELINES FOR M & E.			
18	PEMBAGIAN WILAYAH SUNGAI.			PERMEN PU 39/1989.
19	PENGELOLAAN KAWASAN LINDUNG.			KEPPRES RI 32/1990.
20	PENGELOLAAN ATAS AIR DAN SUMBER AIR.			PERMEN PU 48/1990.
21	PENGAMANAN SUNGAI DALAM HUBUNGAN DENGAN PENAMBANG BAHAN GALIAN GOLONGAN C. AN C.			KEPMEN PU 458/1986.
22	JUKLAK BUTIR 1.			KEP.DITJEN AIR 187/1986
23	JUKNIS PENYUSUNAN PIL UNTUK KEGIATAN PENAMBANG BAHAN GALIAN GOLONGAN C.			RAPERMEN RAPERMEN P & E.
24	PENGENDALIAN PENCEMARAN AIR.			PP 20/1990.
25	PENGENDALIAN MUTU AIR PADA SUMBER AIR.			PERMEN PU 45/1990.
26	METODE PENGAMBILAN CONTOH KUALITAS AIR.			SK SNI M-02-1989F.
27	METODE PENGUJIAN KUALITAS FISIKA AIR.			SK SNI M-03-1989F.
28	METODE PENGUJIAN KUALITAS KIMIA AIR.			SK SNI M-10-1990F. SK SNI M-11-1990F.
29	METODE PEMILIHAN LOKASI POS DUGA AIR DISUNGAI.			SK SNI M-01-1990F.
30	METODE PENGUKUR DEBIT SUNGAI DAN SALURAN TERBUKA.			SK SNI M-17-1989F

1	2	3	4	5
31	TATA CARA DAN PERSYARATAN IJIN PENGUNAAAN AIR DAN ATAU SUMBER AIR.	1990	Water Use and water resources regulation .	PERMEN PU 49/1990.
32	JUKLAK BUTIR 1.		Implementation prosedure guidance.	Menunggu penetapan.
33	PENETAPAN SATUAN KERJA YANG MENANGANI PERIJINAN PENGGUNAAN AIR DAN SUMBER AIR YG MENJADI WEWENANG MENTERI PU.		Ministry of Public Work decree for water resources development.	- sda -
34	KRITERIA PENETAP SEMPADAN SUNGAI.			
35	JUKNIS AMDAL PROYEK P3PS.			PERMEN PU
36	JUKNIS AMDAL PROYEK BENDUNGAN.			PERMEN PU
37	TATA CARA KEAMANAN BENDUNGAN.			SNI NO. 1725-1989F
38	Second Swamp Reclamation Project (4 Provinces/18 schemes)	1985	Feasibility study of upgrading existing swamp schemes.	DOS
39	Second Swamp Reclamation Project (2 Privinces/3 schemes)	1986	Detail Design of upgrading of existing swamp schemes.	DOS
40	Integrated Swamp Development Project (SID) 3 Provinces	1990	Feasibility Study of integrated Development of 120.000 Ha Existing swamp schemes.	DOS
41	Telang saleh Agriculture Development Project, Srush Sumatera	1989	Feasibility study and design of upgrading Telang saleh schemes.	DOS
42	Fisheries support services Project, (3 Provinces)	1990	Engineering design of shrimp pound water supply improvement.	DOS

3.3. GUIDELINE / TECHNOLOGY
THAT NEED TO BE ESTABLISHED IN THE FIELD OF O & M.

NO.	I T E M	C O N T E N T	SEQUENCE OF PRIORITY
1	2	3	4
1	Diversion structure.	- technical data of structures - technaical condition. - manual of O&M.	1
2	Measuring Devices.	- general description. - technaical condition. - prosedure of O&M. - prosedure of report.	1
3	Pumping Station.	- technical description. - water use management. - materials and equipment. - manual of O & M. - budget (materials, equipment, sallary and other).	1
4	Canals and facilities.	- scope of O&M and criteria. - O&M methods. - water use management. - budget.	1
5	Guidelines for improvement of water management facilities.	- organization and each job description. - implementation program. - facilities of management. - training of staff.	2
6	Guidelines and technologies for water management.	- as built drawings of each facilities. - technical specification. - regular inspection and report - evaluation and recommendation for O&M.	2
7	Water pollution for water management.	- general condition. - data collection. - equipment of O&M. - operation cost. - squence of work. - operation method. - disposal area or others.	2

1	2	3	4
8	Standardisation for maintenance equipment in swamp Irrigation.	- Creteria of O & M. - Manual of O & M.	3
9	Guidelines for standard O & M organization.	i d e m	4
10	Guideline O & M for aqua culture.	i d e m	4
11	Guideline O&M for treecrops.	i d e m	4
12	Guidance Support for river maintenance.	i d e m	4
13	Inventory of river and its facilities.	i d e m	4
14	Pollution measurement method of river.	i d e m	4
15	Plan criteria of river capacity.	i d e m	4
16	Code of land use of river area.	i d e m	4
17	Analysis of river fee estimation.	- Item of fee - Unit price calculation	3
18	Transportation.regulation use of river.	- Transportation condition - manual of O & M	5
19	Damage criteria and solve of river.	- Criteria damage - Solve manual	3
20	Safety dam evaluation method. tion method.	- Manuals of investigation - Evaluation method - Recomondation	3
21	The specification of river maintenance.	- Specifications	3
22	Analysis of maintenance cost of river.	- Item - Data need - Calculation method	3
23	Evaluation method of river structure condition.	- Technology condition - Data collecting method	6
24	Guidance of flood control operation.	i d e m	4

1	2	3	4
25	Guidelines of O&M for Irrigation Scheme.	- Description. - Net work. - Hidrology data. - Design data. - Design of operation. - Design of maintenance. - Organization. - Facilities of O & M. - Equipment of O & M.	1
26	Guidelines of O & M for Head work (Barage).	- Introduction. - Operation of the service spillway. - Operation of the Irrigation Facilities. - Monitoring of barrage performance. - Maintenance of the Barrage.	2
27	Guidelines of O&M for Gate.	- Description. - Operation of undersluice. - Operation of inlet gate. - Operation of Romyn gate. - Operation of sliding gate. - Continous Maintenance. - Occasionally Maintenance. - Emergency Maintenance.	2
28	Guidelines of O & M for Dam/ Reservoir.	1 Preparation. 2 Operation. - undersluice flow. - intake gate and trashrock. - valve. - outlet. - control valve. - a float. - others. 3 Inspection. - continous. - general. - equipment. - discharge. - earth dam. - spillway. - others.	1

1	2	3	4
		4 Maintenance. - equipment of hydromechanic - instrumentation - pipe - bench mark (BM) - Filling soil - spillway - others.	
29	Guidelines For the improvement of water management facilities.	- Description - Basic consep - Manual operation - computer network.	5

IV. REHABILITATION AND UPGRADING (R & U)

4.1. Background.

In an attempt to maintain and upgrade servicibility of the irrigation facilities, it is necessary to rehabilitate or to upgrade the existing irrigation infrastructures to optimize its utilization.

Rehabilitation is to restorate the system to the original performace.

Upgrading is to improve the system to attain a certain serviceability or technology to a higher level condition.

The rehabilitation and upgrading a large number of irrigation networks has already conducted in the First Long Term Development Plan (PJPT I), such as shown in the List of Existing Reference Book for R/U.

In the coming Long Term Development Plan (PJPT II), which will be started in 1994/1995 fiscal year, the rehabilitation works and upgrading of the irrigation infranstructures will be continually conducted, in accordance with the Government policy as to maintainfood self sufficiency.

Nowdays, the rehabilitation works are implemented to the poor irrigation networks caused by inadequate O & M budget, method and personnal. It's necessary O & M budget in the future will be provided, decreasing of irrigation facilities service will be less (longer). Due to life time, rehabilitation is needed. Therefore to determine when and what condition, the rehabilitation should be done, guidelines are required.

