No. 2

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

FEASIBILITY STUDY
ON
THE K.C.C IRRIGATION DEVELOPMENT PROJECT
(STAGE I)

VOLUME 1
EXECUTIVE SUMMARY REPORT

JULY 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

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

FEASIBILITY STUDY
ON
THE K-C-C IRRIGATION DEVELOPMENT PROJECT
(STAGE I)

VOLUME 1
EXECUTIVE SUMMARY REPORT

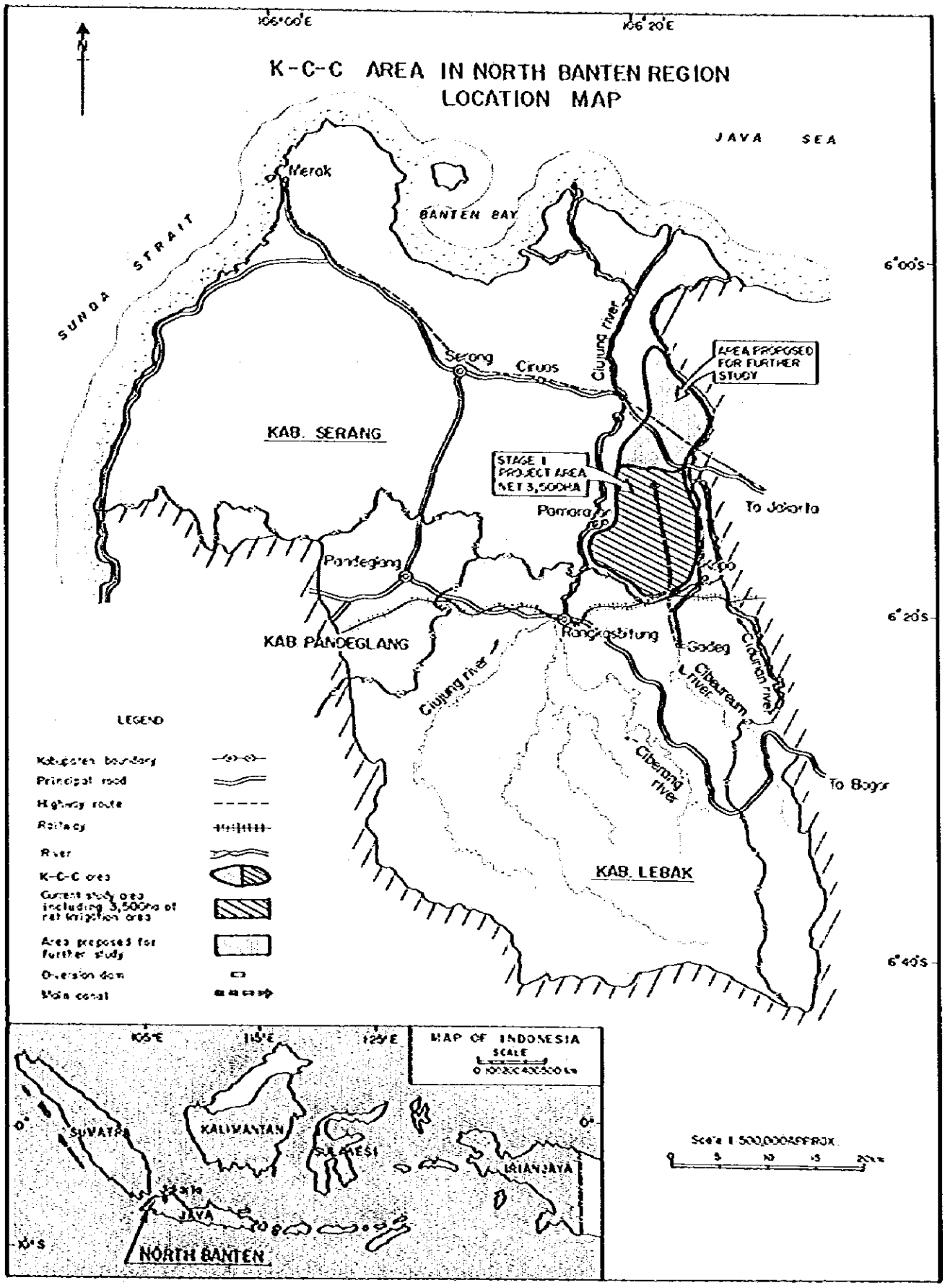
JULY 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

