

2. COUNTRY REPORT OF INDONESIA

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I. Introduction

Indonesia is an archipelago which forms a highway between two oceans (the Pacific and the Indonesian oceans) and a bridge between two continents (Asia and Australia). The area of land is about 2,027,087 square kilometers, and its area of sea is about four times larger than the land area. The whole territory extends from 6° north latitude to 11° south latitude and from 95° to 141° east longitude, covering a distance of 5,100 km from east to west, and 1,888 km from north to south. There are at least 3,000 inhabited islands among a total of 13,667 varying enormously in size. The land surface of the islands are:

Table 1. Land Surface of Indonesia

Island	SQ. KM	%
Java	134,703	6.64
Sumatera	541,174	26.69
Kalimantan	550,848	27.17
Sulawesi	227,654	11.23
West Irian	412,781	20.36
Maluku	83,675	4.13
Nusa Tenggara	70,629	3.48
Bali	5,623	0.28
Indonesia	2,027,087	100.00

The climate of Indonesia owes much to the insularity of the country, its position astride the equator, and its location between the two continents of Asia and Australia. The first two factors ensure a very even, and generally high temperature, although rarely reaching an extreme heat, throughout the year. Generally, the highest temperature occurs in the coastal plains, but in the mountainous areas it is much cooler.

Temperature ranges between 35 and 18 degrees centigrade and above 600 m the conditions are temperate.

From June to October Indonesia is subject to the east monsoon which originates from Australia and becomes south-west wind as it crosses the equator, linking with the main Asian monsoon. The east monsoon brings little rain, in fact it is identified by the dry season for most parts of Indonesia. The period from November to May is the west monsoon. It originates as north-east wind from the South China Sea and the western Pacific, and becomes west after crossing the equator. The west monsoon is an important source of rain for the archipelago.

II. Population

The rapid growth of population must be considered in relation to food production and the need for the optimum development of land and Water Resources. The annual growth rate is around 2,4 percent. The bulk of the population is concentrated in Java

and Bali. Other islands face problems of man power shortages while transmigration from Java has been limited by finance.

The present population of Indonesia is about 135 million; by 1990 it is expected to be about 189 million (Table 2). To reduce the rate of growth, the Government has set up a planned parenthood programme as a component of the current five-year development plan, by the end of which 3 million people are expected to be participants in the programme.

III. Nutritional levels and food requirement

The staple food of Indonesia is rice. It is hoped to have a daily per capita intake average of 2100 calories and 55 grams of protein by 1974–1979.

Since the present production is not sufficient to meet the demand, the Government is obliged to import rice. At the normal consumption rate of 120 kg per capita per annum, the present consumption of milled rice is about 16,2 million tons; by 1990; consumption will have risen to 22,7 million tons (Table 2).

Table 2. Estimated of Milled Rice 1970–1990

Year	Population (millions)	Milled rice Consumption (million tons)
1970	120	14.4
1975	135	16.2
1980	150	18.0
1985	168	20.2
1990	189	22.7

IV. Land Resources

Only one-third of the total area of countries comprising the developing portion of the region is suitable for cultivation. Indonesia have substantial areas of farmland in reserve, even these favourably situated island (Java and Bali) have zones of over population and exploitation.

V. Water Resources

Basic Policies in Water Resources Development in Indonesia

1. In the years before World War II, irrigation is developed mainly in the island of Java to support sugar canes plantation. Traditional irrigation techniques for rice

Table 3. Irrigated, Rainfed and other Cultivated area in Indonesia (Hectares)

Type of Cultivated area	Java	Outside Java	Indonesia
Full technically irrigated	1.503.740	277.628	1.781.368
Semi technically irrigated	486.379	363.304	849.683
Simply irrigated	919.668	597.209	1.516.877
Total irrigated area	2.909.787	1.238.141	4.147.928
Rainfed	551.135	552.014	1.103.149
Reclaimed swampy/tidal area	162.000	315.449	477.449
Total	3.622.922	2.105.604	5.728.526

Table 4. Effective Rainfall

Island	Mean yearly rainfall	Mean yearly evapotranspiration	Mean yearly effective rainfall
Java	2,700	1,500	1,200
Sumatera	2,845	1,200	1,645
Kalimantan	2,860	1,200	1,660
Sulawesi	2,285	1,100	1,185
West Irian	2,610	1,200	1,410
Maluku	2,315	1,200	1,115
Nusa Tenggara	1,375	1,200	175
Bali	1,910	1,200	710
Indonesia	2,700	1,250	1,450

Those figures give a rough picture of water resources potential of the islands.

