No. 05

THE CONSTRUCTION PROJECT

18086

BASIC DESIGN STUDY REPORT

ON

THE CONSTRUCTION PROJECT

OF

THE DIVERSIFIED CROPS IRRIGATION ENGINEERING CENTER

IN

THE REPUBLIC OF THE PHILIPPINES

JUNE 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Basic Design Study for the Project for construction of the Diversified Crops Irrigation Engineering Center, and entrusted the survey to the Japan International Cooperation Agency (JICA).

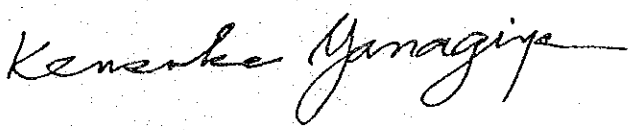
The JICA dispatched to the Philippines a study team headed by Mr. Sosaku Hagiwara, Director of the Construction Department., Tokai Regional Agriculture Office, Ministry of Agriculture, Forestry and Fisheries, from January 21 to February 7, 1988.

The team had discussions with the concerned officials of the Government of the Philippines and conducted surveys of the project site and collected data. Further studies were made after the team returned to Japan. Then the draft mission headed by Tomoyuki Fujii, Technical Cooperation Div., Agricultural Development Cooperation Dept., JICA, was dispatched from May 8 to 14, 1988 to confirm the draft of the final report, and the present Report has been prepared.

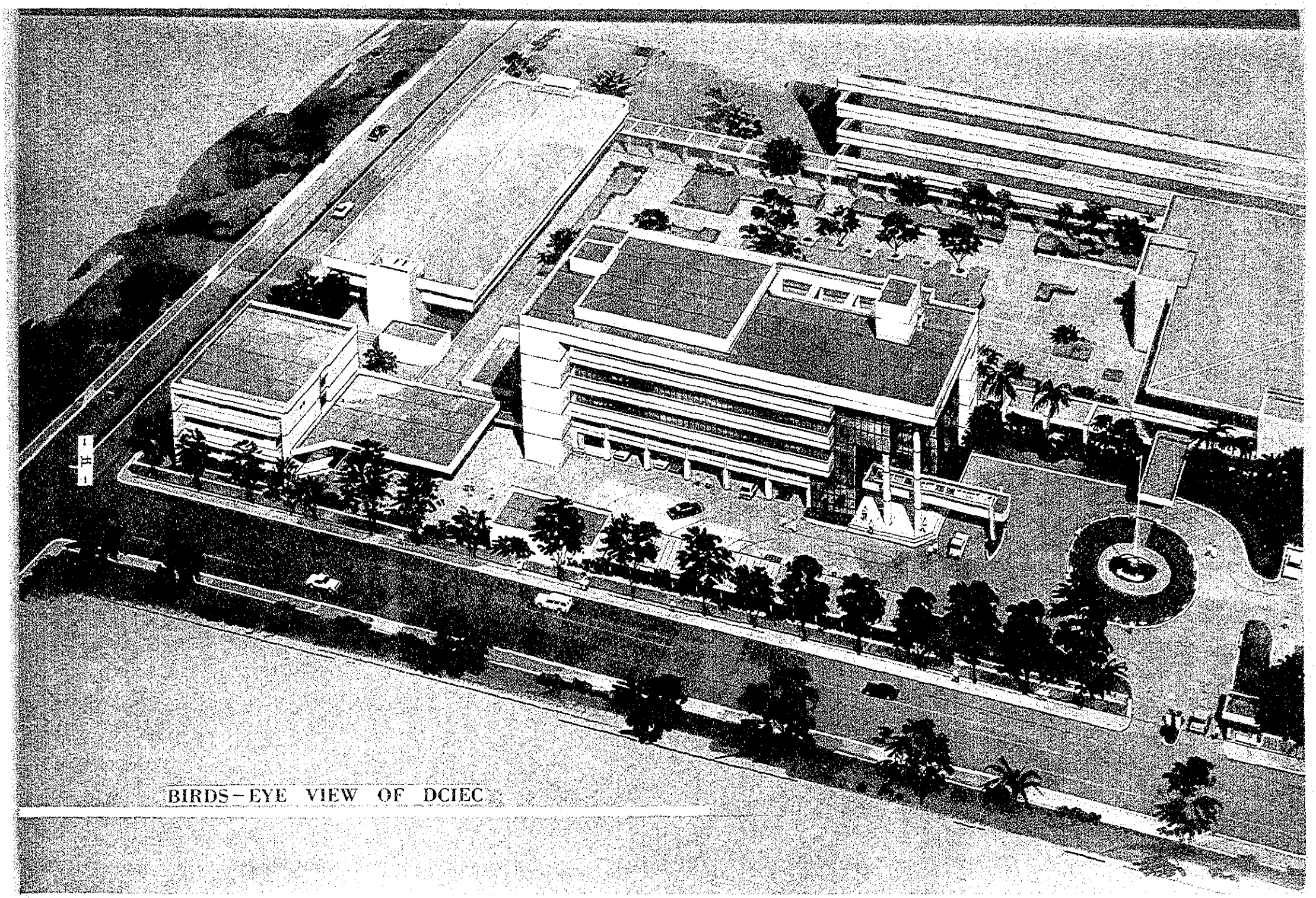
I hope that this Report will serve for the development of the project and the improvement of diversified crops irrigation engineering in the Republic of the Philippines, and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the study team.