108

83.3

AFT


K-C-C AREA IN NORTH BANTEN REGION
LOCATION MAP
106°00'E
106°20'E
N
JAVA SEA
Merak
BANTEN BAY
SUNDA STRAIT
6°00'S
Serang
Cruos
Ciujung river
AREA PROPOSED FOR FURTHER STUDY
KAB. SERANG
STAGE I PROJECT AREA NET 3,500HA
Pamoraya
To Jakarta
Pandeglang
Kopo
6°20'S
KAB PANDEGLANG
Rangkasbitung
Gadeg
Cibaseum River
Cidurian river
Ciujung river
Cibenang river
To Bogor
KAB. LEBAK
6°40'S
LEGEND
Kabupaten boundary
Principal road
Highway route
Railway
River
K-C-C area
Current study area including 3,500ha of net irrigation area
Area proposed for further study
Diversion dam
Main canal
MAP OF INDONESIA
SCALE
SUMATRA
KALIMANTAN
SULAWESI
IRIAN JAYA
JAVA
NORTH BANTEN
Scale 1:500,000 APPROX.

EXECUTIVE SUMMARY REPORT

TABLE OF CONTENTS

I. INTRODUCTION

1. In response to the request of the Government of Indonesia, the Government of Japan dispatched a preliminary survey team of Japan International Cooperation Agency (JICA) to Indonesia in December 1981. As a result of the field survey, it was agreed between the Governments concerned that a Master Plan on North Banten Water Resources Development and a Feasibility Study on the K-C-C Irrigation Project should be carried out as a part of the technical cooperation program of the Government of Japan in 1982.

2. This report presents the results of survey and study for feasibility study (Stage I) on irrigation development of the K-C-C area with about 3,500ha of net irrigable farmland which lie between the Ciujung and the Cibeureum rivers in North Banten region of the Province of West Java.

3. This report has been prepared under the agreement between the Government of Indonesia and the Government of Japan that the feasibility study on the K-C-C Irrigation Development Project should be considered as the first stage development of the whole K-C-C area and the current feasibility study should be conducted based only on the available water from the Cibeureum river.

4. The field survey and study on the proposed Project were conducted by the study team of JICA from July to September 1982 as the first field survey and from October to December 1982 as the second field survey. Based on the findings of the field survey, the analyses and the feasibility study on the Project have been conducted for about one and a half months at home office for preparation of Draft Final Report.

5. The comments and valuable suggestions were made on the Draft Final Report by the Indonesian authorities concerned. Based on these comments and suggestions, the study team has prepared herewith the Final Feasibility Report.

II. BACKGROUND

6. Agriculture is the mainstay of Indonesia's economy; in 1980, this sector accounted for about 31% of GDP, 55% of employment and almost all non-petroleum exports. In the agricultural sector, food crop production is the most important component, which amounts to about 61% of the total agricultural products.

7. The production of milled rice, the country's main staple, increased from 13.7 million tons in 1971 to 20.3 million tons in 1980; increase of about 4.8% per annum on average. Production of other staple food crops such as cassava and sweet potatoes did not make significant growth. The stable production increase of rice attained in this period is attributable to the expansion of the cropped area as well as the increased unit yield resulting from the construction and rehabilitation of irrigation facilities, the introduction of high-yielding varieties and the technical guidance and financial support under the nationwide rice intensification program. The aforementioned increase in rice production, however, has been insufficient to meet the growing domestic demand resulting from the population growth coupled with the increased per capita rice consumption. Thus, Indonesia has to import a considerable amount of staple food from abroad every year.

8. The Government of Indonesia has laid the great emphasis on the stabilization and increase of food production through its national development plan. The increased production in foodcrops can be attained by increasing the productivity of farmlands through the improvement of irrigation infrastructure as well as the introduction of new technology of farming.