4.2. TABEL RU 1. EXISTING REFERENCE BOOK FOR REHABILITATION AND UPGRADING (R/U).

NO	T I T L E	YEAR PUBLI SHE	C O N T E N T	REMARK
1	2	3	4	5
I	Cirebon Irrigation Rehabilation Project.	1973 Feb.	Feasibility study Report Rehabilitation Irrigation net work.	Ministry of Public Work, DGWRD.
II	Rehabilitation & Improvement irrigation Project Lampung.	1983/ 1984	Special condition of rehabilation work irrigation "Way Andak" weir.	DPU Lampung Province.
III	Executive Summary Rehabitation and Improvement Central Java Irrigation System Citanduy Project.	1979	Rehabilitation & Improvement irrigation system of Citanduy Project.	Sanyu Consultan International.
IV	Inventory of Irrigation System (I S I)	1989	Recapitulation the condition of irrigation net work in Indonesia.	C G S C
V	Rehabilitation and Up Grading irrigation Project.	1980/ 1981		
1	Aceh Utara - Aceh Barat.	"	Rehabilitation/Improvement Irrigation net work on area 23.500 Ha.	D O I DGWRD Ministry of Public Work.
2	Simalungun Irrigation on Project.	"	Rehabilitation and Up Grading Irrigation net work on area 50.000 Ha.	"
3	Gambar Sari - Pesanggrahan.	"	Rehabilitation and Up Grading main system Irrigation net work and tertiary area 5.500 Ha.	"
4	Serayu Irrigation.	"	Rehabilitation and Up Grading main system Irrigation net work and tertiary area 1.500 Ha.	"

1	2	3	4	5
5	Semarang Barat.	"	Rehabilitation and Up Grading Irrigation net work on area 19.418 Ha.	D O I DGWRD Ministry of Public Work.
6	Waru Jayeng-Turi Tunggorono Irrigation on Project.	"	Rehabilitation and Up Grading Irrigation net work on area 23.000 Ha.	"
7	Delta Brantas Irrigation Project.	"	Rehabilitation and Up Grading Irrigation net work on area 40.000 Ha.	"
8	Tukad Ayung Yeh Ho Irrigation Project.	"	Rehabilitation and Up Grading Irrigation net work on area 14.000 Ha.	"
9	Sumba Irrigation Project.	"	Rehabilitation and Up Grading on main system Irrigation net work.	"
10	Kalimantan Irrigation Project.	"	To increase the irrigation area 4.800 Ha.	"
11	Lombok Selatan Irrigation Project.	"	Rehabilitation and Up Grading on main system Irrigation net work.	"
12	S Jeneberang Irrigation Project.	"	Rehabilitation and Up Grading Irrigation net work on area 24.000 Ha.	"
13	Tabo - Tabo Irrigation Project.	"	Rehabilitation and Up Grading Irrigation net work on area 11.538 Ha.	"
14	MBay - Lembor Irrigation Project.	"	Rehabilitation and Up Grading Irrigation net work and tertiary area 2.300 Ha.	"
15	Embung Irrigation Project.	"	Rehabilitation and Up Grading on main system Irrigation net work.	"

4.3. TABEL RU 2. MONITORING METHOD/TECHNOLOGIES/GUIDELINE/THAT NEED TO BE ESTABLISHED/ DEVELOPED FOR R / U.

I T E M	CONTENT	SEQUENCE OF PRIORITY
1	2	3
(A) Method for the Monitoring of the facilities and the Assesment of them.	1) Data Colection (What,When,How 2) Evaluation and Analysis 3) Recomendation 4) Organization (Who).	
(1) Channel/Canal	i d e m	1 st
(2) Head Works	i d e m	2 nd
(3) Reservoir	i d e m	2 nd
(4) Embankment	i d e m	1 nd
(5) Flood Control Structure	i d e m	2 st
(6) Krib/Groyin/Gabion	i d e m	3 nd
(7) Retaining wall	i d e m	3 nd
(8) Gate	i d e m	4 nd
(9) Pumping Station	i d e m	5 th
(10) Others		
(B) Technology for the Efficient & Cost Effective Rehabilitations.	1) Data Colection. 2) Technical Analysis. 3) Design and Specification. 4) Implementation procedure. 5) Unit Cost Analysis Methods. 6) Management.	
(1) Channel/Canal	i d e m	1 st
(2) Head Works	i d e m	2 nd
(3) Reservoir	i d e m	2 nd
(4) Embankment	i d e m	1 nd
(5) Flood Control Structure	i d e m	2 st
(6) Krib	i d e m	3 nd

1	2	3
(7) Retaining wall	i d e m	3 nd
(8) Gate	i d e m	4 nd
(9) Pumping Station	i d e m	5 th
(10) Others		
(C) Guide lines for R/U.	1) Item of Irrigation facilities 2) Technical condition 3) Technical Criteria for R/U 4) Implementation Procedure of R/U.	
(1) Channel/canal	i d e m	1 st
(2) Head Works	i d e m	2 nd
(3) Reservoir	i d e m	2 nd
(4) Embankment	i d e m	1 nd
(5) Flood Control Structure	i d e m	2 st
(6) Krib	i d e m	3 nd
(7) Retaining wall	i d e m	3 nd
(8) Gate	i d e m	4 nd
(9) Pumping Station	i d e m	5 th
(10) Others		

V. SYSTEM DEVELOPMENT

5.1. General

Since the first long-term development plan (PJPT-I), the DGWRD has already carried out the development in the field of water resources through Water Resources Development Projects scattered throughout Indonesian.

In an attempt to make a guidance, supporting, monitoring and evaluation for these Water Resources Development Projects, it is really necessary to have a complete information concerning the respective project to be disseminated in a proper time.

In order to cover the above matter, it is necessary to develop a such information and data base system in the DGWRD which will act as a data collection and data processing. The output of this system is expected to be used as a valuable and important information for the Water Resources Development in general.

5.2. The system that have already been developed in DGWRD

1. Data management system that has already developed in the DGWRD are shown in the table 1.

   Beside the above system, there are also several information systems in the field of Water Resources Development that has been developed by other institutions in Ministry of Public Works (MPW) such as :

Unit/Institutions	Product
- Research Institute for Water Resources Development (Puslitbang Pengairan)	- Technical Calculation - Data Base - Mapping
- Center of Data and Mapping MPW (Pusdata).	- MIS

2. Problems :

   In the reality, the developed systems in DGWRD are not smoothly applied, because of several problems, such as :

- Flow of data from the project sites to DGWRD are not offered, continouesly and feed back from DGWRD to the project sites must be done respon- sively in proper time.

- The configuration of the main frame computers used for the development of the system it don't support the operation, because the existing computer systems already more than 10 years old, not compatible with new system and need high maintenance cost.

- Shortage of skilled personnel/brainwares

5.3. The system that need to be developed for helping the activitics of System Development.

The system especially consist of Technical Calculation and Data Base including mapping, the details are as follows :

1. Technical Calculation.

- Hydraulic analysis programs
- Water balance analysis
- Water distribution system.
- Water requirement effisiency.
- Structural design programs
- GIS System
- Drainage analysis
- Engineering economics
- Others

2. Data Base

- Register of Irrigation System
- Hydrological Data
- Register of beneficiaries
- Soil Data
- Digital Mapping
- Ground Water data
- Geo Technical Data
- Meteorological Data
- Register of the projects
- MIS (included personnel data and training)
- Others

3. Brand of new computer.

The new computer should compatible with the

existing personal computer which used in DGWRD (APC III), in fact not full compatible to new system. "SUN" computer as used in Center of Data and Mapping MPW full compatible with all brand of existing Personal Computers.

4. Conversion of the existing system.

The new computer system will use ASCII system code instead of EBCDIC as NEC-250 system. So the existing data should be made conversion to ASCII system, which can be read by Personal Computer. The conversion of data will be done through Magnetic Tape to floppy disk (discette) and hard disk.

On line system are very important for data communication so will be done smoothly and on time. But if this method not possible according to the limited of budget can be used OFF-LINE system through floppy disk, although this system not effisien. On Line DOI-I, DGWRD has already tried using on line system by radio and will be tried also by telephone line.

5. The setting up of a system organization of the new computer.

The base of selection of the new computer are as follows :

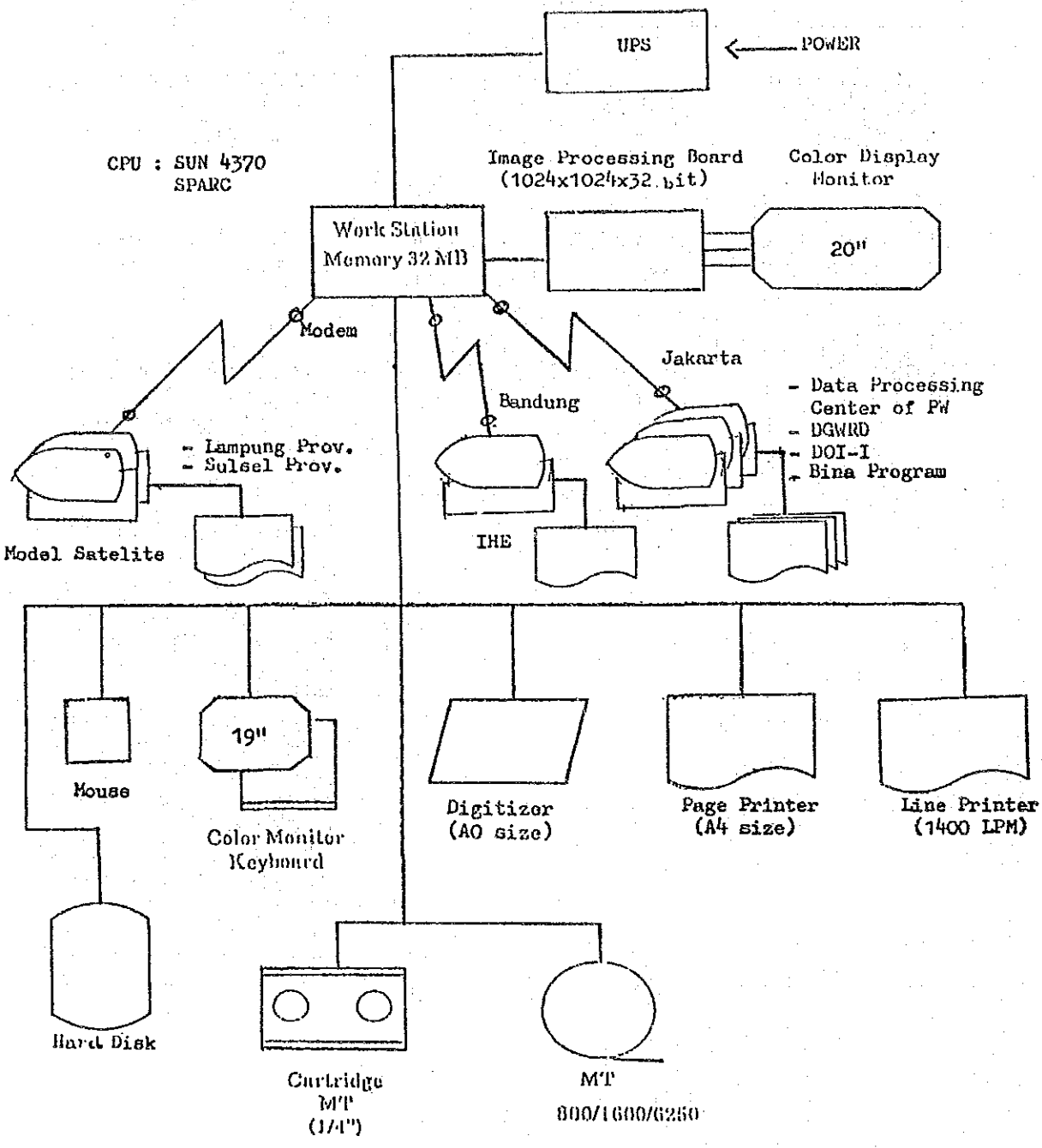
- The computer also process the existing large software, also will be able to handle the larger requirement in IESC project.
- The new computer should be completed with Magnetic Tape Drive facilities to process the existing Magnetic Tapes which will be required any time.
- Complited with mapping facilities i,e. Digitizer (Ao size) and Page Printer.
- Line printer at least 1400 LPM is required to produced large printouts.