June 1988

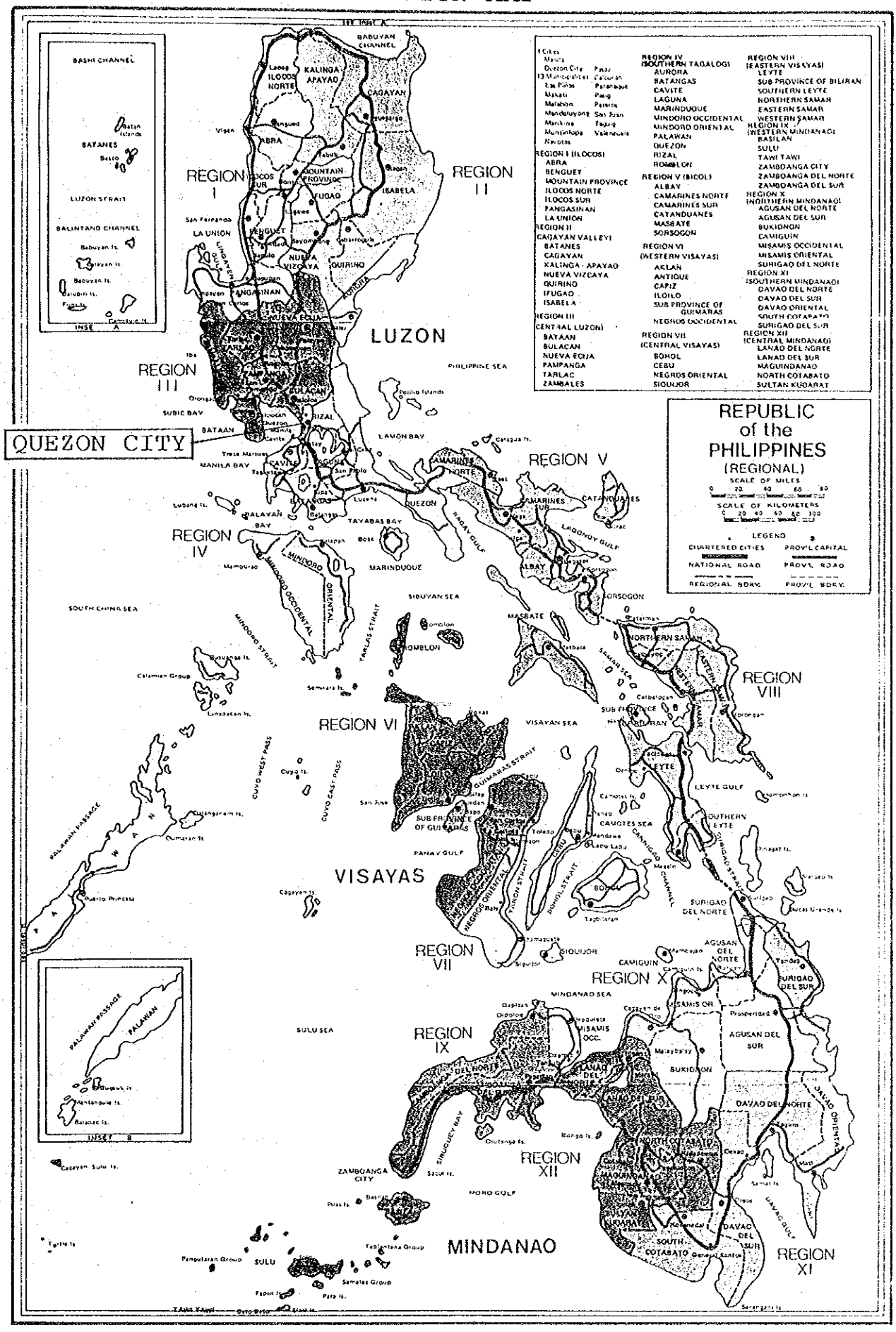


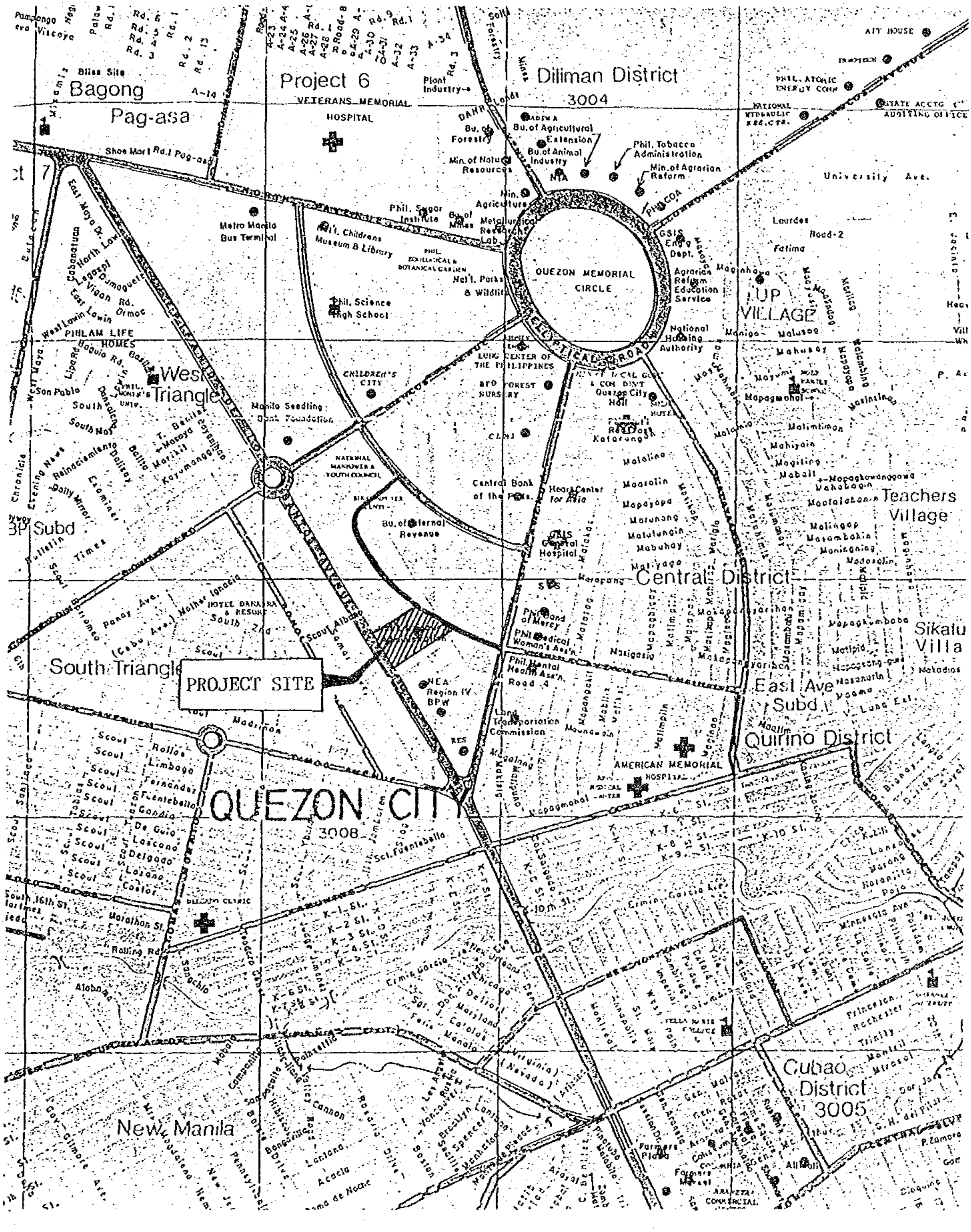
Kensuke Yanagiya
President
Japan International Cooperation Agency



BIRDS-EYE VIEW OF DCIEC

LOCATION MAP




Bagong
Pag-asa
Project 6
Diliman District
3004
VETERANS MEMORIAL HOSPITAL
QUEZON MEMORIAL CIRCLE
UP VILLAGE
West Triangle
Central District
Teachers Village
Sikatuna Villa
South Triangle
PROJECT SITE
East Ave Subd
Quirino District
QUEZON CITY
3008
AMERICAN MEMORIAL HOSPITAL
Cubao District
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PHILAM LIFE HOMES
University Ave.

SUMMARY

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The government of the Philippines, having recently reemphasized the importance of agriculture, one of the country's major industries, turned to a policy of giving highest priority to the development of agriculture. Meanwhile, the cultivation of rice, the principal agricultural crop, has increased to the level of self-sufficiency, owing to the implementation of agricultural promotion policies -- the Masagana 99 Project (rice production improvement program) -- and technical training for the farmers. The government of the Philippines now established the major objectives of agricultural development as the increase of crops production other than rice and the maintenance of an adequate supply of rice in order to attain overall self-sufficiency in food.

For this purpose, it became necessary to promote the multi-utilization of rice fields to develop the cultivation of crops other than rice, and to emphasize crop diversification by introducing non-rice crops in rice fields as secondary cultivation. As the Philippines has concentrated its activities on rice field irrigation, it does not have sufficient technology and experience in crop irrigation other than rice.

Recognizing this situation, the National Irrigation Administration (NIA) drew up a Diversified Crops Irrigation Engineering Project (DCIEP), and requested the government of Japan to provide project-type technical cooperation.