9. The Government introduced the BIMAS (Mass Guidance) program in 1965 and then the INMAS (Mass Intensification) program to increase food production and farm income by supplying credit and farm inputs at government-subsidized prices. Under the programs, several services for farmers have been provided; such as: 1) credit services; 2) distribution network of farm inputs; 3) extension services; and marketing and processing services through KUD/BUUD (farm-cooperatives).

10. Under the Third Five-Year Development Plan (REPELITA III) in Indonesia, the water resources development programs have been playing a key role to support the agricultural sector in the sense that the irrigation farming is indispensable for raising the food production.

11. North Banten is situated in the northwest corner of West Java and comprises the Kabupaten of Serang, the northern part of Kabupaten Lebak and the north eastern corner of Kabupaten Pandeglang with gross land area of 3,630km^2 including 39 Kecamatans (Sub-Districts). In spite of its short distance from Jakarta, this region has long remained under less-developed condition except only a part of the area where some modern industries have been planned and introduced. The per capita income of this region was about Rp.130,000 in 1980 at current price, which is equivalent to about 50% of the whole country and 63% of West Java province. Low income in Banten region is mainly due to its heavy dependence on agricultural sector which can yield only very low income compared with other industries. Within Banten region, one of the least developed areas with lower income is the K-C-C area in Kabupaten Serang where traditional farming under rainfed condition is common. The average per capita income of this area is estimated to be about 65% of that of whole Kabupaten. Under these circumstances, water resources development in this region would play a key role for the development of agricultural sector as well as industrial sector since demands for water in the region come principally from irrigated agriculture and industrial area.

III. THE PROJECT AREA

12. The K-C-C area is located in the eastern boundary of the District (Kabupaten) of Serang of West Java Province, sandwiched by the Ciujung and the Cibeureum/Cidurian rivers. This area, having a gross land area of about 22,000ha, is administratively belongs to four Sub-Districts (Kecamatan) of Kopo, Cikande, Carenang and Pamarayan, all within the District (Kabupaten) of Serang.

13. The study area of about 11,500ha has been selected from the K-C-C area for the feasibility study taking into consideration the agricultural potentiality of development, topographic condition of the area and availability of the water. The study area thus selected is bounded by the Cibeureum river to the east, by the boundary of Ciujung Project to the west, by the Kabupaten road which connects Cikande and Babakan to the north and by the Kabupaten boundary to the south.

14. The Project area, having a net irrigable area of 3,500ha, has been selected from the study area considering the high potentiality for the agricultural development, topographic condition of the area and availability of the water.

15. Climate in the study area is tropical. Average annual rainfall in the study area is approximately 1,800mm, of which about 70% fall during the wet season from October to April. The monthly mean temperature is 33°C at the maximum and 21°C at the minimum and average annual temperature is about 27°C. The humidity in the study area ranges from 78% to 83% on average.

16. The Cibeureum river originates from Mt. Gede in the south of the study area, gathers water from the northern foothills and reaches Gadeg, the proposed dam site. The river continues flowing northward from the dam site, joining the Cidurian river near the cross point with the national road connecting Jakarta to Merak and emptying its water to the Java sea.

17. Based on the data from Kopomaja rainfall station, the flood discharge at Gadeg dam site is estimated to range from 97 to 119 m^3/sec. Based on the data at Kopomaja station and the flood discharge estimated by the Average Flood Frequency

Growth Curve, the design flood at Gadeg is estimated as 400 m^3/s for the return period of 1/1000 and 320 m^3/s for the return period of 1/500.

18. Population in the Project area is estimated to be about 43,000 in 1980 comprising 9,409 households, of which about 97% are considered to be engaged in the agricultural activities. There are about 9,000 farm household in the Project area with the average family size of 4.57. The average farm holding size is estimated at about 0.4ha per farm household.

19. The study area covers about 11,500ha, out of which about 5,000ha are cultivated with rice, 1,000ha with upland crops and the remaining 5,500ha are used for mixed farm, homeyards and others. Most of rice cultivation is put under rainfed conditions in the study area and rice farming is concentrated in the wet season from October to April.

20. Present crops cultivation in the Project area is on the considerably matured stage under rainfed condition. Unit yield of rice is estimated at 3.2 ton/ha (dry paddy). Unit yields of palawija are 1.8 ton/ha for chilli, 0.8 ton for groundnut, and 0.7 ton/ha for maize, mungbean and soybean respectively. The increase of unit yield of crops cannot be expected much without developing irrigation facilities.