6. Capable personnel (brainwares) to handle hardware and software.

TABLE SD 1.

No.	Unit	System	Output
1.	Information Division, DGWRD.	- System development of MIS.	- Monthly report of physical and financial progress for each project (such PRT, INT).
2.	Directorate of Planning and programming.	- Hydrological Data Base	- Water Resources data for planning.
3.	CGSC	- Technical Calculation	- Unsteady flow analysis. - Stability of dam - Hydraulic calculation.
		- Data Base	- Register of Irrigation system. - Post training evaluation data. - Payroll system - Basic of cost estimation. - Data indexing system for library in CGSC and Microfilm - Model of personnel System. - Basic of office equipment inventory. - Candidates for Supervisor training.

CONFIGURATION SYSTEM TO BE DEVELOPE



VI. T R A I N I N G

6.1. Present Stage and The Problems in the Field

During the first Long Term Development Plan (PJPT I), especially in relation to the Technical Cooperation between the Government of Indonesia and the Government of Japan has succesfully improve the Human Resources both in quality and quantity.

Up to the end of PJPT I, CGSC Bekasi has already implemented Training on Construction Supervision (Senior and Junior level) for about 1,200 persons.

Approaching to the PJPT II the policy of the Government of Indonesia is to strengthen Irrigation efficiency with better water use management and Operation & Maintenance.

In order to support the said Government policy it's necessary to improve the quality of Human Resources through training activities.

Relating to the above matters, the Training requirement for the coming Technical Cooperation including Water Users Assosiations (WUAs) should focus on Operation and Maintenance aspects as well as survey, investigation, design, construction supervision and management matters.

Training which was conducted by the Derectorate General of Water Resources Development (DGWRD) are as follows :

1. Training with the target groups of Public Works officials consists of survey, Investigation and Design (SID), Construction (C) or Rehabilitation and upgrading, Operation and Maintenance (O & M) including management course.

2. Training with the target groups of Institutional involved in Irrigation Management, mainly officials of Home Affairs, Agricultural Services and Irrigation Service at Provincial, District and Sub District and Village level.

3. Training with the target group for members of Water Users Associations in irrigation management at tertiary level.

Those training activities has been sucessfully implemented scattered for the whole provinces, however, the number of trainee have already achieved still few than the number of requirement.

Human Resources Requirement in the field of survey, Investigation, Design and Construction (SIDC) are adequate but capability should be improved in the subject matters of survey, mapping, investigation, drawings, technical design and Construction Supervision.

Since the Government Policy on Irrigation Development was focused on the operation & maintenance, the human resources requirement for O & M aspects, was necessary to be increased both the number of personnels and their skill and knowledges.

Training which has been conducted by the CGSC as shown in table 1.

Problems to be faced in the field of irrigation management both at the main system and tertiary level are as follows :

- Lack of Coordination and Communications among agencies involved in irrigation management.
- Unity understanding towards the development for water distributions system in the field.
- Number executor of irrigation committees at Sub District level as well as Field Advisory Groups at Village level.
- Low efficiency of water caused by inability of water users in managing water at the tertiary system level.
- Low cropping intensity due to poor water distribution and poor water utilization.
- Lack of water users participations in water management at the tertiary system level.

Outcome to be expected through training activities are for supporting the trainee capability, changing their attitude and improving their knowledge in order to improve their job performance, better organization management and to strengthen the institutions at all level.

Table TR 1. The existing training course that are conducted at CGSC

Title	Content	Level of trainees	Number of trainees	Duration	Annual plan
1. Construction Supervision Course (Junior level)	-	-Technical Senior High School + Years -BE + 2 Years	35 persons	1,5 months	2 times
2. Construction Supervision Course (Senior level)	-	-Civil Engineer+2 Years -BE + 5 Years	30 persons	1 month	1 times
3. International Course on Irrigation and Drainage Engineering	-	-Irrigation Engineers from developing countries	18 persons (12 foreigners + 6 Indonesian participants)	1 month	1 times

6.2. Training to be proposed (during Technical Cooperation 5 years period).

6.2.1. As a matter of fact, the policy on training delivery should be distributed into :

20 % for SID, 30 % for C, 40 % for O&M, and 10 % for Management, as shown in figure 1.

The training delivery program as shown in table 4

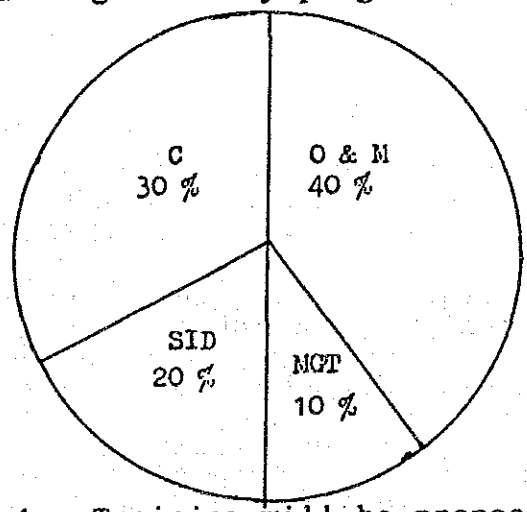


Figure 1 : Training will be proposed in IESC.

6.2.2. Besides that, the training delivery for society and beneficiaries should be distributed into : 10 % for B1, 25 % for B2, 40 % for C and 25 % for KTL as shown in figure 2.

The training delivery program as shown in table 5, table 6, table 7 and table 8.

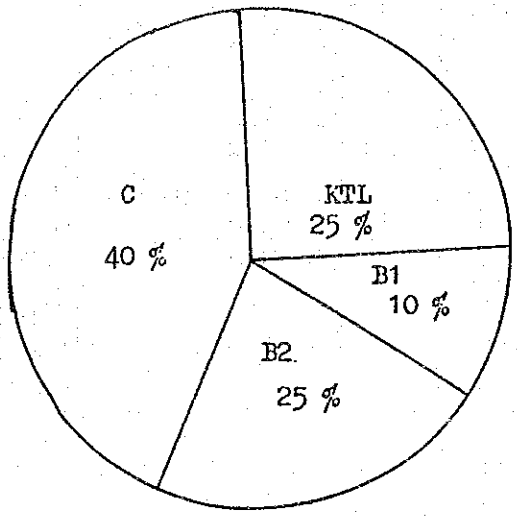


Figure 2 : Training will be proposed in Model Sattelite.

Training for Junior staff such as draftmen, surveyors, and O & M staff (Kepala Ranting Dinas and Juru Pengairan) will be conducted in Model Sattelite and financed by the Technical Cooperation.

6.2.3. Counterpart Training

For Senior officials who involved in the IESC activities need to improve their knowledges and experiences in the field of SIDCOM.

The overseas training proposed through the Technical Cooperation will be :

- Training Management proposed in AIT-Bangkok
- Training for SIDC proposed in Japan
- Training for O & M proposed in China.

Table 2. Proposal Counterpart Training Financed by The TC

	Field Training	No of person/ Year	Total No of Person for 5 Years	Country Destinition
1	Training Management	2	10	Bangkok
2	Training for Survey, Investigation, Design and Construction	2	10	Japan
3	Training for Operation and Maintenance (O&M).	2	10	China
	T o t a l :	6	30	-

6.3. Training Equipment requirement and cost to be provided by the Technical Cooperation as shown in table 9 and in table 10.