Table 5. Population

Island	1. 000 persons	%	Density per sq. km.
Java	76,102	63.8	565
Sumatera	20,813	17.4	38
Kalimantan	5,152	4.4	9
Sulawesi	8,535	7.1	37
West Irian	923	0.8	2
Maluku	1,089	0.9	13
Nusa Tenggara	4,497	3.8	64
Bali	2,120	1.8	377
Indonesia	119,232	100	59

cultivation however are already by farmers in Java and other island such as in Bali and some part of Sumatera (gravity irrigation) and in Kalimantan (drainage of swampy areas).

2. In the first and second five year development plans (1969–1979), efforts are focused on food production. This means that, as rice is the staple food, irrigation, reclamation of swampy areas for agriculture purposes and flood protection of rice producing areas are on the first priority list of the National Development Planning.
3. The main idea of developing water resources are the following:
 - 3.1. to support the increase of food production by providing irrigation facilities, improvement of irrigation water use, protection of the densely populated intensive agricultural lands from flood and secondary lava flooding and reclamation of swampy and areas for agriculture purposes.
 - 3.2. to support the solving of population problems providing irrigation and drainage facilities in the transmigration areas and employment especially in rural areas.
 - 3.3. to support industrial development by construction of multipurpose projects.
4. The policy of water resources developments is based on five principles ,as follows:
 - 4.1. rehabilitation of the existing irrigation networks, which will be realized during a period of approximately 10 years (2 Five Year Development Plans).

- 4.2. construction of irrigation and drainage facilities, which are located in or nearby the so called food consuming areas, transmigration and densely populated areas.
 - 4.3. intensification of flood protection works, especially in the intensive agricultural and densely populated areas, both the water and secondary lava floodings.
 - 4.4. intensification of water resources planning in the form of comprehensive river basin development planning to guide developments of the region in agriculture, industrial, hydro-power, fisheries and other objectives.
 - 4.5. intensification of survey, investigation and research on hydraulic engineering, water resources development and water administration, especially for proper management of the projects during the years to come, and the administration of water as well.
5. With the existence of "heavy consumption centres" namely Medan and surroundings, Palembang (included the Bangka and Belitung, tin island), the urban centers Jakarta, Bandung, Semarang, Yogyakarta, Surabaya, Malang, Balikpapan, etc., there have to be developed rice producing centers in areas close to the consumption centers. Based on this idea, Aceh, West Sumatera, South Sumatera, Lampung, Java, Bali, South Kalimantan and South Sulawesi are selected to be developed further as rice supplying areas (See appendix I).
 6. In selecting priorities of projects to be executed, the following requirements have to be taken into consideration:
Priority should be given quick yielding projects located in or nearby the consumption centers and meeting the following requirements:
 - 6.1. Suitable soil for rice cultivation.
 - 6.2. Quantity and quality of the available water.
 - 6.3. Availability of man power for agriculture.
 - 6.4. No problems in marketing.
 - 6.5. No problems in land ownership.
 - 6.6. Outside regularly flooded or inside flood controlled area.
 - 6.7. Accessibility of the project site.
 - 6.8. And other favourable conditions.

The Extent of Water Resources Development

A. Irrigation

1. In Indonesia there are different kinds of irrigated ricefields: from the most elementary to the full technically irrigated. Simple elementary irrigation networks are usually constructed and operated by the farmers themselves in the framework of village activities, whereas the semi or fully technical ones are constructed by government agencies.