At present, this project-type technical cooperation is being implemented at the existing facilities. However, the distant locations of the testing laboratories for water and soil in relation to the NIA Central Office, and the inadequacy of equipment make it inconvenient for close relationships and obstruct successful results. These training programs have not been expected to attain particularly satisfactory results because of the distance from the training center and lack of appropriate training facilities and equipment.

The project for establishing the "Diversified Crops Irrigation Engineering Center" (DCIEC) with the necessary equipment was subsequently requested by the NIA to the government of Japan from the concept that a promotional and development center for irrigation engineering would be

needed for the effective progress of the DCIEP and project-type technical cooperation. The activities of the DCIEC are as follows:

(1) Examination of irrigation methods for crops
(2) Standardization of research methods
(3) Establishment of crop irrigation criteria
(4) Selection of irrigable farm land
(5) Research and analysis of water, soil and construction materials
(6) Training of the NIA staff, preparation of training aids
(7) Education of farmers

Responding to this request, the government of Japan decided to conduct a "Basic Design Study on the Construction of the Diversified Crops Irrigation Center", and sent a study team through the Japan International Cooperation Agency to the Philippines from January 21 to February 7, 1988. The study team carried out the basic design study including discussion of contents of the request, the background and objectives of the project, a survey of the construction situation, and confirmation of the implementing agency of the project, etc.

As a result of this study, the Center has been designed to consist of a 5-storey Main Building of about 5,500 m^2, a 3-storey Dormitory of about 800 m^2, a single-storey canteen of about 200 m^2, and connecting passages of about 100 m^2, after examining the expected activities of the Center and the personnel appointment plan for the Center presented by the NIA. The principal rooms and equipment needed for each purpose are as follows:

- Administrative Section (478 m^2)
  rooms for the director and executive staff, management and control room, conference rooms, clinic, information desk, storage, etc.

- Research and Laboratory Section (1,580 m^2)
  computer room, line staff's room, research and study rooms, soil chemical test laboratories, soil physical test laboratories, sample preparation room, plant sample analysis room, storage, library, locker rooms, etc.

- Promotion & Training Section (943 m^2)
  instructors' room, classrooms, seminar rooms, convention hall and anterooms, A-V room, exhibit room, printing room, storage, etc

- Garage (659 m^2)
  parking area, drivers' room

- Common Facilities (1,873 m^2)
  water tank room, pump room, main utility room, elevator machine room, fan room, storage, etc.

- Dormitory (1,056 m^2)

- Major Equipment
  - Equipment for water quality and soil chemical analyses
  - Equipment for soil engineering tests
  - Equipment for training
  - Computers and vehicles

The entire compound of the NIA in Quezon City has about 29,000 m^2. The project site provided by the NIA in this compound is about 4,000 m^2, adjacent to the 9-storey headquarters of about 18,000 m^2 on the south and the 2-storey annex building of about 2,000 m^2 on the southeast.
The required floor area is calculated at about 6,600 m^2 according to the staff allocation schedule prepared by the NIA. To allocate this floor area in the project site, a 5-storey building is regarded as appropriate, leaving sufficient surrounding space and keeping harmony with the environment, and especially the adjacent 9-storey NIA headquarters. As the project site is located in the compound of the NIA, there will not be any infrastructure trouble except for water supply.

The types and amount of the equipment for research and testing, and for training will be so selected that they are not the same type as that to be provided by the project-type technical cooperation, based on frequency of use.
A simple system with a minimal possibility of trouble is the principal object. A sufficient amount of spare parts shall be also included in the grant, in view of the present conditions.

It is expected to take 20 months to complete the project after signing the Exchange of Notes, including approximately 15 months of constructing the middle-rise building. The project implementing organization of the Philippines is the NIA.

The most important factor in developing irrigation technology is to improve the irrigation engineers' technical level. In this respect, this Center will play an important role as the research and training center for irrigation engineering.

The improvement of diversified crops irrigation technology will result in the enhancement of agricultural productivity and farmers' incomes, which will contribute to national prosperity. When this is considered, the realization of this Center is expected to provide a great deal of assistance and indirect benefits to the Filipino people.

In addition, the following matters need to be considered, for the purpose of efficient implementation of this project.

(1) Assurance of land preparation and infrastructure at the project site, especially sufficient water supply.

(2) Detailed negotiations and discussions with the Department of Agriculture and other authorities concerned as to crops to be introduced and promotion of cultivation technology among farmers.

(3) Consideration of maintenance after the completion of work. Sufficient budget will be needed to assure proper maintenance of the laboratory equipment, buildings and facilities.

(4) Procurement of the necessary number of executive personnel, engineers and assistants for smooth operation of the Center; proper appointment of these staff members to right positions.

(5) Carrying out the long-term technology training schedule to train young scientists and irrigation engineers who will do research and studies using the equipment in the Center.

CONTENTS

ABBREVIATIONS

ACI Code	: Building Code Requirements for Reinforced Concrete, American Concrete Institute
ADB	: Asian Development Bank
APC	: Bohol Agricultural Promotion Center
BPI	: Bureau of Plant Industry
DA	: Department of Agriculture
DCIEC	: Diversified Crops Irrigation Engineering Center
DCIEP	: Diversified Crops Irrigation Engineering Project
DPWH	: Department of Public Works and Highways
E/N	: Exchange of Notes
IFPRI	: International Food Policy Research Institute
IIMI	: International Irrigation Management Institute
IRRI	: International Rice Research Institute
MERALCO	: Manila Electric Company
MWSS	: Metropolitan Water Works and Sewage System
NCSO	: National Census and Statistics Office
NEDA	: National Economic and Development Authority
NIA	: National Irrigation Administration
NPC	: National Power Corporation
NSCP	: National Structural Code of the Philippines
NWRC	: National Water Resources Council
PAGASA	: Philippine Atmospheric Geophysical, Astronomical Services Administration
PCARRD	: Philippine Council for Agricultural Resources Research and Development
PDD	: Project Development Department
PF	: Phase Free Energy
PLDT	: Philippine Long Distance Telephone
R/D	: Record of Discussions
TDD	: Training and Manpower Development Division
UBC	: Uniform Building Code
UPLB	: School of Agriculture, University of the Philippines in Los Baños

CHAPTER 1 INTRODUCTION

CHAPTER 1 INTRODUCTION

The government of the Philippines, aiming at the modernization of industry, concentrated its investment in the urban areas for a long period. Industrial productivity showed very rapid development, while agricultural productivity lagged behind. However, agriculture is the principal industry of the Philippine economy. In spite of depressed state of exports of primary products including coconut, sugar, and Manila jute, the major exports of the country, export profits from agriculture have compensated for about half of the trade deficit of other industrial sectors.

Though agriculture contributes largely to the Philippine economy, productivity is still insufficient, the rate of growth being low. The income difference between the urban and rural regions is becoming wider.

The cultivation of rice, one of the major crops in the Philippines, has increased to attain recent self-sufficiency owing to the implementation of agricultural policies -- the Masagana 99 Project -- and technical and financial assistance to the farmers, in addition to improvements to the agricultural environment such as the expansion of farm land, crop breeding and irrigation engineering. Major objectives of agricultural development are the increase of crop production other than rice and the maintenance of an adequate supply of rice, to attain self-sufficiency in food. For this purpose, it became an urgent necessity to promote the multi-utilization of rice fields to develop cultivation of non-rice crops, and emphasize crop diversification by introducing non-rice crops in secondary cultivation.