Training Material requirement should be up dated and standardized in order to unity in the training delivery and methods, as shown in Table 3.

Table 3. Cost for Training Modules Of SIDCOM

No.	Training Material for	No of Modules	Cost / Unit (in thousand Rp.)	Total Cost (in thousand Rp.)
1	Survey, Investigation and Design.	30	2,500	75,000
2	Construction Supervision (Junior+Senior)	50	2,500	125,000
3	Operation and Maintenance.	35	2,500	87,500
4	Water Users	50	2,500	125,000
	T o t a l :	165	-	412,500

Table 4. The training courses that are planned to be conducted at IESC.

No.	Title of course	Level of trainees	Number of trainees	Duration	Annual plan
1.	Surveying and mapping course	1.1.Senior	30 persons	3 weeks	1 times
	Design course	1.2.Senior	30 persons	3 weeks	1 times
2.	Construction Supervision Course	2.1.Senior	30 persons	1 month	1 times
		2.2.Junior	35 persons	1,5 months	2 times
3.	O & M Course for Irrigation (Facility Management)	3.1.Senior	30 persons	3 weeks	2 times
	Training of Trainers in Irrigation	3.2.Senior	30 persons	3 weeks	2 times
4.	Management Course	4.1.Senior	30 persons	2 weeks	1 times
5.	Others (System Engineering Course)	5.1.System Analyst, Programmer, Operator.	10 persons	2 weeks	1 times

NOTES :

1. The course expenses is expected to be borned fully by the Government of Japan through its Technical Assistance, except the Construction Supervision Course which had already implemented and financed fully by the Government of Indonesia. If the Course budget is limmitted, the training programme will be selected based on the priority.

2. Training Programme on the Model Satellite such as in Lampung and South Sulawesi Provinces will prior for O & M Course (Junior Level) and Course for Water User Association.

3. Participatory approach such as Case Study, Discussion and Field trips would be applied in those training in order to make the Training Method more effectively.

4. Provincial institution will play important functions at IESC activities both organization and human resources.

ESTIMATION OF TRAINING OPERATION EXPENSES (IN THOUSAND Rp)

1.1. Surveying and mapping course.
30 persons x 3 weeks x 1 x Rp. 500 = Rp. 45,000

1.2. Design Course.
30 persons x 3 weeks x 1 x Rp. 500 = Rp. 45,000

2.1. Construction Supervision Course (Senior).
30 persons x 4 weeks x 1 x Rp. 500 = Rp. 60,000

2.2. Construction Supervision Course (Junior).
35 persons x 6 weeks x 2 x Rp. 500 = Rp. 210,000

3.1. O & M Course.
30 persons x 3 weeks x 2 x Rp. 500 = Rp. 90,000

3.2. Training of trainers in Irrigation Management.
30 persons x 3 weeks x 2 x Rp. 500 = Rp. 90,000

4.1. Management Course.
30 persons x 2 weeks x 1 x Rp. 500 = Rp. 30,000

5.1. System Engineering Course.
10 persons x 2 weeks x 1 x Rp. 500 = Rp. 10,000

Total Expenses/year ..... = Rp. 580,000

Total expenses/Five years ..... = Rp.2,900,000

Table 5. Water Users Training that are planned to be conducted in Model Satellite Lampung.

No.	Title of Training	Level of trainees	Number of trainees	Duration	Annual plan
1.	Irrigation Management Practice	Officials involved in irrigation Management at Sub Distric Level (B1)	40 persons	6 weeks	2 times
2.	Irrigation Management Practices	Lower Officials at Village Level (B2)	40 persons	6 month	4 times

No.	Title of Training	Level of trainees	Number of trainees	Duration	Annual plan
3.	Optimal Water User and Farmers Organization Management	Board Members of WUAS (C)	40 persons	2 weeks	8 times
4.	Strengthening and Developing of WUAS	Board Members Key Farmers, informal leaders Women (KTL)	20 persons	13 days (5 times visits)	8 times

Estimation of Water Users Training Cost (In thousand Rp)

1. Irrigation Management Practices for Target Group B1 = 2 x 40 persons x 6 days x Rp.25 = Rp. 12,000

2. Irrigation Management Practices for Target Group B2 = 4 x 40 persons x 6 days x Rp.25 = Rp. 24,000

3. Optimal Water User and Farmers Organization Management for target Group C =
8 x 40 persons x 2 weeks x Rp.25= Rp. 96,000

4. Strengthening and Developing of WUAS for target Group KTL =
8 x 20 persons x13 days x Rp.25 = Rp. 52,000

T o t a l Cost / Year = Rp.184,000

Total Cost Requested for Lampung (5 years plan).

5 x Rp. 184,000 = Rp.920,000

Table 6. Junior level of PU Staff training that are planned to be conducted in Model Sattelite in Lampung.

No.	Title of Training	Level of trainees	Number of trainees	Duration	Frequency
1.	Drawing and Cost Estimate.	Draftmen	20 persons	2 weeks	1 times
2.	Survey and Mapping	Surveyors	20 persons	3 weeks	1 times
3.	Technical Design	As. Design Enginering	20 persons	2 weeks	1 times

Estimation Expenses of Training for Junior level of PU staff (in thousand Rp)

1. Drawing and Cost Estimate for Draftmen =
   1 x 20 persons x 2 weeks x Rp. 25 = Rp. 6,000

2. Survey and mapping for Surveyors =
   1 x 20 persons x 3 weeks x Rp. 25 = Rp. 9,000

3. Technical Design =
   1 x 20 persons x 2 weeks x Rp. 25 = Rp. 6,000

   T o t a l Cost = Rp.21,000

Table 7. Water Users Training that are planned to be conducted in Model Satellite South Sulawesi.

No.	Title of Training	Level of trainees	Number of trainees	Duration	Annual plan
1	2	3	4	5	6
1.	Irrigation Management Practice	Officials involved in irrigation Management at Sub Distric Level (B1)	40 persons	6 weeks	2 times
2.	Irrigation Management Practices	Lower affi-cials at Village Level (B2)	40 persons	6 month	4 times
3.	Optimal Water User and Farmers Organization Management	Board Members of WUAS (C)	40 persons	2 weeks	8 times
4.	Strengthening and Developing of WUAS	Board Members Key Farmers, informal leaders Women (KTL)	20 persons	13 days (5 times visits)	8 times

Estimation of Water Users Training Cost (In thousand Rp)

1. Irrigation Management Practices for Target Group B1 =
   2 x 40 persons x 6 days x Rp. 25 = Rp. 12,000

2. Irrigation Management Practices for Target Group B2 =
   4 x 40 persons x 6 days x Rp. 25 = Rp. 24,000

3. Optimal Water User and Farmers Organization Management for target Group C =
   8 x 40 persons x 2 weeks x Rp.25 = Rp. 96,000

4. Strengthening and Developing of WUAS for target Group KTL=

   8 x 20 persons x 13 days x Rp. 25 = Rp. 52,000

T o t a l Cost / Year = Rp.184,000

Total Cost Requested for South Sulawesi (5 years plan).
5 x Rp. 184,000 = Rp.920,000

Table 8. Junior level of PU Staff training that are planned to be conducted in Model Sattelite in Ujung Pandang.

No.	Title of Training	Level of trainees	Number of trainees	Duration	Frequency
1.	Drawing and Cost Estimate.	Draftmen	20 persons	2 weeks	1 times
2.	Survey and Mapping	Surveyors	20 persons	3 weeks	1 times
3.	Technical Design	As. Design Enginering	20 persons	2 weeks	1 times

Estimation of Training for Junior level of PU staff Cost (in thousand Rp)

1. Drawing and Cost Estimate for Draftmen =
   1 x 20 persons x 2 weeks x Rp. 25 = Rp. 6,000

2. Survey and mapping for Surveyors =
   1 x 20 persons x 3 weeks x Rp. 25 = Rp. 9,000

3. Technical Design =
   1 x 20 persons x 2 weeks x Rp. 25 = Rp. 6,000

T o t a l Cost = Rp. 21,000

VII. MODEL SATELITE

7.1. General

For the implementation of IESC in the first stage is established in 2 (two) provinces as a model satelite, ie : Lampung Province and South Sulawesi Province. For the future stage, these two model IESC will be established in all provinces in Indonesia.

These model is act as supporting agency in the respective province. The function expected from the model satelite is to implement a case study for collecting and analyzing data concerning IESC activities as to prepare technical guidance, software standard, development and strengthening of O & M and water management.

7.2. Scope of works

Scope of works in the model province consists of :

1) Data collection & processing such as hydrological data, topographical, geotechnical, etc.

2) Management Imformation System (Such as : PRT, INT) with on line system.

3) Demonstation of O & M and water management.

   This demonstration is provided as the job training for O & M executor and farmer.

   Approximately 1000 ha is service for demonstration plot, the result of this investigation will be used as O & M manual and water management.

4) Training Activity

   Training group target in the model satelite is technician for irrigation engineering and O & M of water management.

   The method of training is combination between classical and field study.

   * Training activity in irrigation engineering consist of : survey, design and drafting.