Simple irrigation is usually easily operated and the supply of water is quite enough but the area is limited. The water resources are naturally small rivers mainly in the highlands, which offer no technical problems.

Semi and fully technical irrigation networks are Government's responsibility as their scope are beyond the technical abilities of the village communities. These systems require more technical knowledge in the case of big rivers from which the water is diversified, and large commanded areas covering many villages.

2. There is a tendency however that some villages, especially the wealthy ones, construct technical irrigation networks, although in small sizes, stimulated by the shortage of rice and at recent years by the objective to reach better living standard for the people. The so called village irrigation schemes are designed and constructed by the local Governments or by the villages with the approval by the provincial Public Works Services.

3. The goal of irrigation rehabilitation program is to increase agricultural production especially rice and this is priority No. 1 among the programs implemented in the First Five Year Plan. However, an important increase occurs only when technical irrigation has been rehabilitated which assures the water input.

Technical irrigation requires proper operation and maintenance. These are necessary for the diversion facilities, the primary and secondary irrigated system, the drainage networks and also the tertiary networks operated by farmers themselves through the village water distributors as an extension of the Public Works Operating staff.

4. The "Five Points Efforts" (Panca Usaha) promoted by the Ministry of Agriculture consists of:
 - 4.1. a good irrigation water supply and effective water management through imported irrigation system.
 - 4.2. improved cultivation techniques.
 - 4.3. high yielding variety.
 - 4.4. fertilizers.
 - 4.5. pesticides, which are meant to support the increase of food production.
5. To secure the water input mentioned above, especially in the dry season, two ways have to be realised:
 - 5.1. effective and efficient operation and maintenance of the existing irrigation networks and proper water management at the farm level.
 - 5.2. construction of reservoirs.
6. For an effective and efficient operation and maintenance two things have to be prepared.
 - 6.1. effective organization and skilled personnel.
 - 6.2. available funds.
7. It is decided by the Government that contribution for operation and maintenance will be collected from the water users. This policy however is rather new for Indonesia, at least for the farmers, where they are used to have the irrigation water free of charge. No water charge scheme have been realised up to now. Land tax on the other hand, has been collected for years before by the Land tax office; therefore contribution by the farmers to finance operation and maintenance will be collected in the near future by the former Land tax Office.

B. Development and Reclamation of Deltaic and Swampy Areas

1. Development and reclamation of deltaic and swampy areas are common to the agricultural society, and there are many cultivated lands which formerly have been swamps such as Karawang (rawa or rawang is swamp) in the middle part of Jatiluhur irrigation scheme or the Brantas Delta irrigation scheme.
2. There are approximately 34,000,000 Ha of swampy areas throughout Indonesia. A very small part has actually been cultivated and there is still approximately 10,000,000 Ha which potentially can be developed. Since the implementation of the Five Year Development Plan Reclamation of swampy areas has been given a high priority and the Government has tackled the project seriously and systematically. The former swamps which have been developed such as in South and Central Kalimantan, South Sumatera, Jambi etc. have started to produce and since many transmigrants cultivate these lands.
3. The present efforts of developing the deltaic and swampy areas are focused upon the development of irrigation ricefields or reclamation of swamps by means of drainage to support rice production and transmigration or resettlement. In the second Five Year Development Plan the target for such reclamation is 1,000,000 Ha covering 6 Provinces as follows:

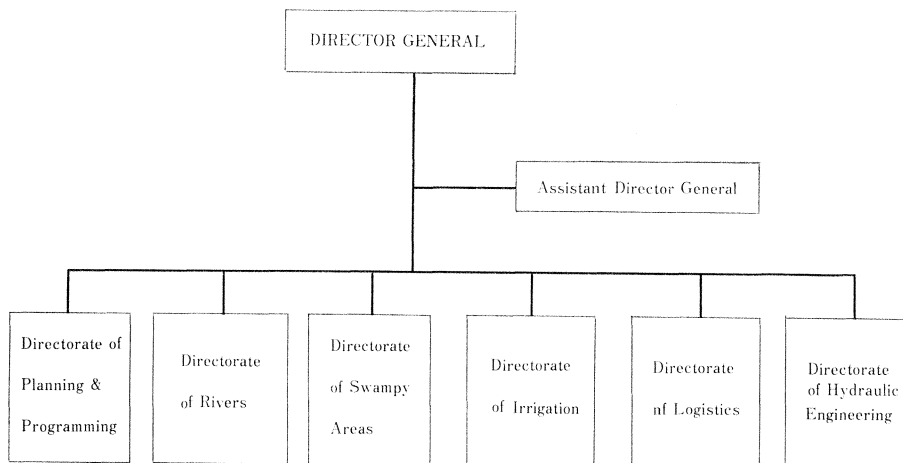
—Riau	300,000 Ha
—Jambi	100,000 Ha
—South Sumatera	300,000 Ha
—West Kalimantan	100,000 Ha
—South and Central Kalimantan..	200,000 Ha

4. Since January 1975 the Directorate of River and Swampy Area Development is divided and reorganized especially to support the reclamation programmes. At present there are 2 Directorates, i.e. Directorate of Rivers, which is responsible for the flood control, river training and river improvements, and Directorate of Swamps which is responsible for the reclamation of swampy areas.

C. *Flood Control, River Training and River Improvement*

1. Flood control, river training and river improvements have been tackled intensively since the end of 1960 with the objectives of:
 - 1.1. the main objective is to control the rivers from floods, to protect rice producing areas, especially the intensive ones.
 - 1.2. to protect the export commodities producing agricultural lands (such as palm oil, tobacco etc.).
2. Flood problems are naturally influenced by the extent of the catchment areas and another factors such as rainfall intensity, wind, temperature, topography, geology, protecting forest, land use and methode of cultivating the lands. Beside the water flooding, in Indonesia there are also floods caused by the secondary lava flooding, or as the continuation of volcanic eruption. At this time being 3 volcanoes (Mount Merapi in central Java, Mount Kelut in East Java and Mounng Agung in Bali) have been tackled by the Government and a sulphuric polution control (in Bangkulu) is also under construction.
3. The extent of flood control and river engineering substantially can be divided into 4 categories, as follows:

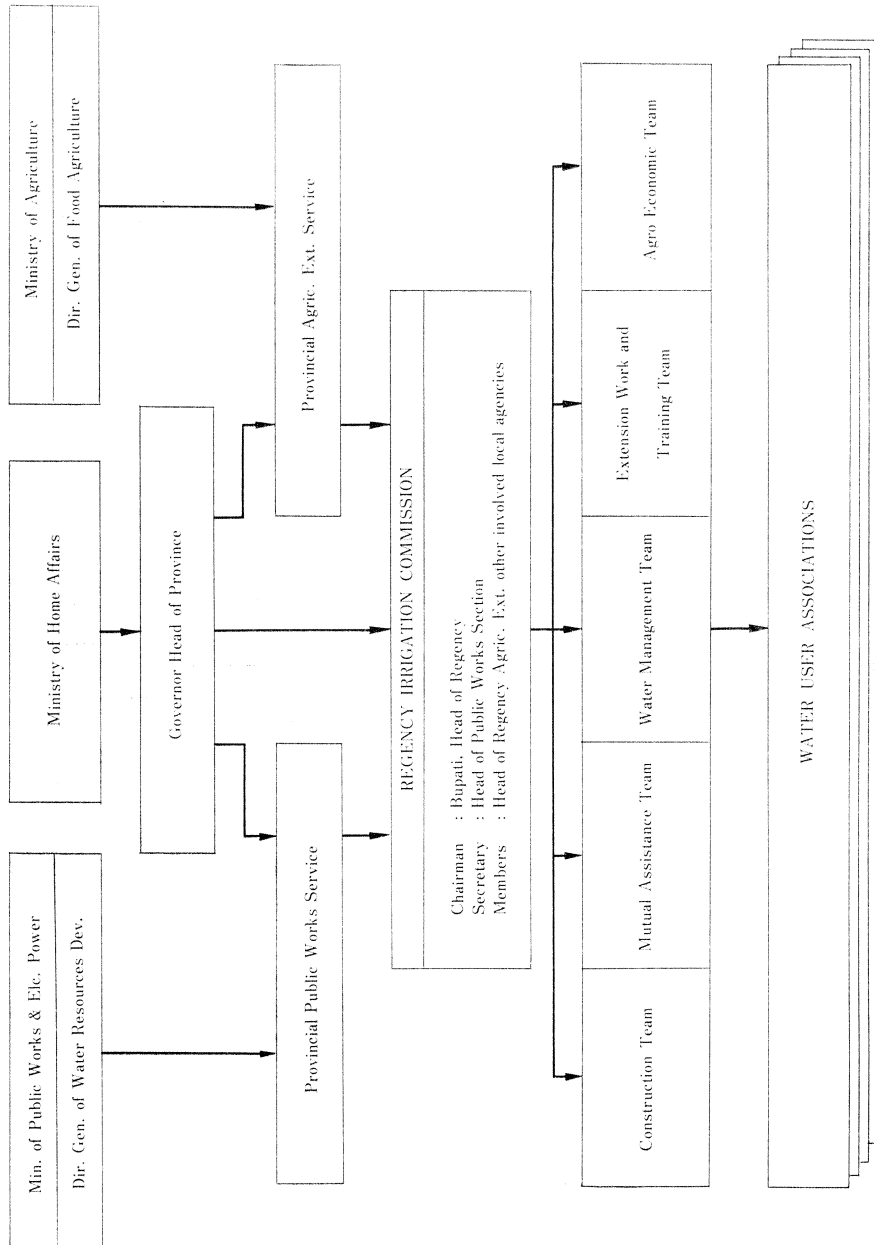
Directorate General of water Resources Development