21. Surplus of rice produced by farmers in the Project area is marketed through the channels of both KUD/DOLOG and the private traders. The KUD/DOLOG market the rice for stabilization of the price under the Government control. The market prices of major farm products prevailing in the Project area are as follows:

	Rp/kg
Milled rice	250
Dry paddy	135
Groundnut	450
Maize	150
Cassava	45
Soybean	300
Chilli	600

22. Extension services to the farmers are carried out by field extension workers (PPL) under the supervision of the Agricultural Office in Kabupaten through PPS and PPM. Service area of PPL averages about 600ha of rice fields cultivated. There are three seed multiplication farms in Kabupaten Serang. The stock seeds of rice produced at the seed farms are distributed to the seed growers authorized. Then the seeds produced by the seed growers are distributed to farmers through BUUD/KUD. The amount of rice seeds is still insufficient, and the shortage is mainly supplied by farmers' own produce.

IV. THE PROJECT

23. The Project is formulated with the main concepts of:

(1) stabilization and improvement of production of the wet season rice through the establishment of new irrigation system and introduction of improved farming practices,

(2) increase of planted area of dry season rice and palawija with year-round irrigation system which will lead to the increase of total production of rice and palawija,

(3) improvement of living standard and more equitable distribution of income and welfare of the people.

24. The study area covers the land area of about 11,500ha in gross, out of which about 3,800ha in gross of rice field are delineated as the Project area for irrigation taking into consideration the land suitability, topography, land use and the Government's policy for development. Excluding non-irrigable land of 300ha for the irrigation facilities, inspection road and others, about 3,500ha of the net irrigable area will be supplied with the irrigation water.

25. For the proposed agricultural development in the area, the cropping pattern of "Rice-Rice-Palawija" a year is recommended as the most optimum cropping pattern taking into account the agro-climatic conditions and the farm holding size. In order to maximize the yields and profits, improved high yielding varieties will be introduced. Palawija crops such as groundnut and soybean will be cultivated after the second rice cropping in dry season. Fig. 1 shows the proposed typical cropping patterns.

26. After implementation of the Project, the following crop yields and production are expected.

	Yield (ton/ha)	Area (ha)	Production (tons)
Rainy season rice	5.0	3,500	17,500
Dry season rice	5.0	3,500	17,500
Palawija (represented by groundnut)	1.2	3,500	4,200

27. The water source available for the Proejct is the river flow of the Cibeureum river. A diversion dam is to be constructed at Gadeg on the Cibeureum river and the water is delivered to the Project area by means of headrace and irrigation canals.

28. Dependable discharge for irrigation is assumed to be 80% of the run-off of the Cibeureum. The total diversion requirement for the Project is estimated as 5.73 m^3/sec at the maximum.

29. The general features of the Proejct is to supply irrigation water of 6.0 m^3/sec at the maximum to the Project area (3,500ha) from the Cibeureum river through the facilities of a diversion dam, headrace, canals and related structures. The basis for planning and design of the facilities is to make the most effective use of water resources available.

30. In order to regulate intake water level, a diversion dam will be constructed at about 20km upstream the Cibeureum from the junction of the Cidurian and the Cibeureum. The main feature of the diversion dam is as follows:

1) Dam

Type	Zoned rock fill type with center core
Height	16.0m from river bed level
Length of crest	160.0m
Crest elevation	El. 41.0m
Catchment area	117 km^2
Pond area	480,000 m^2

2) Spillway

Emergency water level	EL 39.00m
High water level	EL 38.50m
Design discharge (max.)	320 m^3/sec
Type	Gated over flow 2-way
Crest elevation	EL 30.60m EL 36.40m
Type of gate	Radial gate - 2 bays Roller gate - 1 bay
Size of gate (HxB)	8.40m x 7.00m x 2 2.30m x 2.00m x 1

3) Intake

Design discharge	6.0 m^3/sec
Diversion water level	EL 38.50m
Width	3.50m x 2
Type of gate	Roller gate
Number of gate	2 Nos.