As the irrigation projects have been concentrated in rice cultivation, and the government of the Philippines does not have ample technology for non-rice crop irrigation, they requested the government of Japan to provide technical cooperation for the Diversified Crops Irrigation Engineering Project (DCIEP), which is now under way. However, the NIA is not equipped with the proper laboratories and training facilities. In addition, the scattered locations of the research and testing

facilities in relation to the NIA Central Office make it inconvenient for close relationships and obstruct successful results. In recognition of this situation, the government of the Philippines planned the establishment of the Diversified Crops Irrigation Engineering Center (DCIEC) to integrate the functions of these facilities, and presented a request to the government of Japan for grant aid to realize the establishment of the Center.

In response to this request, the government of Japan sent a basic design study team headed by Mr. Sosaku Hagiwara, Director of the Construction Dept., Tokai Regional Agriculture Office, Ministry of Agriculture, Forestry and Fisheries, to the Republic of the Philippines from January 21 to February 7, 1988. The study team discussed the contents of the request and the project, surveyed the background of the project, construction situation and site conditions, confirmed the implementation body of the project, explained to the Philippine authorities the scope and procedure of grant aid programs, and confirmed the scope of the responsibilities of both governments when the project is realized.

Based on previous study results, JICA carried out further studies concerning the project including scale, construction period, costs and feasibility, and prepared the draft of the basic design study (draft final report) on the basic design study. The final report mission, headed by Tomoyuki Fujii of the Technical Cooperation Div., Agricultural Development Cooperation Dept., JICA, was in the Philippines from May 8 to 14, 1988. The mission presented and discussed the draft of the basic design study report, and this report was prepared following a basic agreement reached between the governments of the Philippines and Japan.

CHAPTER 2
BACKGROUND OF THE PROJECT

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2-1 Overview of the Philippines

2-1-1 Land and Population

The Philippines, situated between the west Pacific Ocean and the South China Sea, is composed of about 7,100 islands. The total area of the Philippines is about 300,000 square kilometers. The country is located in the tropical monsoon climate zone, with rather high temperatures. The annual average temperature is 27°C.

The population was about 54.67 million in 1985, with a population density of 182/km^2. As the population in 1980 was 48.1 million, the population increased about 5.57 million in 5 years, with the annual increase rate being about 2.0%.

The major agricultural products for export are coconuts, pineapples and their products, bananas and sugar.

2-1-2 National Economy

The recent economic growth rate in the Philippines declined by 5.3% in 1984, 4.0% in 1985 and 2.2% in 1986, but has shown a positive growth since 1987. The foreign currency reserves once decreased to less than one billion dollars because of huge accumulated foreign liabilities accounting to 26.3 billion dollars, but have been recovering by taking advantage of the low levels of international interest rates.

2-1-3 National Development Programs

The government has made the following economic principles:

1) to lessen the role of the government, introducing private industry in a central role in the economy,
2) to exclude monopolies,
3) to establish the fair and stable economic activity standards,
4) to increase production of food, to decrease food imports, and

5) to lessen the outflow of capital by negotiating debts with the foreign governments.

(source: Philippine Country Report, No.2 - 1986,
The Economic Intelligent Unit, United Kingdom)

Based on these principles, the new government issued "A Short-term Recovery Plan for the Rural Sector" on May 14, 1986, and "A Long-term Policy Agenda for the Agricultural Sector" in June 1986, showing priority to agriculture in its policies.

2-2 Overview of Agriculture in the Philippines

2-2-1 Agricultural Circumstances

(1) Present Situation

Having attained self-sufficiency in rice production in the 1970's, the Philippines now puts emphasis on the increase of yields of other crops, especially self-sufficiency in feed crops and an increase of crop transportation capacity. It also intends to encourage crop production to compensate for lower sugar cane prices in order to raise farmers' incomes.

Agriculture is the principal industry in the Philippines. Agricultural production accounts for about one-third of the gross domestic product. About 60% of total exports are made up of agricultural products and processed foodstuffs. According to the 1985 statistics, about 50% of the total labor force were agricultural workers. Around 60% of all families live below the poverty line, 70% of which are concentrated in rural agricultural areas. The development of agriculture is regarded as important for the relief of the poor.

The 1983 statistics showed the total cultivated area to be 11.25 million hectares, 37.7% of the total country, of which 7.85 million hectares are single crop areas and 3.4 million hectares multiple crop areas. Major agricultural products are rice and corn for food, and coconut and sugar cane as export products. Planted area of each product are -

rice	3,240,000 hectares
corn	3,157,000
sugar cane	420,000
coconut	3,209,000

(Source: Bureau of Agricultural Economics, 1983)

The statistics showed that the total population of the Philippines in 1983 was 52.09 million. Farmers families accounted for 22.72 million, about 48% of the total population. About 40% of the farmers are tenant farmers. On the country-wide average, one farmer owns about 3.6 ha. of land, while the farmer mainly cultivating rice and corn owns 2.7 ha. As rice planting has been the most stable farming activity recently, farmers are inclined to grow rice if only they have a secure source of water.

As for productivity, rice is 2.5 metric tons/ha., almost reaching the self-sufficiency level, due to introduction of the high yield type, and corn productivity rather low 1.0 metric tons/ha. Though corn is in large demand as a food and forage crop, about 10% of the total corn consumption (about 300,000 tons) is imported. Coconuts are mostly cultivated by small-scale farmers, and sugar cane by large-scale farmers. Both are in difficulties in exporting due to the limitations of the market and depression of international prices.

(2) Recent Agricultural Policy

After the political change, the DA of the new government issued "A Short-term Recovery Plan for the Rural Sector" (referred to as the "short-term plan") in May 14, 1986. Likewise, "A Long-term Policy Agenda for the Agricultural Sector" (referred to as the "long-term policy agenda") was presented in June 1986.

1) The short-term plan

This plan is programed based on the President Aquino's pre-erection speech. The 3 principal policies are --

a) to create an economic environment for the farmer that is free from unnecessary and costly institutional and political intervention,
b) to provide the farmer with access to land, adequate infrastructure and irrigation, as well as to provide greater employment opportunities, and
c) to increase the effectiveness of the various concerned ministries in pursuing the new directions in agriculture and the rural sector. Decentralization will be a key feature of this effort.

Five objectives are stated as the short-term strategies:

a) to create jobs for the landless workers,
b) to redistribute land and income to the poorest,
c) to raise output prices (at the farm-gate level),
d) to lower input costs, and
e) to increase productivity.

Various steps are scheduled to reach these objectives. Activities concerning irrigation, flood control and drainage are mentioned with roads and ports in the article describing a massive infrastructure program. To summarize:

- Irrigation --- focus on rehabilitation of existing systems, development of individual and small communal systems, improving efficiency of operation and maintenance, and providing private sector soft loans to encourage crop diversification.

- Flood Control and Drainage --- focus on repair and rehabilitation of selected flood control and drainage facilities in areas with the highest risk and productive bottom lands.