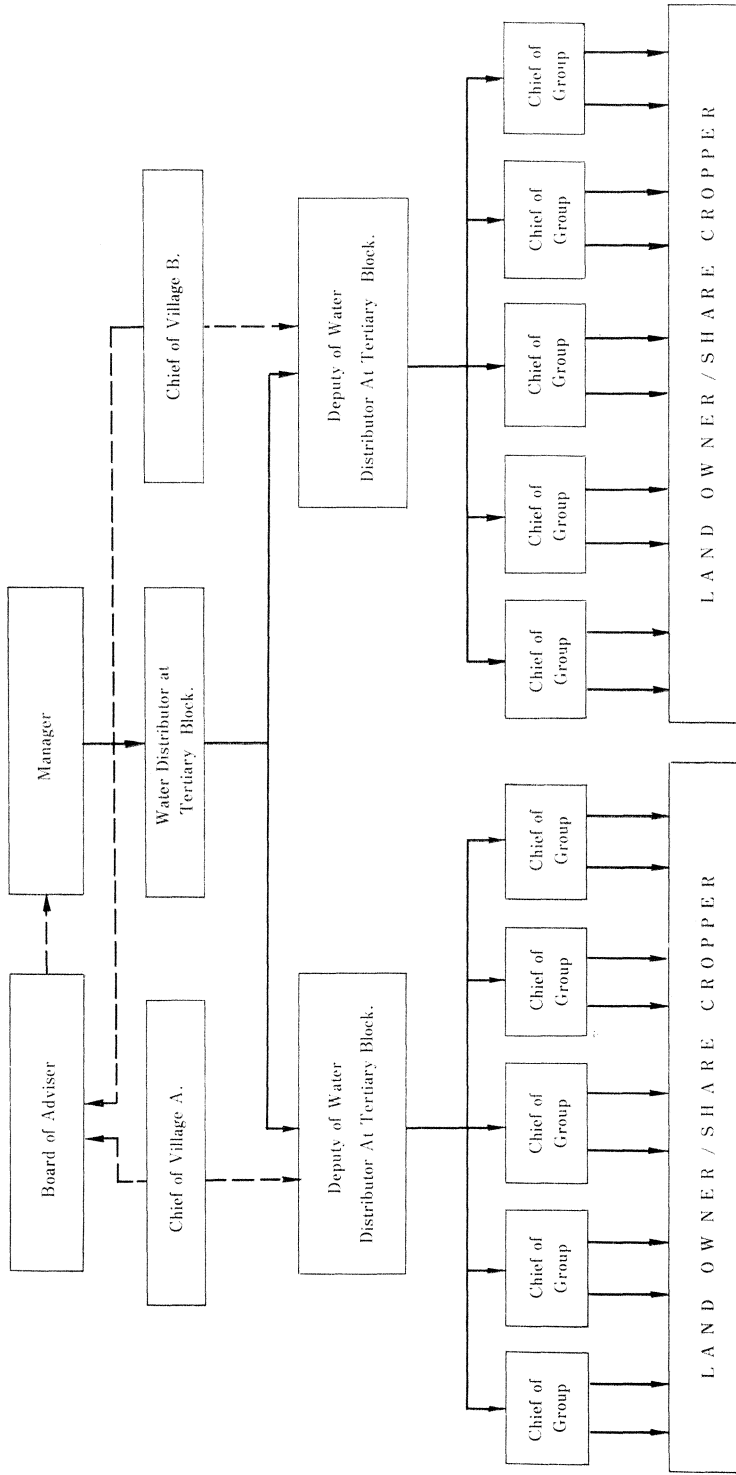
Notes :