31. The following table shows the salient features of the headrace, canals and inspection road. General layout of the Project is shown in Fig.__

a) Headrace

- Design discharge (max.)	6.0 m^3/s
- Canal length	9.6km
- Structure	Trapezoid earth canal
- Related structure (nos)	
Bridge	2
Cross drain	2
Spill way (Waste way)	2
Siphon	2

b) Main canal

- Design discharge	6.0 - 3.0 m^3/s
- Canal length	13km

- Structure	Trapezoid earth canal
- Related structure (nos)	
Bridge	7
Drop	2
Spill way	2
Check	7
Turnout	17

c) Secondary canals

- Total length (km)	32.4
- Numbers (nos)	9
- Related structure (nos)	
Drop	31
Bridge	-
Crossdrain	9
Waste way	10
Check	20
Culvert	21
Turnout	70

d) Secondary canals max. discharge (m^3/s) & Tertiary canal length (km)

Secondary - 1	0.230 m^3/s
" - 2	0.786 "
" - 3	0.286 "
" - 4	0.941 "
" - 5	0.507 "
" - 6	0.712 "
" - 7	0.516 "
" - 8	0.622 "
" - 9	0.598 "
Tertiary	63.6 km

e) Inspection road

- Main inspection road	14.8 km
- Secondary inspection road	25.3 km
- Tertiary inspection road	69.0 km (B = 3.0m, without pavement)

32. The Project will be implemented taking the following two phases in consideration of the scale of the Project:

(1) The first phase will be devoted to the mapping, detailed design, tendering, procurement of construction materials and O & M equipment for about one year. Preparatory works for the construction of the major components of the Project facilities will be also carried out before the start of the construction works.

(2) The second phase will be for actual construction of diversion works which consist of intake dam, intake gate, spillway, coffering and dewatering works and the canal works which consist of headrace, main canals and inspection road for about two years.

The time required for the implementation of the Project is approximately three and a half years including design works and preparatory works as shown in ANNEX VIII.

33. Office and quarters required for the Project implementation are briefly estimated as follows:

(1)	Main office	1	800 m^2
(2)	Branch office	4	400 "
(3)	Repair shop	1	200 "
(4)	Store house	1	200 "
(5)	Quarters	4	200 "
(6)	Motor pool	1	6,000 "

34. In order to implement the Project successfully it is proposed to establish the K-C-C Project Office under the superintendence of the Provincial Department of Public Works. The main functions of the Project Office are as follows:

1) Financial arrangement needed for construction works and operation and maintenance of the Project facilities,

2) Design and construction supervision of the construction works down to tertiary systems,

3) Assistance to farmers in construction of quaternary canals, and

4) Accounting and management of the construction works.

35. In order to attain the expected crop production, more intensive agricultural support services are essential. In this context, the agricultural extension services should be strengthened. More farmers' cooperatives are to be organized and strenghtened for proper operation of irrigation farming. In addition, it is desired to establish the water users' association for proper water management.

36. The total Project costs required are estimated to be about US$35.9 million which comprise US$22.6 million equivalent of local currency and US$13.3 million of foreign currency, which include the physical contingency of about 10% of direct cost and the price contingency of 8% per annum for the foreign currency portion and 15% per annum for the local currency portion as shown in Table 1. The annual operation and maintenance costs are estimated to be about US$164,000 per annum.

37. The agricultural net incremental benefit through the Project is estimated to be about US$8.3 million per annum which will accrue from the increased production of rice and palawija.

38. The economic feasibility of the Project is evaluated in terms of internal rate of return on the basis of a 50 years useful life. The calculated internal rate of return is 17.4% as a whole, which indicates the economic soundness of the Project.