2) Long-term policy agenda

This agenda states, according to the objectives of the short-term plan, the long-term policy in more detail. This is not a "decision" applicable to the whole country as the title indicates. The basic aim stated in the long-term policy agenda is to lay the foundation for an equitable, efficient and ecologically sustainable growth in agriculture. The strategy is, unlike in the past, not to achieve production targets or self-sufficiency in food, but to "continue and address concerns for food security in basic staples which have been in long-term structures of relative scarcities, and agricultural diversification." The 5 principal moves to achieve these goals are--

a) to institute a new land reform program,
b) to remove the sources of bias against higher agricultural incentives and employment,
c) to strengthen economic support services,
d) to protect the long-term sustainability of agricultural production, and
e) to increase effectiveness of the various government entities involved with agriculture support services and promote active participation of non-governmental rural organizations.

Research and studies relating to irrigation are stated in "C. Strengthening Agriculture Support Service". It says:

- Research and Extension

Technology generation occurs mainly in the state colleges and universities under the leadership of the PCARRD, while the extension including technology verification, is carried out by the DA. However, the linkage between research and extension is weak. In recent years, the PCARRD has undertaken technology verification as the DA attempts to strengthen its research, further reinforcing the two-track nature of the research and extension system. The effectiveness of the research and extension system is eroded by the fragmentation of efforts

among many different departments and agencies. Institutional reforms are necessary, and the following steps are suggested:

a) to transfer administration of all field extension personnel to the provincial and municipal levels,
b) to strengthen regional state colleges and universities to assume leadership in technology generation and to work directly with the various local extension systems in their areas,
c) to integrate agricultural research and extension at the policy and field level,
d) to move away from project to "formula" or program funding, and
e) to streamline substantially the present operation of the PCARRD.

- Irrigation

In the 1970's, the efficiency of irrigation investment suffered as evidenced by the substantial drop in the ratio of actual irrigated area to design area (93% before 1965 and 52% after 1972). The DA aims to shift its approach from a basically engineering one (infrastructure design, construction and operation as technical problem) to an interactive or participatory one by the farmers. They recommend:

a) to focus investments on rehabilitation of existing systems and on small-scale projects, particularly those promoting crop diversification,
b) to provide greater access to soft loans and technical assistance to the private sector,
c) to improve operation and maintenance of the irrigation systems,
d) to reduce the water management charge to the irrigation farmers, as well as to step up the collection of these charges, and
e) to facilitate coordination of support services at the field level and policy formulation at the national level to reduce costly duplication of activities.

As mentioned above, "crop diversification" is emphasized both in the short-term plan and the long-term policy agenda. Especially that in the existing water-fed rice fields equipped with an irrigation system, and the development of irrigation and cultivation technology are of urgent necessity.

2-2-2 Development of Irrigation Technology in the Philippines

The irrigation projects are divided into the "national irrigation projects" and the "communal irrigation projects" according to the scale of the irrigated areas. The national irrigation projects are of over 1,000 hectares and all construction costs are funded by the state budget. After completion, these projects are called the "national system", and handed over to the NIA for operation and maintenance. Large-scale high-cost projects are implemented by loans from overseas cooperative organizations. The loans pay 50 to 80% of the total project cost. The communal irrigation projects are for small areas. The government bears 10% of the total cost for technical services, and the irrigation farmers bear the rest. In fact, the governmental loans are provided with no interest, which are to be repaid after up to 50 years. In the case of the Tubigon irrigation project in Bohol Island, completed in 1984, the farmers bore 90% of the construction costs of the facilities except for the dam, and are to repay the loan with 4 sacks of rice (about 200 kg of unhulled rice) per one hectare annually for 50 years. Some projects are supported by the WB, in which case the farmers also bear 90% of the cost. The communal irrigation projects are called communal systems after completion, and handed over to the irrigation associations for operation and maintenance. Table 2-1 shows the number of projects carried out in the most recent 5 years.

Other than these projects, the pump irrigation projects (called "pump systems" after completion) are provided in small numbers where gravity irrigation is rather difficult. They are provided with operation and maintenance services by the NIA. The detail on the irrigated areas by the national, communal and pump systems as of 1985 are shown in table 2-2.

TABLE 2-1 PROJECTS UNDER IMPLEMENTATION IN THE PAST 5 YEARS

Year	1981		1982		1983		1984		1985	
Classification	Proj. No.	Area	Proj. No.	Area	Proj. No.	Area	Proj. No.	Area	Proj. No.	Area
National Irrigation Projects		ha.		ha.		ha.		ha.		ha.
By loans from foreign assistance	29	128,676	29	174,209	27	172,044	27	25,917	23	26,443
By capitals provided in the country	28	6,225	22	7,980	19	7,590	15	1,900	13	1,722
Communal Irrigation Projects	468	36,229	372	43,501	152	28,175	103	16,642	177	10,028
T o t a l	525	171,130	423	225,690	198	207,809	145	44,459	213	38,193

(by the NIA)

TABLE 2-2 REGIONAL IRRIGATED AREAS (1985)

Region	Irrigable Areas (ha)	Irrigated Area (ha)				Irrigation Rate (%)
		National System	Communal System	Pump System	Total	
1	309,810	46,849	129,145	5,520	181,514	58.58
2	539,710	140,197	82,104	36,593	258,894	47.97
3	482,220	173,819	85,723	22,946	282,488	58.58
4	263,590	511,38	62,465	27,948	141,551	53.70
5	239,650	16,400	75,706	16,943	109,049	45.50
6	197,250	52,782	29,309	21,677	103,768	52.61
7	50,740	-	16,660	2,481	19,141	37.72
8	84,380	13,770	40,709	2,176	56,655	67.14
9	76,500	12,238	19,999	2,804	35,041	45.81
10	230,150	13,227	43,892	2,045	59,164	25.71
11	290,250	30,235	57,014	6,872	94,121	32.43
12	362,080	30,286	61,082	4,123	95,491	26.37
Total	3,126,330	580,941	703,808	152,128	1,436,877	45.96

(by the NIA)

TABLE 2-3 REGIONAL AND SEASONAL CULTIVATION AREA OF THE NATIONAL SYSTEM (1985)

Region	Blocks	Farmers (household)	Farm Area (ha)	Wet Season Cultivation				Dry Season Cultivation				Tertiary Crop Cultivation			Perenial Plant like Sugarcane, Banana, etc.
				Irrigated Area (ha)	Rainfed (ha)		Average Yield (bag.)	Irrigated Area (ha)	Rainfed (ha)		Average Yield (bag.)	Irrigated Area (ha)	Rainfed Area (ha)	Average Yield	
					Rice	Non-rice Crops			Rice	Non-rice Crops					
1	135,884	103,678	46,316	35,923	35,456	0	64	18,328	14,420	3,908	79	0	0	0	31
2	68,472	64,626	132,335	94,503	89,561	10	73	89,580	85,184	0	79	580	578	72	0
3	85,231	64,073	171,954	135,416	117,437	0	63	100,975	96,865	22	84	0	0	0	2,000
4	28,791	22,506	52,547	35,431	35,343	0	72	24,608	24,127	21	75	286	266	84	21
5	24,777	18,904	17,618	12,842	11,330	0	75	12,108	10,830	0	77	0	0	0	0
6	37,736	31,776	53,119	44,309	44,111	0	84	33,871	33,435	0	81	205	205	120	135
8	16,011	12,663	13,274	10,206	10,136	0	78	9,393	9,393	0	78	0	0	0	0
9	3,304	3,968	11,058	8,924	8,626	0	76	8,306	8,201	0	88	174	174	81	0
10	1,837	5,126	13,894	11,069	10,979	0	73	10,896	9,228	0	72	1,113	1,113	78	0
11	12,671	12,114	31,208	20,049	19,155	93	87	17,516	16,941	160	87	250	200	87	1,189
12	10,143	9,444	24,355	18,820	15,746	995	70	17,780	16,820	397	74	59	59	80	0
Total	424,857	348,878	567,678	427,492	397,880	1,098	71	343,361	325,444	4,508	80	2,667	2,615	81	3,396