- I. The Directorates are organized on the same pattern, consisting of:
 - a) a Staff, headed by an Assistant Director.
 - b) Sub Directorates.
- II. If it is deemed necessary, the Ministry may establish a Special Project Execution Body, especially in charge and assigned to execute a project. This Execution Body may be established as a "Joint task force" consisting of officials from other agencies as well.

**Water Management at Regency (Kabupaten) Lever
Terminal unit Development team**



Water user association



- 3.1. temporary efforts which is still "defensive" (e.g. repairing the damages caused by flood and secondary lava flooding).
- 3.2. rehabilitation of flood and lands slide protection or construction of new structures.
- 3.3. improvements of existing and construction of new structures for river training and river improvements.
- 3.4. multipurpose projects for agriculture, hydro-power, municipal and industrial water supply, fisheries, recreation and other purposes.

D. River Basin Developments

1. Development of river basin is a comprehensive effort to develop the whole river basin and can be categorized as regional planning by means of river, following the experiences of Tennessee Valley development in the United States of America.
2. At this time being 4 multipurpose projects are under construction, i.e. the Jatiluhur, Karangates, Selorejo, and Riam Kanan, multipurpose projects. Several other projects are still studying or planning, such as the Bengawan Solo development, Lampung water development, Barito river Development, Bali, Lombok, and Others.