   * O & M training activity in Sub Branch level (Ranting Dinas) is Gate master and farmer.

5) Laboratory test for material used for rehabilitation and upgrading of irrigation networks.
6) Water sampling to determine quality of water for agricultural and non agricultural purpose, etc (Such as : salinity, PH and sediment content).

In order to support the above activities it is necessary to facilitate the model satelite with field equipment as shown in the following table (See Tabel : 8.6).

VIII LIST OF EQUIPMENT & BUDGET NEED

8.1. THE FIELD OF INVESTIGATION, PLANNING AND DESAIGN.

NO.	DISCRIPTION & SPECIFICATION	QUANTITY	UNIT PRICE J (Rp.x 10)	SUB TOTAL J (Rp.x 10)
1	2	3	4	5
1.	WATER QUALITY TES EQUIPMENT			
1.1	W. Quality Checker EA.440.200	1 set	12.500	12.500
1.2	Spectro photo meter EL525-140	1 unit	43.725	43.725
1.3	Conducto meter EL525-180	1 unit	10.468	10.468
1.4	PH meter EL525-057	1 pcs	4.508	4.508
1.5	Turbidi mtr completer with acces sories (Paquafilter) EL521-013	1 set	39.177	39.177
1.6	Balancer (digital) EL582-543/01	1 pcs	21.246	21.246
1.7	Refrigerator EL548-555/01	1 unit	7.143	7.143
1.8	Do meter EL521-042	1 unit	6.137	6.137
1.9	W. Proof digital Thermometer EA.520-452	1 unit	16.750	16.750
			Sub Total	161.654
2.	SURVEY EQUIPMENT			
2.1	Dig. Vane Anemometer EA.503-060	3 units	7.500	22.500
2.2	Current meter EL.520-260	10 units	25.226	252.260
2.3	W. level Recorder EL.520-040	10 units	36.317	363.170
2.4	Hook Gauge & Staff EL.506-250	10 units	8.530	85.300
2.5	Lycimeter	1 set	4.950	4.950
2.6	Standar Rain Gauge EL.502-012	1 set	578	578
2.7	Piezometer EL.514-380	1 set	3.791	3.791

1	2	3	4	5
2.8	Copper Ring Sampler	1 set	1.650	1.650
2.9	Soil Moisture Tester EL.514-050	1 set	5.021	5.021
2.10	Ordinary Thermometer EA.504-010	20 units	250	5.000
2.11	Portable Soil Thermometer EA.504-024	10 units	200	2.000
2.12	Over Drier Sampler & Cup	1 set	6.325	6.325
2.13	Plate For Scale EL.582/850	1 set	6.404	6.404
2.14	Sampler Extender	1 set	4.125	4.125
2.15	Rollmeter (Stainless Steil)	1 set	825	825
2.16	Survey staff SKT 3 M	1 unit	297	297
2.17	Instriment Distance Meter Sokkia APS 1J	2 units	23.760	47.520
2.18	W. Pass (auto level) Sokkia C40	2 units	3.080	6.160
2.19	Theodolith (Electronic Digital) Sokkia DT4	2 units	22.000	44.000
2.20	Camera	2 units	1.200	2.400
2.21	Drawing Facilities	2 units	10.700	21.400
2.22	Planimeter Unchida/Kens	2 units	913	1.826
2.23	Measuring Tape	2 units	405	810
2.24	Drafting Machine EP 4	2 units	2.959	5.959
			Sub Total	1.252.430
3.	INTERNAL EQUIPMENT			
3.1	Personal Computer + Printer - PC Komputer IBM 8530-F31 - Printer 8512 - Visual 4208-022	2	12.000	24.000
3.2	Portable PC + Printer 40 MB	2	8.000	5.000

1	2	3	4	5
3.3	Facsimile for 22 Provinces Xerox	22	3.000	66.000
3.4	Word Processor	2	5.500	11.000
3.5	Mobile Storage system filling cabinet Elite	1	4.000	4.000
3.6	Filling Cupboard (steel) Daiichi	4	1.000	4.500
3.7	Filling Cabinet (4 drawers)Elite	6	750	4.500
3.8	Working Desk + chair 1,4 x 0,8 m	6	400	2.400
3.9	Typing Desk 0,4 x 0,6 m	4	250	1.000
3.10	Book Selves 1,20 x 2,40 m	6	1.000	6.000
3.11	Over head Projector Direct Priject DP - 10	1	6.500	6.500
3.12	White Board	2	150	300
3.13	Stabilizator Izumi 500 VA	3	650	1.950
			Sub Total	136.650
			T O T A L	1.550.650

8.2. THE FIELD OF OPERATION AND MAINTENANCE.

NO.	DISCRIPTION & SPECIFICATION	QUANTITY	UNIT PRICE 3 (Rp.x 10)	SUB TOTAL 3 (Rp.x 10)
1	2	3	4	5
1.	CLIMOTOLOGY EQUIPMENT			
1.1	Anemometer 4.3018	1 set	4.719	4.719
1.2	Automatic Rainfall Recorder 5.4010	1 set	10.780	10.780
1.3	Sunshine Recorder 7.1400	1 set	7.645	7.645

1	2	3	4	5
1.4	Thermo Hygrograph 1.0620	1 set	4.895	4.895
1.5	Sun Radiation 7.1410	1 set	12.444	12.444
1.6	Thermometer (wetball - dryball) 2.0447	1 set	506	506
1.7	Ordinary rain fall local	1 set	506	506
			Sub Total	41.495
2.	INTERNAL EQUIPMENT			
2.1	Personal Computer + Printer - PC Komputer IBM 8530-F31 - Printer 8512 - Visual 4208-022	2	12.000	24.000
2.2	Word Processor	2	5.500	11.000
2.3	Mobile Storage system filling cabinet Elite	1	4.000	4.000
2.4	Filling Cupboard (steel) Daiichi	2	1.000	2.000
2.5	Filling Cabinet (4 drawers)Elite	3	750	2.250
2.6	Working Desk + chair 1,4 x 0,8 m	5	400	2.000
2.7	Typing Desk 0,4 x 0,6 m	4	250	1.000
2.8	Book Selves 1,20 x 2,40 m	3	1.000	3.000
2.9	Over head Projector Direct Priject DP - 10	1	6.500	6.500
2.10	White Board	2	150	300
2.11	Stabilizator Izumi 500 VA	3	650	1.950
			Sub Total	122.000
			T O T A L	163.495

8.3. THE FIELD OF REHABILITATION AND UPGRADING.

NO.	DISCRIPTION & SPECIFICATION	QUANTITY	UNIT PRICE 3 (Rp.x 10)	SUB TOTAL 3 (Rp.x 10)
1	2	3	4	5
1.	SOIL LABORATORY EQUIPMENT			
1.1	Large speciment triaxial comp. SO - 530	1 set	30.250	30.250
1.2	Standard type triaxial SO - 540	1 set	26.400	26.400
1.3	Direct shear apparatus standard SO - 520	1 set	6.173	6.173
1.4	Direct shear apparatus SO - 520A	1 set	9.350	9.350
1.5	Unconfined compression SO - 500	1 set	4.382	4.382
1.6	CBR Laboratory test SO - 360	1 set	8.487	8.487
1.7	Consolidation apparatur SO - 250A	1 set	4.949	4.949
1.8	Automatic Mechanical Compaction SO - 356	1 set	9.910	9.910
1.9	Constant head permeability SO - 550	1 set	2.200	2.200
1.10	Falling head permeability SO - 575	1 set	963	963
1.11	Plate beraing set SO - 250B	1 set	22.715	22.715
1.12	Compaction set SO - 350	1 set	1.759	1.759
1.13	Specific grafity SO - 340	1 set	731	731
1.14	Liquid limit SO - 310	2 sets	939	1.878
1.15	Plastic limit SO - 315	2 sets	194	388
1.16	Shrinkage limit SO - 320	1 set	585	585
1.17	Mechanical analysis stirrer SO 333 + 334	1 set	1.176	1.176
1.18	Hidrometer SO - 332	10 buah	367	3.670

1	2	3	4	5
1.19	Grain sieve analysis SO - 330	2 sets	7.665	15.330
1.20	Rotap sieve shaker G - 2206	1 set	11.226	11.226
1.21	Cone penetrometer of Laboratory So - 585	1 set	3.219	3.219
1.22	Soil mixer GE - 953	1 set	17.875	17.875
1.23	Wooden sieving machine SO - 510	1 set	5.775	5.775
1.24	Spatula GE - 3820	20 buah	14	300
1.25	Straightedge GE - 890	20 buah	12	240
1.26	Desicator GE - 452	2 buah	822	1.644
1.27	Volumetric flash GE - 410	20 buah	57	1.140
1.28	Water distalation BI - 120	1 set	748	748
			Sub Total	193.463
2.	CONCRETE LABORATORY EQUIPMENT			
2.1	Compression testing machine CO - 325.2	1 unit	34.926	34.926
2.2	Compression testing Hand CO - 321.2	1 unit	22.023	22.023
2.3	Los Angeles testing machine AG - 700	1 unit	14.861	14.861
2.4	Electric oven GE - 172	2 unit	9.266	18.532
2.5	Portable concrete mixer CO - 610	1 unit	5.920	5.920
2.6	Plate form scale GE - 158A	1 unit	605	605
2.7	Coarse agregat specific grafity test AG - 820	1 unit	2.875	2.875
2.8	Concrete pans GE - 303	2 nos	231	462
2.9	Cilinder mold (0 15 / 30 cm) CO - 301	20 nos	275	5.500