Table 1 **SUMMARY OF PROJECT COST**

(US$'000)

	Item	Total	Foreign Portion	Local Portion
1.	Preparatory Works	1,283	290	993
2.	Diversion Works /1	2,980	1,778	1,202
3.	Canal Works	9,944	4,552	5,392
4.	Tertiary Development	750	220	530
	Sub-total	14,957	6,840	8,117
5.	Land Acquisition and House Evacuation /2	2,580	-	2,580
6.	O/M Equipment	600	600	-
7.	Administration Expenses	600	-	600
8.	Engineering Services	1,880	1,264	616
9.	Physical Contingency	2,061	870	1,191
	Sub-total	7,721	2,734	4,987
	Total	22,678	9,574	13,104
10.	Price Contingency	13,261	3,706	9,555
	Grand Total	35,939	13,280	22,659

/1: including Dam Spillway and Intake Structure

/2: about 65 houses to be evacuated from the submergible area near Gadeg dam site

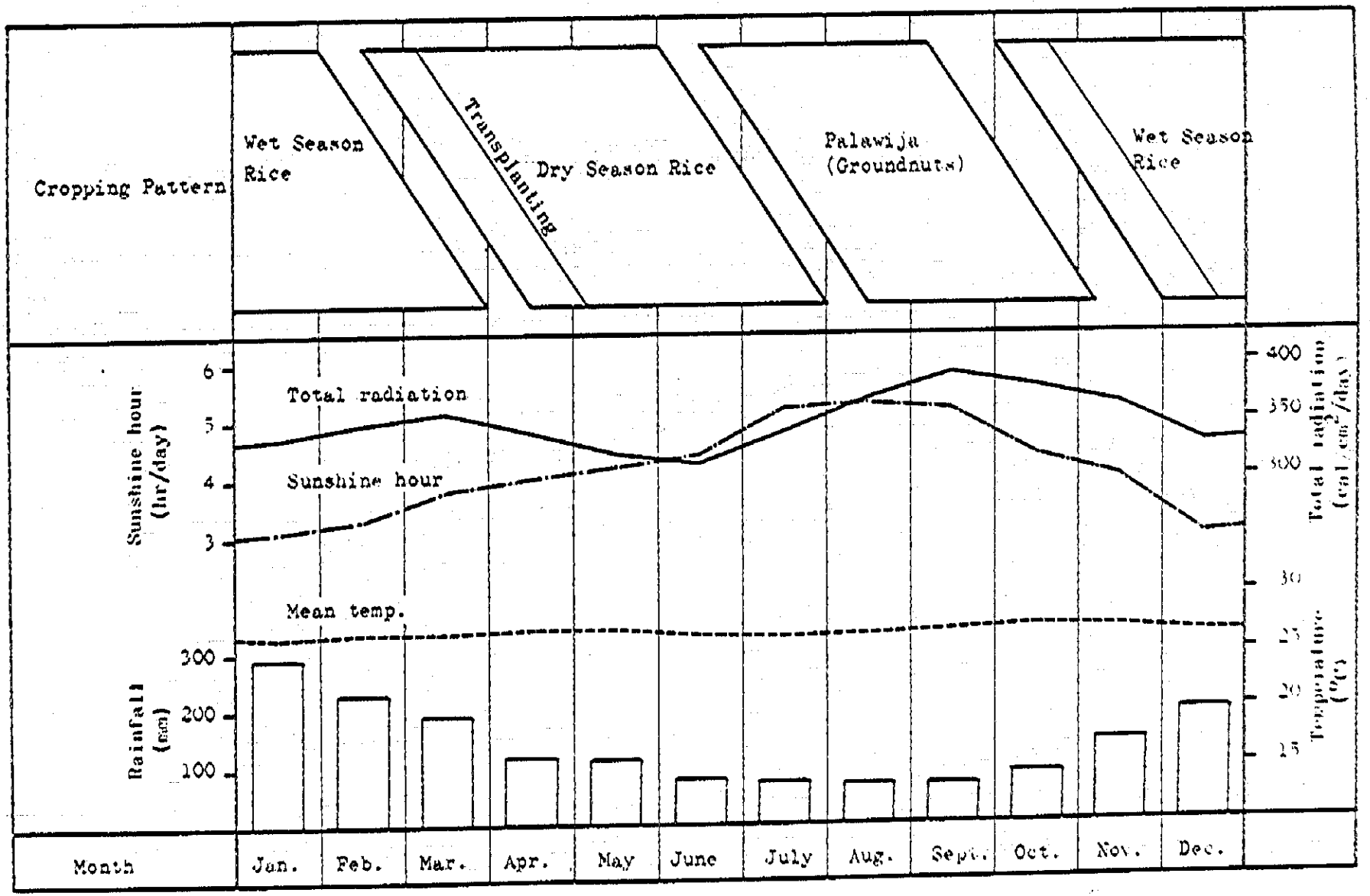
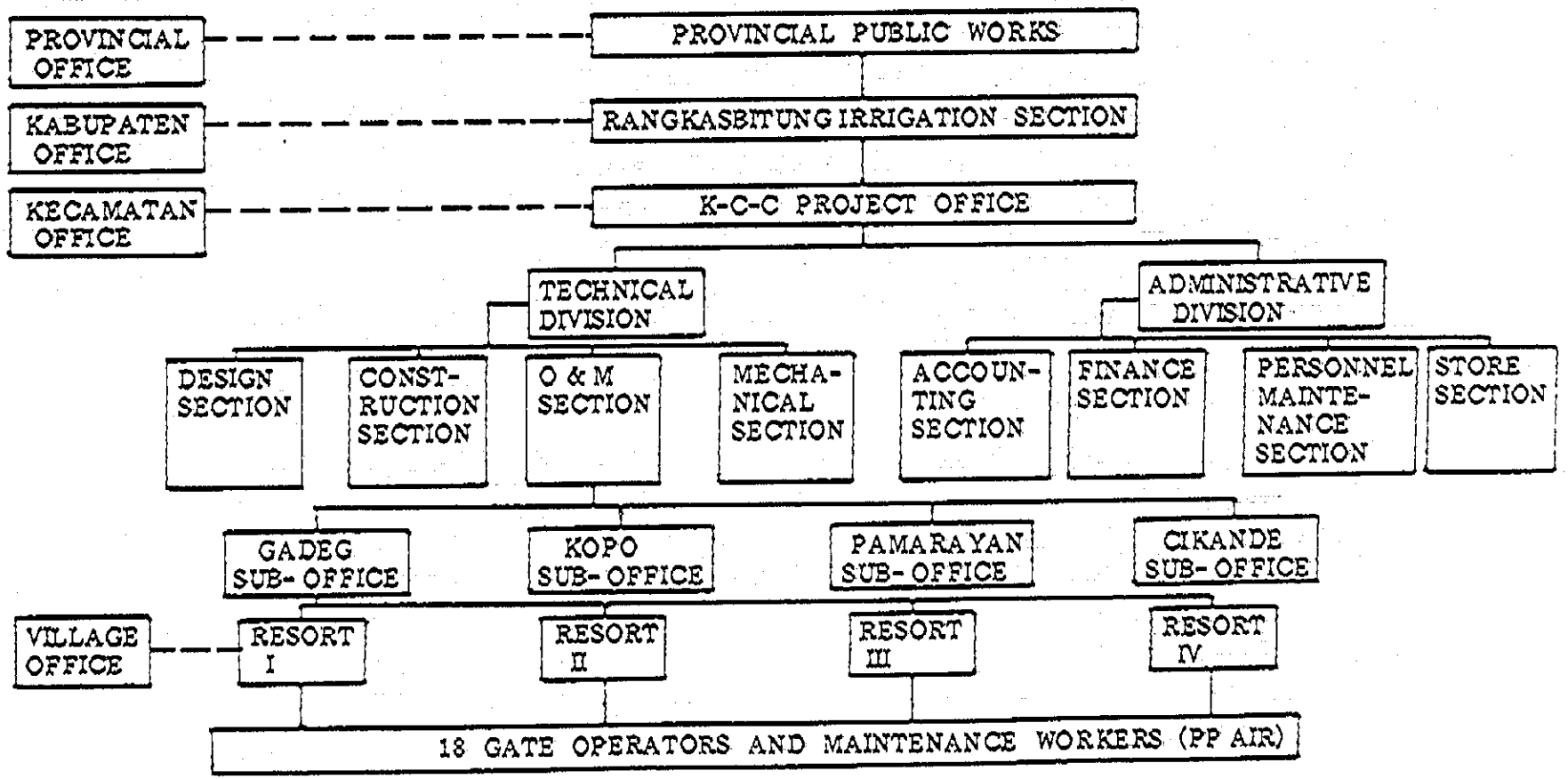