VI. Conclusions

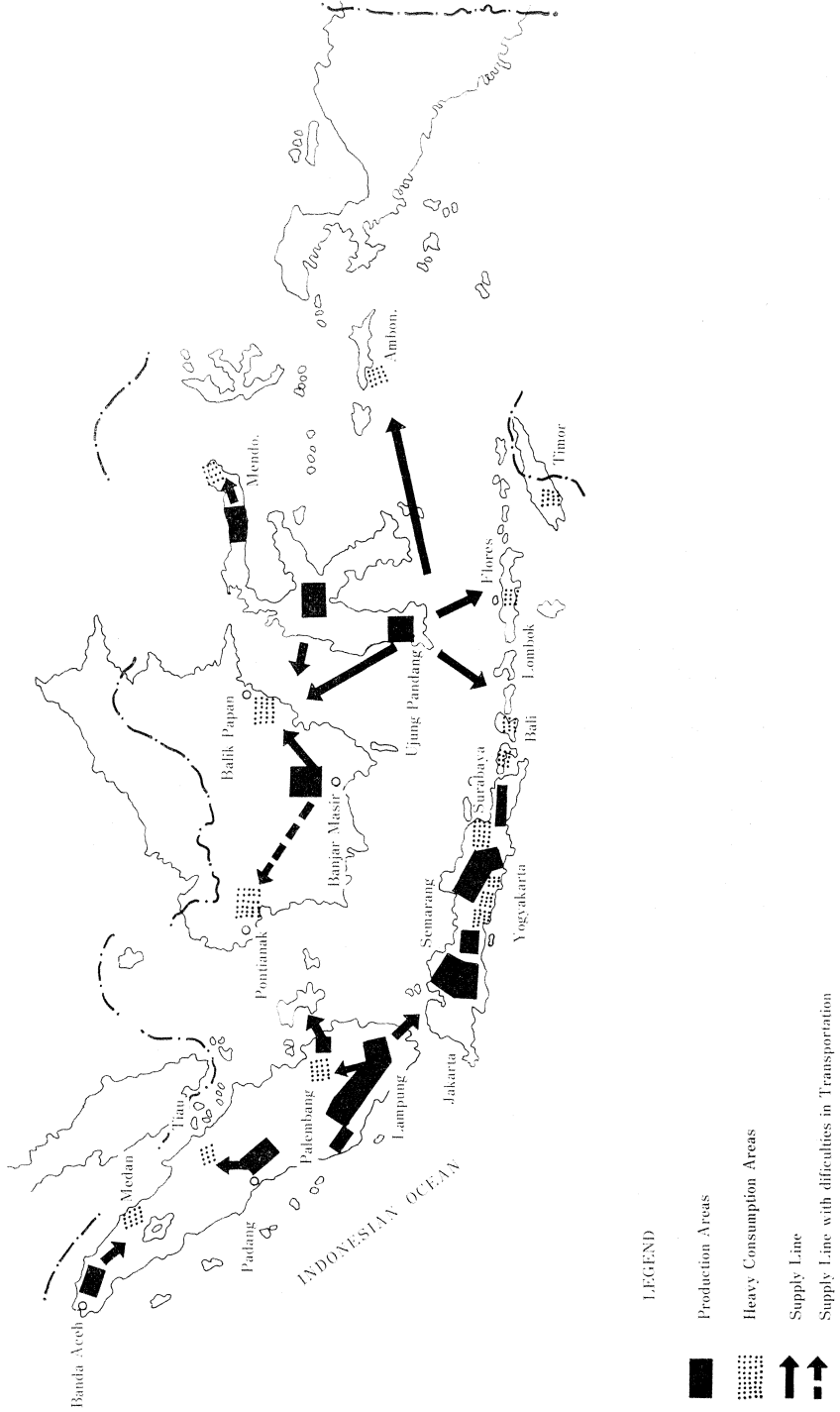
6.1. Water resources for the present.

- 6.1.1. Water resources of Indonesia is unequally distributed throughout the islands, while the population distribution is unfavourable. Java and Bali islands have the worst condition since the effective rainfall is relatively low (resp. 1200 and 710 mm/year) and the population density is very high (resp. 565 and 337 cap/sqkm). Nusatenggara has another poor characteristics. Although the population density is small (64 cap/sqkm), but the effective rainfall is terribly low (175 mm/year). These three regions are classified as having poor water resources condition. The rest of the country with its fair and good water resources conditions has no real problem.
- 6.1.2. The variation of water availability in time makes bigger problem. People suffer from floods in the rainy seasons and from drought in the dry seasons. Those conditions effect agricultural food productions, especially rice as main food of the population.
- 6.1.3. Efforts have been made to plan and manage the available water resources efficiently to meet the present requirements. Old facilities are available and new facilities are established, eventhough it is still insufficient to meet the increasing demand of the population.
- 6.1.4. Priorities have been set up to be able to fulfil the short-term needs with the available budget. Fair result is achieved at the end of the First Five Year Development Plan (March 31, 1974).
- 6.1.5 The practice of water resources planning and management is improved gradually following the trend of modern development. Relatively new methods are adopted, e.g. the use of "soft wares".

6.2. Water resources for the future.

- 6.2.1. Short-range planning for the coming Second Five Year Development Plan commencing from the 1st April 1974 is established.
- 6.2.2. Priority for the short-range development has been given to the small schemes which are able to be executed by intermediate technology. The direct impact of this development to the rural population is preferred.
- 6.2.3. Serious attention has been given to the preservation of environment, among others by soil & water conservation and water pollution abatement. Prevention by careful planning, proper management and regulation and law enforce-

Map of rice consumption and production areas



ment will be established.