1	2	3	4	5
2.10	Cub mold (15 x 15 x 15 cm) CO - 312	20 nos	205	4.100
2.11	Washington type air meter EL34 - 3260	1 unit	8.876	8.876
2.12	Slump test apparatus CO - 370	1 set	591	591
2.13	Triangular straighteger GE - 893	2 nos	39	78
2.14	Specimen grip GE - 121	1 nos	138	138
2.15	Sample spliters GA - 955	1 set	612	612
2.16	Agregate test sieve set AG - 121	1 set	3.074	3.074
2.17	Sand absorption cone AG202A-250	1 set	178	178
2.18	Ro-tap sieve shaker AG - 811	1 unit	11.650	11.650
2.19	Stoppered volumeter flask GE - 412	3 nos	96	288
2.20	Glas breaker GE - 42213	10 nos	33	330
2.21	Dial balance GE - 153	1 set	1.929	0.929
2.22	Safe card Daichi	2 nos	1.650	3.300
2.23	Steel head hammer GE - 901	1 nos	25	25
2.24	Rubber head hammer GE - 900	1 nos	13	13
2.25	Wooden head hammer GE - 903	1 nos	17	17
2.26	Concrete sovel GE - 815	3 nos	63	189
2.27	Wooden frame sieve AG - 400	1 set	4.518	4.518
2.28	Wooden sieve machine AG - 510	1 set	5.775	5.775
2.29	Hand scope round GE - 800	3 nos	63	189
2.30	Sample pans GE - 301	2 nos	101	202
2.31	Graduated cylinder GE - 405	3 nos	139	417
2.32	Evaporation dishes GE - 500	2 sets	10	20

1	2	3	4	5
2.33	Desikator GE - 452	1 nos	822	822
2.34	Crusible tong GE - 551	2 nos	38	76
			Sub Total	152.111
3.	INTERNAL EQUIPMENT			
3.1	Personal Computer + Printer - PC Komputer IBM 8530-F31 - Printer 8512 - Visual 4208-022	2 unit	12.000	24.000
3.2	Word Processor - XT - LQ	2 set	5.500	11.000
3.3	Mobile Storage system filling cabinet Elite	1 nos	4.000	4.000
3.4	Filling Cupboard (steel) Daiichi	2 nos	1.000	2.000
3.5	Filling Cabinet (4 drawers)Elite	3 nos	750	2.250
3.6	Working Desk + chair 1,4 x 0,8 m	5 nos	400	2.000
3.7	Typing Desk 0,4 x 0,6 m	4 nos	250	1.000
3.8	Book Selves 1,20 x 2,40 m	3 nos	1.000	3.000
3.9	White Board	2 nos	150	300
3.10	Stabilizator Izumi 500 VA	3 unit	650	1.950
3.11	Daihatsu Taft Jeep GTX	1 unit	43.000	43.000
			Sub Total	92.050
			T O T A L	437.585

8.4. THE FIELD OF SYSTEM DEVELOPMENT.

NO.	DISCRIPTION & SPECIFICATION	QUANTITY	UNIT PRICE J (Rp.x 10)	SUB TOTAL J (Rp.x 10)
1	2	3	4	5
A. 1.	Engineering Work Station.	1 Unit	111.800	111.800
2.	Server. Sun Server 10 model 51	1 Unit	116.600	116.600
3.	PC Computer 486 DX/66	6 Unit	13.600	81.600
4.	Basic Software	1 Unit	23.640	23.640
5.	Serial Printer 400 Cps	1 Unit	1.680	1.680
6.	Line Printer 1400 lpm	1 Unit	6.115	6.115
7.	UPS System 5 KVA	1 Unit	13.524	13.524
8.	Digitizing System	1 Unit	3.196	3.196
9.	GIS Software	1 Unit	409.812	409.812
10.	Work Station ARC/INFO	1 Unit	95.550	95.550
11	Image Analysis Software	1 Unit	235.411	235.411
12.	LAN (Ethernet)	1 Unit	32.490	32.490
13.	Data Base Software	1 Unit	24.103	24.103
14.	Magnetic Disk (Include in each Server, PC and Work Station).			
15.	Optical Disk Unit	1 Unit	68.513	68.513
16.	Magnetic Tape Device	2 Unit	9.525	19.050
			Sub Total	1.242.488
B.	Model Satelite (Lampung & South Sulawesi)			
1.	PC Computer 486 DX/66 ACER 486 DX/66	2 Unit	27.189	27.189

1	2	3	4	5
2.	HP Pen Ploter	2 Unit	29.400	29.400
3.	Optical Disk Unit	2 Unit	68.513	68.513
4.	Serial Printer	2 Unit	3.363	3.363
5.	UPS System 2 KVA	2 Unit	16.464	16.464
6.	Image Analysis Software Include in Paket A No.1			
7.	GIS Software Include in Paket A No. 9			
8.	Data Software Include in Paket A No. 12			
			Sub Total	144.929
C.	JAKARTA AND BANDUNG OFFICE			
1.	PC Computer 486 DX/66 ACER 486 DX/66	4 unit	54.378	54.378
2.	Printer Epson LQ 1170 400 cps	4 unit	6.726	6.726
			Sub Total	61.104
		T O T A L		1.448.521

8.5. THE FIELD OF TRAINING.

NO.	DESCRIPTION	BEKASI CENTER INCLUDING TR.SATELITE JATILUHUR	WUTP /PTGA	WRD TRAINING DIVISION	TRAINING SATELITE LAMPUNG	TRAINING SATELITE SOUTH	TOTAL	COST per UNIT (Thousand Rp)	TOTAL COST (Thousand Rp)
I.	VEHICLES								
1.	Field Vehicles (Toyota Kijang Super)	2	1 -	1 -	1 1	1 1	6	35,000	210,000
2.	Micro Bus	2	-	-	1	1	4	120,000	480,000
3.	Mobile Training Unit	1	1	-	1	1	4	65,000	260,000
4.	Motor CYcles	4	2	-	3	3	12	3,500	42,000
II	TARINING EQUIPMENT								
1.	Projector Film 16 mm	1	1	1	1	1	5	4,500	22,500
2.	Camera Movie	1	1	1	1	1	5	2,500	12,000
3.	Video Recorder	1	1	1	1	1	5	2,000	10,000
4.	Color TV 27	1	1	1	1	1	5	2,500	12,500
5.	Sound Slide	1	1	-	1	1	4	2,500	10,000
6.	Slide Projector+Screen	2	1	1	1	1	6	2,500	15,000
7.	Laser OHP + Screen	2	1	1	1	1	6	4,500	27,000
8.	Printed White Board	2	1	1	1	1	6	15,000	90,000
9.	Personal Computer (PC) + Printer	2	2	2	1	1	8	7,500	60,000
10.	Photo Copy Machine	1	1	1	1	1	5	10,000	50,000
11.	Theodolit wild T0	2	-	-	1	1	4	22,000	88,000
12.	Theodolit wild T2	1	-	-	1	1	3	23,760	71,280
13.	Waterpass wild NaK2	2	-	-	1	1	4	3,580	12,320
14.	Roll Meter	4	-	-	2	2	8	405	3,240
15.	Wireless	2	1	1	1	1	6	1,500	9,000
								TOTAL	= 1,485,340

Note : For supporting the head of laboratory equipment in the model Sattelites will be proposed as required.

8.6. THE FIELD OF MODEL SATELITE.

1. Laboratory Test :

A. Soil Mechanic

1. Moisture Content Test
2. Spesific gravity of soil
3. Permeability test apparaturs
4. Extander

B. Concrete

1. Concrete Test hammer
2. Sieve analysis of cement portland
3. Compressive strength of hydraulic
4. Organic impuritis test set (glass bottle, stock solution and standard color chart).
5. Compressive strength of concrete cube.