Note: "Bag." means a unit of sack.
1 baggage equals to 1 sack (approx. 50 kg)

(by the NIA)

Vegetable cultivation projects have been partially introduced into the irrigation projects as shown in table 2-3, the regional planting areas of the national system in 1985, but rice cultivation is given higher priority. According to the report by the one-month survey team of the DCIEP, 2,500 ha. are to be for vegetable planting out of 14,000 ha. of the total irrigated area in the Cavite Friar Lands Irrigation System in the Second Laguna de Bay Irrigation Project (SLBIP). This is the only example. The SLBIP conducts studies of vegetable cultivation jointly with the DA, which are to be completed in 1988.

Crop irrigation is being implemented in some locations, though on a small scale. Tobacco and corn are provided with furrow irrigation or a flash-flooding system. Some advanced farmers install ditches or introduce water from the reservoir pond and spray water at the root of crops by a hand sprinkler. In the Ilocos Region, some are reported to irrigate fields by connecting a hose directly to the lift pump of underground water. However, they are done only in the limited areas, and are not so extensive as to be promoted as the practical irrigation methods by the NIA.

The equipment for sprinkler system or drip irrigation system is not available in the Philippines. The advanced farmers purchase them from foreign countries themselves.

2-2-3 Irrigation Policy of the Government of the Philippines

Programing the irrigation projects can be realized on the basis of coordination among the governmental organizations concerned, especially between the NIA and the DA. For this purpose, an "Agricultural Development Coordinating Council" is to be founded for state-level and project-level coordination. The only present council is the one established in the Upper Panpanga River Irrigated System for project coordination. Most of other projects are independently programed by the NIA. As for regional agricultural development projects, for example in the APC, irrigation occupies a major portion of the development, which is supervised by the Provincial Irrigation Office and Provincial Government Office, leaving the Regional Offices, etc. hardly concerned in the project.

In other words, the NIA handles all the administrative work of programing irrigation projects. First, the NIA drafts the project schedule and secure funds from at home and abroad. Projects with domestic funds are realized when the money is appropriated into the governmental budget. Those through foreign loans are realized after feasibility studies by the foreign consultants.

State-level coordination is entrusted jointly to the NIA and the DA for programing development projects, while the NIA takes leadership in project- and provincial-level programing. The DA mainly deals with extension services cooperating with universities and other institutions after the completion of the project. However, as specified in the long-term policy agenda, it is assumed that the DA will expand its participation in programing irrigation projects in the future.

2-3 Related Projects

2-3-1 Development Programs

A study called the "Study on Food Demand and Supply and Related Strategies for Developing Member Countries" (Phase I) was conducted from May 1983 to September 1984 with the technical assistance of the ADB, undertaken jointly by the IFPRI and the IRRI. The study found that the demand for corn as a forage crop would increase rapidly to the year 2000, and recommended that corn and other crops should replace the dry season irrigated rice.

Meanwhile, the NIA presented a DCIEP proposal to the government of the Philippines, stating the following objectives of crop diversification:

(1) to attain self-sufficiency in crops other than rice,

(2) to reduce high development costs in small island areas by cultivation of low-water-requirement crops particularly during the dry season, and

(3) to maintain viability in the operation of the irrigation systems by attainment of higher irrigation crop intensity, reduction of operating costs and making higher profits.

Though the NIA has not had experience in crop irrigation other than rice, the proposal indicates that it is well aware of the necessity of the non-rice crop irrigation and the development of irrigation technology beforehand.

2-3-2 Related Projects

In addition to the NIA, the DA and the School of Agriculture, UP in Los Baños conduct tests and research relating to the development of the diversified crops irrigation technology.

(1) Department of Agriculture

The DA has been implementing the nation-wide "technical experimental program in the private experimental farms" for crop diversification since 1982, as a part of farming rehabilitation, including non-irrigated farms. This program is to introduce non-rice crops into the irrigated fields as the second or third planting. This program is not concentrated on engineering studies on the development of the irrigation facilities.

In the Second Laguna de Bay Development Project undertaken by the NIA with a loan from the ADB, 2,500 ha. of the total 14,000 ha. irrigated area was programed for vegetable cultivation, and the DA constructed a vegetable cultivation training center for the farmers. This center serves for cultivation training and breeding tests of new types of vegetables.

(2) School of Agriculture, UP in Los Baños

The School of Agriculture, UP in Los Baños conducts research in the optimum amount of irrigation water, and computer-aided analysis of climatological data, as a part of agronomical studies. They are interested in academic studies rather than systematic and applicable research on practical irrigation technology targeted by the Center.

2-3-3 Similar Facilities and Equipment

As mentioned above, the activities of the DA and UP in Los Baños are not directly related to the development of irrigation technology aimed at by the Center. Therefore, there are no such facilities and equipment that would be very helpful in this project.

2-4 Cooperation from the International Assistance

The international entities extending cooperation in the development of diversified crops irrigation technology in the Philippines are the ADB, WB, IRRI and APC.

(1) Asian Development Bank

Based on the results of the "Study on Food Demand and Supply and Related Strategies for Developing Member Countries", the ADB conducted a "Study on Irrigation Management for Crop Diversification (Phase I)" for 22 months starting from February 1985, entrusting the study to the IIMI. Following this, the ADB has been conducting the phase II study for 30 months since January 1987. This study, being carried out with the assistance from the NIA, DA and PCARRD, consists of the studies of irrigation, cultivation, economics and organization. It is in accordance with field surveys including experiments at 4 research areas selected in the country. This study is similar in content to the study subjects of the Center and seems to be helpful to the DCIEP in conducting field surveys, but it is different in the following respects.

1) This study is not a continuous study based on tests and analyses, but is rather a spot study of experimental research during a pre-determined period.

2) The number of personnel is a few and the budget insufficient. Most of the budget is alloted to personnel and transportation costs. The budget for instruments for tests and analyses is so small that tests and analytical studies are limited.

The budget for the phase II study is estimated at US$ 415,000 (about 53 million yen), most of which is alloted to personnel and transportation costs.

(2) World Bank

The WB dispatched a mission for a sugar lands diversification study from June to July 1985. The purpose of this study was to review the present problems of the country's sugar industry and to recommend to the government policies and programs to facilitate and manage the sectoral adjustment processes under way.

(3) International Rice Research Institute

The IRRI has been studying the improvement of crop planting systems including the non-irrigated areas since 1965, along with the study of crop diversification under the Multiple Cropping Department since 1972. The objective of the study was to introduce non-rice crops in developing a farming system based on lowland rice for an increase in the land utilization rate and promotion of employing idle farm laborers in the dry season. The main subjects are crop adaptation, various approach and component technology, and especially tillage methods. Although irrigation methods, quantities and periods are partly studied as items of component technology, the main subjects focused on agronomical aspects.