- 6.2.4. Support will be given to the industrial development through the increase of water and hydropower supply to anticipate the change of development priority from agriculture to industry.
- 6.2.5. Big multipurpose schemes will be developed in stages and on long-range basis. Several pre-investment activities will be conducted properly in sufficient length of time.
- 6.2.6. River basin studies will produce master plans for water resources development. Starting from the master plans of major rivers in the priority areas it will be enlarged to the water resources development planning for the whole country.
- 6.2.7. Modern techniques in water resources planning and management e.g. water resources systems analysis will be monitored, evaluated and adopted to be applied for benefit of the future.

VII. Question and Answer

N. Yamada, Japan: I have two questions just for clarification. (1) Irrigation in Indonesia is classified as technical, semi-technical and simple irrigation. What is the difference between these three categories of irrigation?

(2) On page 7 of your report, the Five Points Efforts (Panca Usaha) is mentioned. Does it differ from so-called BIAMS Scheme or INMAS Scheme?

Answer: (1) a) The technical irrigation scheme: A scheme in which the main system is as adequately provided with the appropriate diversion, supply and drainage facilities including the auxiliary regulating structures and measuring devices, enabling the exercise proper water control from source of diversion to the tertiary off takes. Beside the appropriate facilities, the main system was also provided with the adequate amount of O & M personnel and labourers including the necessary tools, equipments and facilities.

Survey, design, construction, Operation & Maintenance of the irrigation and drainage facilities in the system were carried out and financed by the Government. As to the tertiary unit, the Government's responsibilities were restricted to the following:

- * The survey and design of the tertiary units and the conveyance system.
- * The excavation of a stretch of 30 to 50 m length of tertiary ditch which served as a sample for the farmers who had to do the rest of the excavation works.
- * Fixing of stakes in the ground and some profiles for canal tracer and construction.

Thus the construction and maintenance of the tertiary ditches and the practice of water management at the tertiary and farm level were completely left to be carried out by the farmers themselves.

Due to the financial constraint and the generally low technical capability, most of the farmers, have not the ability to produce orderly work or to maintain the system properly.

b) The semi technical scheme:

A scheme which was provided with an appropriate head structure with the necessary regulatory and measuring device for accurate diversion control. Survey design, construction and its Operation and Maintenance of such scheme were carried out and financed by the Government.

The remaining irrigation and drainage canals and structures in the scheme were carried out and financed at farmers expenses (except a stretch of 30 a 50 m length of the canal after the measuring device) were generally not provided with the necessary control devices so proper water management within this area was out of question.

c) The simple/primitive irrigation scheme:

This scheme was developed on proposal and initiative of farmers of one or more

villages, after getting the necessary informations and approval from the local irrigation service.

Structure either for diversion or regulation and distribution of water in the irrigation scheme were temporary character and generally lacking of the necessary devices.

Advisory services on O & M of the system or in water management were extended by the local irrigation service.

From the above stated explanations we can draw the conclusion that the classical & design criteria of irrigation project had not paid enough attention to the significance of rational and timely application of water for increased crop production.

Consequently a wide gap exists between the irrigation potential created and the full exploitation (O & M) of the potential, a gap mainly due to the time lag between the completion of the main civil engineering structures on one hand and on farm development with supporting water management on the other.

(2) Intensification of food production.

The Government has taken measures to increase food production by extending the area under cultivation and raising the productivity of areas already under cultivation.

These measures include the provision of incentives to farmers. In an effort to increase rice production, the Ministry of Agriculture has introduced what are known as BIMAS an INMAS programmes.

The BIMAS programme is an intensive national agricultural extension programme involving the

1. Efficient use of irrigation water.
2. Improved of cultivation techniques.
3. Use of high-yielding varieties.
4. Proper fertilizer application.
5. Control of pests and diseases (five points efforts).