2. Water Quality :

1.	Spectrofoto meter ATM (AAS)	
2.	Tabung reaksi COD	
3.	Vacum Pump	3 unit
4.	Grain size analizer	
5.	Mangnetic sticker	2 unit
6.	Hilige meter	1 unit
7.	Water sampler vertical	2 liter
8.	PH meter (WTW)	2 unit

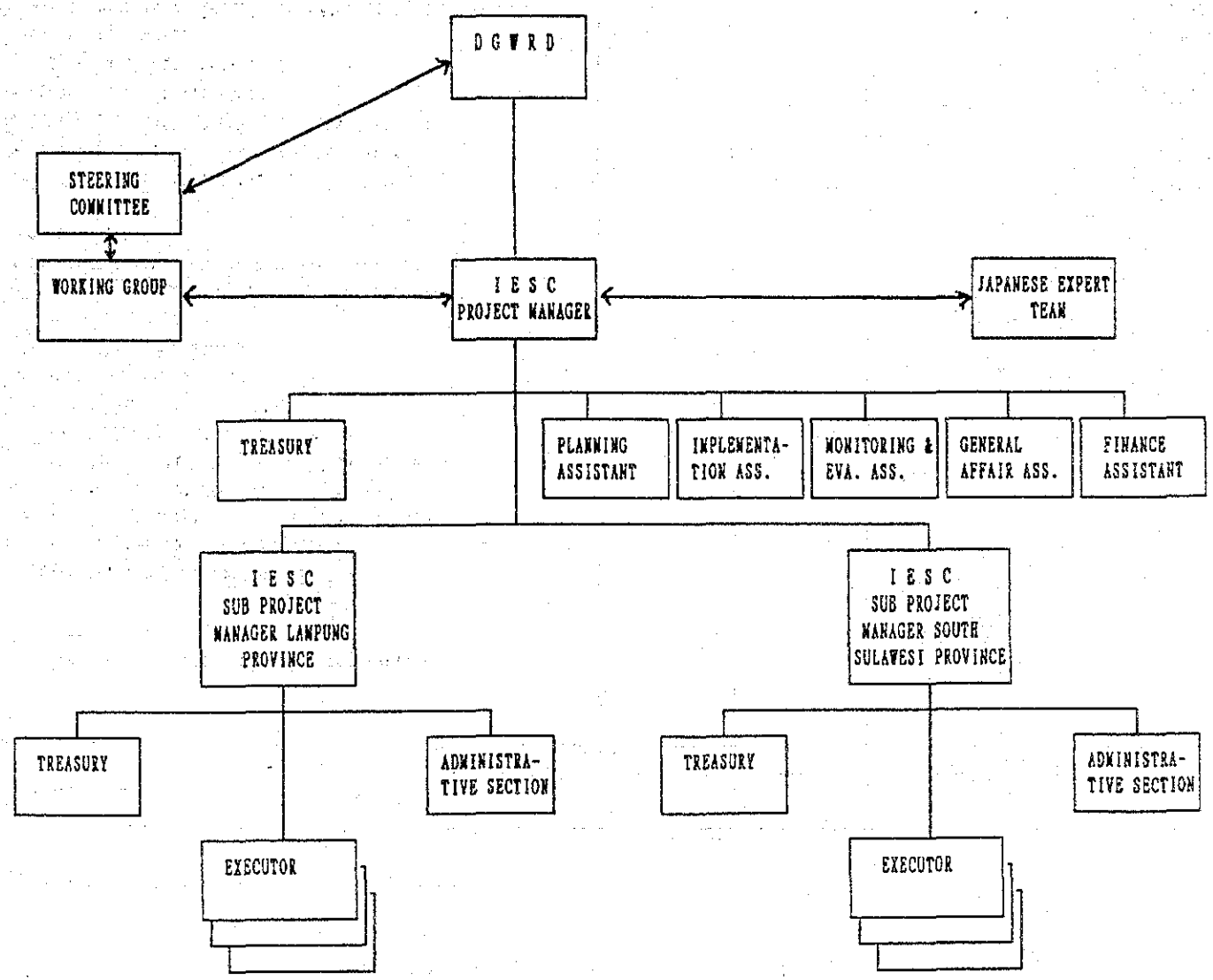
3. Hidrology :

1. Current meter A. OTT tupe C.31
2. Saunding rel kabel 30 meter
3. Planimeter Digital
4. Calculator FX 4000 P

4. Survey :

1.	Theodalit Wild (To - 188934)	2
2.	Theodalit TO Wild (To - 188809)	2
3.	Water pass	5
4.	Curve meter	2
5.	Altimeter	2
6.	planimeter	2
7.	Computer + ploter A2	
8.	Computer	

ORGANIZATION CHART OF IESC PROJECT



TENTATIVE SCHEDULE OF IMPLEMENTATION FOR IESC

I. Field of Technical Cooperation Investigation, Planning and Design

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
1. Activities Estublishment of criteria in the field of investigation, planning and design. (1) Organization Engineering Development Section The section is respensible for coordinating the working prosedures for engineering criteria of each technical area in order to develop creteria (Standards, manuals, guidelines). The creteria to be developed are classified in the following main categories : a. Guidelines for investigation works b. Guidelines for project planning c. Design standars and manuals (2) Working Prosedures for Establishment of Standardization The working prosedures for establishment of standardization are as follows : 1) Guidelines for Investigation Works (i.e Tope Survey, Geology Investigation, Water Requirement Investigation, Soil and Pedological Investigation, Land Consolidation Investigation etc.) a. Setting up each adhoc committee for each investigation works. b. *Decision of appreach method for guideline prepa*ration on seledted type of investigation works.	— —					In order to deteraine the appropriate parameters necessary for in - vestigation fguidelines, the several case studies shall be carried out in the project areas near satellite office.

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
c. Preparation of guidelines * Collection of existing guidelines in Indonesia * Introduction of Japanese and other foreign standars as the reference * Preparation of terms of reference for guidelines						
d. Erecine the contents and key points on guidelines						
e. Draft preparation of guidelines						
f. Trial use of proposed guidelines						
g. Evaluation and modification of proposed guide lines						
2) Guidelines for Project Planning (i.e. Irrigation Projects for Paddy Field, Irrigation Projects for Upland Field , Drainage Projects for Coestal Area)						In order to deteraine the appropriate parameters neccessary for budget planning guidelines, the several casestudies shall be carried cut in the project areas near satellite office.
a. Setting up each adhoc committee for planning works						
b. Decision of appreach method for guideline preparation on seledted type of investigation works.						
c. Preparation of guidelines * Collection of existing guidelines in Indonesia * Introduction of Japanese and other foreign standars as the reference * Preparation of terms of reference for guidelines						
d. Erecine the contents and key points on guidelines						
e. Draft preparation of guidelines						
f. Trial use of proposed guidelines						
g. Evaluation and modification of proposed guide lines						

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
3) Design Standars and Manuals (i.e. Reservoir and Dam Structure, Pipeline Facilities, Pumpings for Irrigation, Diversion weir/Barrage, Open Canal Structures, Drainage Structures etc.)						In order to deteraine the appropriate parameters necessary for De - sign and manuals, the several casestudies shall be carried out in the project areas near satellite office.
a. Setting up each adhoc committee for selected type of design standards and manual works.	—					
b. Decision of appreach method for guideline preparation on seledted type of design stndard and manual works.	—					
c. Preparation of guidelines	—	—				
* Collection of existing guidelines in Indonesia						
* Introduction of Japanese and other foreign standars as the reference						
* Preparation of terms of reference for guidelines						
d. Execine the contents and key points on guidelines		—	—			
e. Draft preparation of guidelines			—	—		
f. Trial use of proposed guidelines				—		
g. Evaluation and modification of proposed guide lines					—	
2. Proposed Input						
(1) Indonesia Side						
1) Personnel						
a. Conterparts concerned	—	—	—	—	—	
b. Assigment of working group concerned	—	—	—	—	—	
c. Assigment of adhoc committee concerned	—	—	—	—	—	

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
2) Budget Running cost including salary,transportation, accomodationtion fee of counterpart and utility,etc. 3) Equipment Sufficient office space for Japanese Expert in IESC and Headquarters						To estimate the reasceable cost
(2) Japanese Side 1) Personnel a. Dispatch of long-term expert assigned for investigation planning and design	———	———	———	———	———	
b. If necessary,dispatch of short-term Experts concerned	- - -	- - -	- - -	- - -	- - -	
2) Budget Mons						
3) Equipment a. Reference books	———	———				
b. Copy machine	———					
c. Survey equipment for case studies	———					
d. Word processor	———					
3. Expected output a. Guidelines for investigation works					———	
b. Guidelines for project planning					———	
c. Design standards and manuals					———	