(4) Bohol Agricultural Promotion Center

The APC through technical cooperation from Japan, studies crops at the trial farms. As the productivity of rice remains low in Bohol, the project is concentrated on rice production. Crop diversification is scheduled for when the rice cultivation technology has been established. Thus, studies on diversified crops irrigation technology are not started yet.

This Center is different from other institutions and projects in that it aims at engineering tests and studies of irrigation facilities and improvement of farm lands, though the development of diversified crops irrigation should be carried out in close relationship to these institutions.

2-5 Circumstances and Contents of the Request

2-5-1 Circumstances of the Request

After achieving self-sufficiency in rice production, the government of the Philippines now emphasizes a crop diversification policy to increase production of non-rice crops as one of the principal agricultural aims.

The NIA has contributed highly to raising rice production by promoting irrigation development, but its know-how is in rice cultivation only. The development of diversified crops irrigation technology which will be more and more important in the future, and especially research and studies needed to develop crop irrigation technology, has hardly been focused upon by the NIA or other institutions.

Realizing the necessity of developing irrigation technology for crop diversification, the government of the Philippines programed the "Diversified Crops Irrigation Engineering Project" (DCIEP) under the NIA, and asked the government of Japan for technical assistance on May 29, 1984. In response to this request, the government of Japan confirmed the importance of the request through JICA, and dispatched an implementation survey team in May 1987. The survey team conducted field surveys as project-type technical cooperation and signed the R/D. This cooperation started from September 1987 with the sending of 7 experts. A trial farm for diversified crops irrigation research was constructed through JICA. The project-type cooperation is being carried out under the following categories:

(1) To collect and analyze data and information.
(2) To conduct field studies on establishment of appropriate irrigation methods, diversified crops cultivation techniques and others.
(3) To prepare technology criteria.
(4) To conduct technical training for technical staff members of the NIA.

The DCIEP is undertaken at the existing facilities of the NIA except for the trial farm, however, the NIA has insufficient testing laboratories and facilities for data analysis. The laboratory equipment is

old and out of order. It does not have appropriate training facilities in technology development either. These difficulties obstruct promotion of crop irrigation technology.

Considering these circumstances, the NIA drew up a program to construct a new research and training center based on the DCIEP organization, for the studies and promotion of diversified crops irrigation technology, and extended a request to the government of Japan for construction of facilities including the equipment for research and training use as a project through a grant aid program on September 26, 1986.

Responding to this request, the government of Japan has decided to conduct a "Basic Design Study on the Construction of the Diversified Crops Irrigation Center", and a study team was dispatched to the Philippines from January 21 to February 7, 1988. The study team carried out the basic design study by discussing the contents of the request and the project, surveying the background of the project and construction situation, and confirming the implementing agency of the project, etc.

2-5-2 Contents of the Request

The implementing organization of this project is the NIA, represented by the administrator. This Center will be constructed in the compound of the NIA, to function as the central unit of the development of diversified crop irrigation technology. The following contents of the project were confirmed by the study team at the time of the basic design study.

(1) Facilities

1) Main Building

a) Garage
b) Laboratory
c) Analysis room
d) Preparation room
e) Canteen/Kitchen
f) Administration office
g) Conference room
h) Exhibition room
i) Library

j) Classroom

k) Seminar room

l) Printing room

m) Others

2) Dormitory Building

a) Dormitory

b) Guest room

c) Pantry

d) Others

(2) Equipment

1) Equipment for Research

a) Equipment for water quality analysis

b) Equipment for soil chemical analysis

c) Equipment for soil engineering

d) Computer

2) Equipment for Training

a) Audio-visual equipment

b) Printing equipment

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objectives of the Project

The objective of the project is to construct a "Diversified Crops Irrigation Engineering Center" for the establishment of diversified crops irrigation technology in order to attain overall self-sufficiency in food by substituting other crops for rice in secondary cultivation and the multi-utilization of paddy fields.

3-2 Review of the Request

3-2-1 Review of the Project

(1) This project is composed of the following contents.

1) Examination of irrigation methods for crops
2) Standardization of the research methods
3) Establishment of crop irrigation criteria
4) Selection of irrigable farm land
5) Research and analysis of water, soil and construction materials
6) Training of the NIA staff, preparation of training materials
7) Education of farmers

(2) The fact that the present project-type technical cooperation operates taking advantage of the existing facilities means that the distant locations of the testing laboratories for water and soil from the NIA Central Office and inadequacy of the equipment make it inconvenient for close relationships with the Central Office and obstruct satisfactory results. Only a limited number of training programs are carried out because of the distance to the training center and the insufficient and rather old training equipment. The establishment of the Center will solve this problem by integrating these facilities and staff into one center as the central unit for research and training. Study technology will be improved with the equipment provided for research and training, which will lead to prompt realization of the contents of this project mentioned in (1) above.

3-2-2 Review of the Requested Facilities and Equipment

The Center will be designed with the following considerations taken into account after reviewing the requests presented by the NIA.

(1) Facilities

Scales of the buildings and facilities to be designed in this project are calculated according to the contents of research and training.

The research and studies section will be arranged on the 2nd floor so that it does not adversely influence other divisions with noise and vibrations. It will be designed giving consideration to the convenience of research and studies. Training programs of the Center include movie film presentations, lectures, symposia, etc. in which 250 or more persons may participate. For this purpose, a convention hall with sufficient capacity and equipment needs to be designed.

The canteen shall be located separately from the Main Building to protect the office environment from smoke and smells in the kitchen, and from contamination in the common space caused in the delivery of food.

The Dormitory will accommodate guest rooms for the executive staff on the ground floor, men's sleeping rooms on the 2nd floor, and women's on the 3rd, for convenience of management.

In the original plan, the garage was located on the basement floor with a 25-car capacity. It will be moved to the ground floor with about a 20-car capacity considering the soil condition of the site, construction period and economy of construction costs.

City water will be taken from the EAST Ave. side, but supply failure is anticipated because of low water pressure. A deep well system shall be designed to deal with this trouble. As to air conditioning, the individual type system will be adopted to reduce operation cost.

(2) Equipment

Equipment shall be selected to suit the actual situation in the Philippines. In particular, equipment easily maintained there shall be provided.

The computer system will be designed not to overlap with that possessed by the NIA, giving emphasis to expanding the present capacity.