Fig. 1 PROPOSED CROPPING PATTERN

Fig. 2

ORGANIZATION OF PROJECT OFFICE



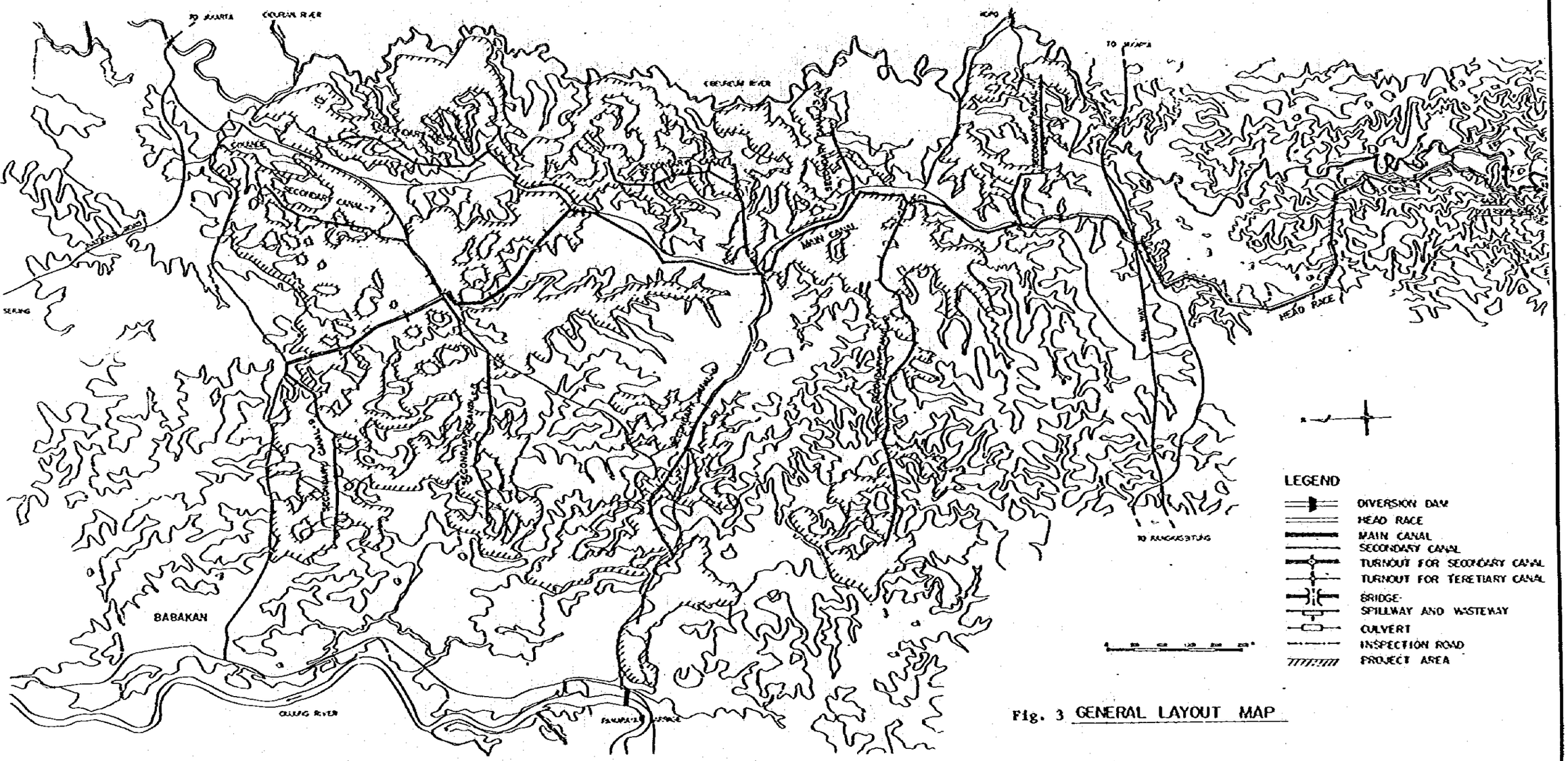


Fig. 3 GENERAL LAYOUT MAP

JICA