II. Field of Technical Cooperation : Operation & Maintenance

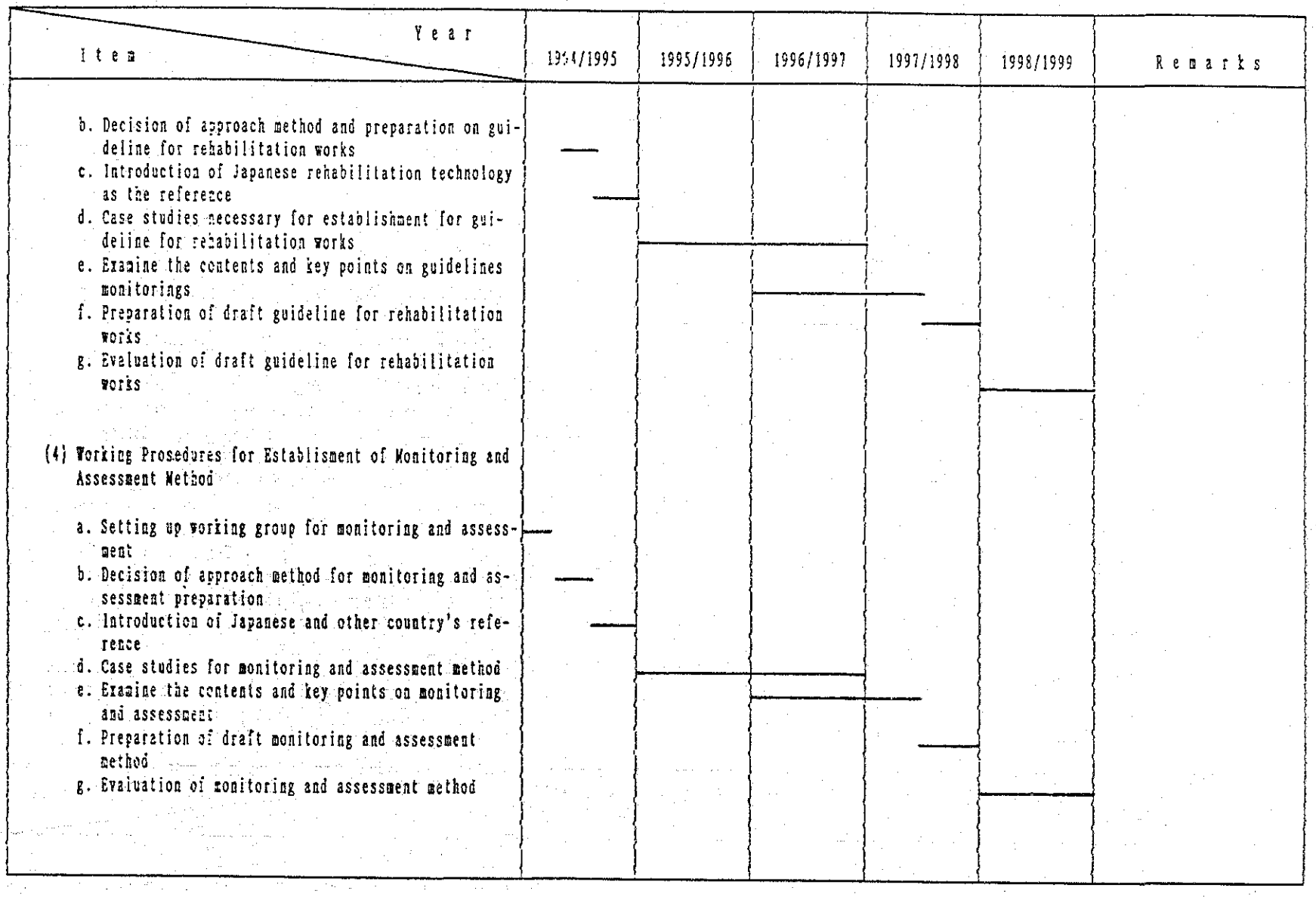
Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
1. Activities Establishment of Guidelines and manuals in O&M and Development of Appropriate Technology for water management (1) Organization : O&M Section The section is responsible for coordinating the working procedures for enginering guidelines-and manuals of operation and maintenance for irrigation facility. The section also has duty to develop appropriate technology for water management in order to achieve the irrigation efficiency. (2) Working procedures for development of Appropriate Technology for Achivement Water Management. a. Setting up each adhoc committee for development of appropriate technology for water management b. Decision of approach method for development of appropriate technology for water management c. Introduction of Japanese water management technology as the reference d. Case study of water management e. Examination of water management technology f. Evaluation of developed technology for water management (3) Working Procedures for Establishment of Guidelines and Manuals of O&M for Irrigation Facility. (i.e. Reservoir, Diversion Structures, Silting Basin, Pump Station, Headwork, Measuring Devices etc.)	—	—	—	—	—	In order prepare appropriate water management guidalines or manuals, the case studies shall

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
a. Setting up each adhoc committee for selected type of water management works						be carried out in the project area dear satellite office.
b. Decision of approach method for guideline preparation on selected type of water management works						
c. Preparation of guidelines						
* Collection of existing guidelines in Indonesia						
* Introduction of Japanese standards and other foregin standards as the reference						
* Preparation of terms of reference for guidelines						
d. Examination of the contents and key points on guidelines						
e. Draft preparation of guidelines						
f. Trial use of proposed guidelines						
g. Evaluation and modification of proposed guidelines						
2. Proposed Input						
(1) Indonesian side						
1 Personnel						
a. Counterparts concerned						
b. Assingment of adhoc committee concerned						
c. Assingment of working group concerned						
2 Budget						
Running cost including salary, transportation, accomodation fee of counterparts and utility, etc.						
3 Equipment						
Equipment necessary for implementation of case studies.						

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
(2) Japanese side						
1 Personnel a. Dispatch of long-term expert assigned for operation & maintenance b. If necessary, dispatch of short-term experts concerned						
2 Budget None						
3 Equipment Equipments necessary for implementation of case studies						
3. Expected output						
(1) Development of appropriate technology for water management						
(2) Guidelines and manuals of irrigation facility for operation and maintenance						

III. Field of Technical Cooperation : Rehabilitation and Upgrading

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
I. Activities Estublishment of criteria in the field rehabilitation and upgrading works						
(1) Organization : Rehabilitation and Upgrading Section The section has responsibility and duty to establish engineering guideline and canals of rehabilitation and upgrading for irrigation facility.						
(2) Working Prosedures for development of efficient and cost-effective rehabilitation technology.						
a. Setting up working group for cost-effective rehabilitation technology	—					
b. Decision for approach method for development of efficient and cost-effective rehabilitation technology		—				
c. Case study for efficient and cos-effective rehabilitation technology			—	—		
d. Examination for efficient and cos-effective rehabilitation technology				—		
e. Evaluation for efficient and cos-effective rehabilitation technology					—	
(3) Working Prosedures for Establisment of Guidelines for Rehabilitation Works						
a. Setting up working group for guideline for rehabilitation of monitoring and assessment works	—					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Remarks
b. Decision of approach method and preparation on guideline for rehabilitation works
c. Introduction of Japanese rehabilitation technology as the reference
d. Case studies necessary for establishment for guideline for rehabilitation works
e. Examine the contents and key points on guidelines monitorings
f. Preparation of draft guideline for rehabilitation works
g. Evaluation of draft guideline for rehabilitation works
(4) Working Prosedures for Establisment of Monitoring and Assessment Method
a. Setting up working group for monitoring and assessment
b. Decision of approach method for monitoring and assessment preparation
c. Introduction of Japanese and other country's reference
d. Case studies for monitoring and assessment method
e. Examine the contents and key points on monitoring and assessment
f. Preparation of draft monitoring and assessment method
g. Evaluation of monitoring and assessment method

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
2. Proposed Input						
(1) Indonesian side						
1. Personnel						
a. Counterparts concerned						
b. Assignment of adhoc committee concerned						
c. Assignment for working group concerned						
2. Budget						
Running cost including salary, transportation, accomodation fee of counterpart and utility, etc.						
3. Equipment						
Equipment necessary for implementation of case studies						
(2) Japanese Side						
1. Personnel						
a. Dispatch of long term expert assigned for rehabilitation and upgrading						
b. If necessary, dispacth of short-term experts concerned						
2. Budget						
none						
3. Equipment						
Equipments necessary for implementation of case studies.						
(3) Expected output						
1. Introduction and development of efficient and cost-effective rehabilitation and upgrading method						
2. Guideline and manual of rehabilitation and upgrading works for irrigation facility						
3. Establishment of monitoring and assessment method for rehabilitation and upgrading						

IV. Field of Technical Cooperation : System Development

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
1. Activities System development necessary for preparing and supporting criteria developed by the activities of Standardization section (1) Organization : System Development Section The section has duty and responsibility to develop, operate and maintain the computer systems of DGWRD consisting of investigation , planning, design, O&M and Rehabilitation and Upgrading works. The section has main works as follows : a. To develop computer engineering management system of IESC b. To develop technical calculation system for investigation planning design and O&M and rehabilitation and upgrading works c. To create necessary data base system including application sofware d. To develop the data entry system for necessary data base system (2) Target of System Development 1. Technical Calculation a. For Planning Works (i.e. Drainage analysis, Water balance analysis) b. For Design works (i.e. Structure design programs, Hydraulic analisys programs (Finite defference method for unsteady and steady flow), CAD system (Computer Aided Design))						

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
c. For O&M Works (I.e. Water distribution system)						
2. Data base						
a. For Investigation Works (I.e. Geo-technical data, Soil data, Meteorological data, Topo data (Mapping data)						
b. For Planning Works The data base developed in the investigation field could be applied to the planning works						
c. For O & M Works (i.e Register of irrigation facilities, Register of beneficiaries in individual cos area						
d. Rehabilittation and Upgrading (i.e. Register of irrigation facilities)						
2. Proposed Input						
(1) Indonesia Side						
1) Personnel						
a. Conterparts concerned						
b. Assigment of working group concerned						
c. Assigment of adhoc committee concerned						
2) Budget Running cost including salary, transportation, concerned						To estimate the reasceable cost
3) Equipment Sufficient office space for Japanese Experts in IESC and Headquarters						

Item \ Year	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	Remarks
(2) Japanese Side						
1) Personnel						
a. Dispatch of long-term expert assigned for system development						
b. If necessary,dispatch of short-term Experts concerned						
2) Budget						
None						
3) Equipment						
a. Hardware necessary for system development						
b. Software necessary for system development						
3. Expected output						
(1) Organization of technical Information system						
(2) Technical calculatica system concerned						
(3) Technical Data Base System Concerned