3-3 Contents of the Project

3-3-1 Implementing Organization

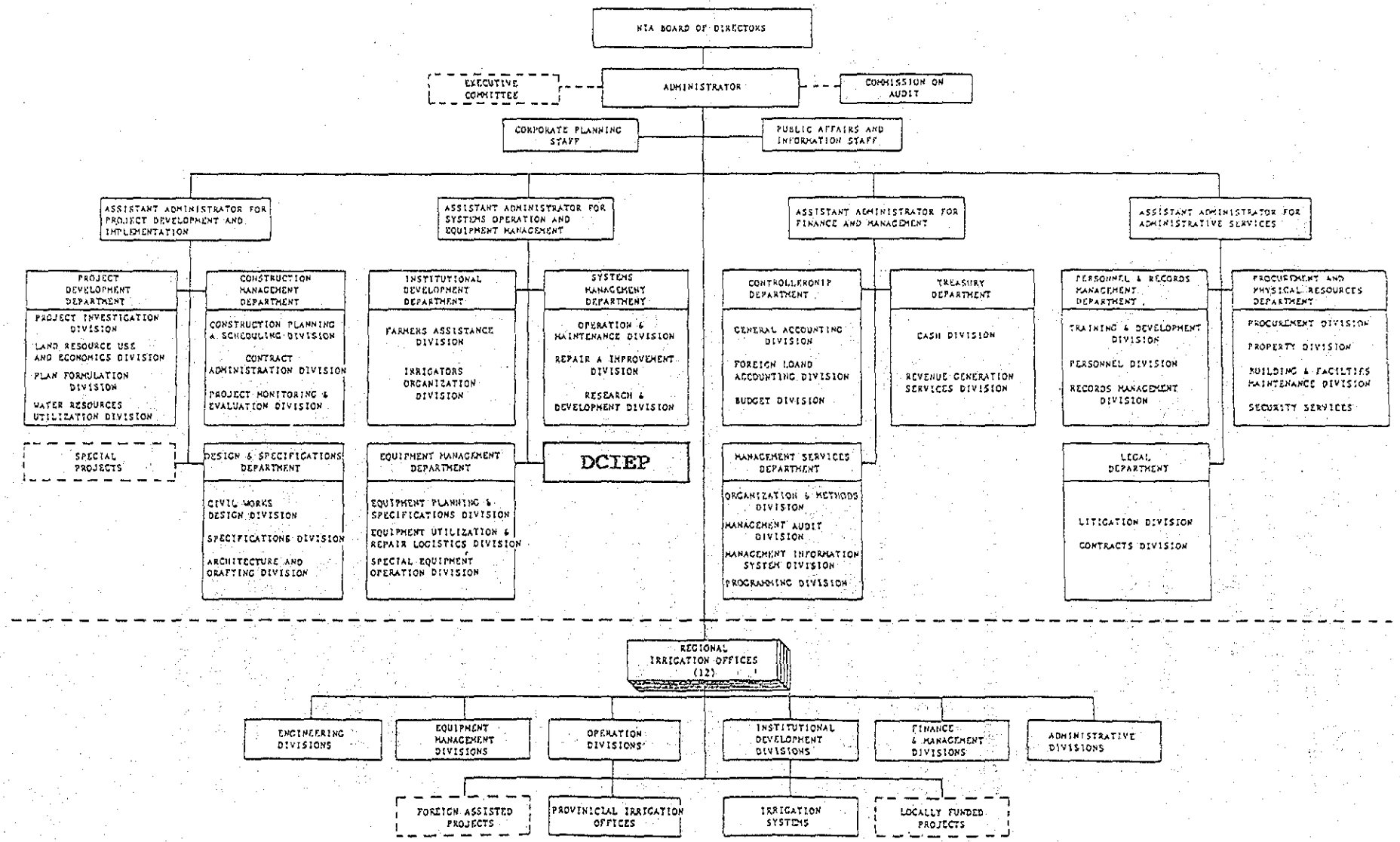
The NIA is the implementing agency of the project for constructing the DCIEC by means of the grant aid program. Figure 3-1 shows the present organization of the NIA. The NIA is responsible to the services such as:

(1) Operation and maintenance of the national systems
(2) Research, survey and feasibility study of the irrigation projects
(3) Construction of irrigation facilities
(4) Rehabilitation of the existing systems
(5) Formulation of the Irrigators' Associations
(6) Afforestration of water source areas
(7) Exploitation of underground water
(8) Planning and implementation of training programs in water management

The administrator of the NIA is appointed by the President and is responsible for the services of the NIA based on the approval by the board of directors consisting of the following members:

Chairman	: Secretary of the DPWH
Vice Chairman	: Administrator of the NIA
Members	: Director-General of the NEDA
	Secretary of the DA
	President of the NPC
	Representative of farmers' group

FIGURE 3-1 ORGANIZATION OF THE NIA



Under the administrator of the NIA, four assistant administrators are appointed for project development and implementation, systems operation and equipment management, finance and management, and administrative services, who supervise about 21,000 staff members including those in the regional offices throughout the country. In addition to the regional offices, an independent office administers each large-scale irrigation project financed by the loans through foreign assistance. The entire country is divided into 12 regions, and 11 regional offices are established, since regions 7 and 8 are supervised by one office. The director of each regional office manages and supervises operation and maintenance offices as to construction, operation and maintenance carried out through the domestic budgets. There are 67 provincial offices which supervise construction, operation and maintenance of the communal systems under the direction of the director concerned in the regional office. Each large-scale project undertaken with the foreign loans and managed by an independent office is managed by the operation and maintenance office after completion. Other than these offices, the NIA has 4 special centers:

Name	Location	Services
1. Soil & Water Laboratory	Muñoz	Soil and water analysis on irrigation project areas
2. Soil Materials Testing Laboratory	Cabanatuan	Tests of construction materials
3. Soil Physics Testing Laboratory	Cabanatuan	Physical tests of earth structures
4. National Training Center	San Rafael	Training of the NIA staff and farm leaders

The original budget for the NIA was 30 million pesos. It was increased to 10 billion pesos by the government ordinance of July 18, 1980, along with the expansion of irrigation projects. This ordinance allowed that the NIA could earn independent revenues in addition to the state budget allocation. Income earned through the irrigation service fees, operation and maintenance, drainage systems, rental of the equipment and sales of old equipment and materials, etc. can be used as operation capital by the NIA. Thereafter, it was recommended by the WB that the NIA operate with its own capital since 1982. The NIA budgets during 1984 - 1987 were as shown in table 3-1:

TABLE 3-1 THE NIA BUDGET (1984 -- 1987)

(in 1,000 pesos)

Items	1984	1985	1986	1987
1. Expenditures	1,644,019	1,687,920	2,150,355	2,708,783
(1) Current expenditures	254,000	300,000	370,069	430,240
- Personnel	192,000	199,308	226,668	305,966
- Others	62,000	100,692	143,401	124,274
(2) Project expenditures	1,390,019	1,387,920	1,780,286	2,278,543
- Projects through foreign assistance loans	1,263,031	1,312,920	1,708,286	1,876,510
- Projects through government assistance	126,988	75,000	72,000	403,033
2. Revenues	1,644,019	1,789,200	2,183,099	2,708,783
(1) Current revenues	300,038	174,000	581,313	1,108,033
- Government funds	205,000	99,000	150,000	400,000
- Others	95,038	75,000	431,313	703,033
(2) Operational income (water management charge)	255,000	401,280	371,000	424,650
(3) Foreign assistance	1,088,981	1,213,920	1,230,786	1,181,100

3-3-2 Implementation Plan

(1) Administration System

The Center will be operated by 96 staff members as shown in figure 3-2. They will be positioned as follows:

Department	No. of Staff
Directors & Secretariat	8
Administrative Division	14
Soil & Water Laboratory Division	14
Training & Public Information Division	20
Planning & Design Standardization Division	17
Agronomy & Economics Division	18
Pilot/Demonstration Farms Division	5
T O T A L	96

JICA experts team is not included in the above.

(2) Staff Allocation Plan

The staff will be alloted to each position as shown below.

- Directors & Secretariat

Director	1
Asst. Director	1
Coordinator	2
Secretaries	2
Drivers	2
	8

- Administrative Division

Manager	1
Secretary	1
Clerks	11
Driver	1
	14

- Soil & Water Laboratory Division

Manager	1
Secretary	1
Researchers	11
Driver	1
	14

- Training & Public Information Division

Manager	1
Secretary	1
Instructors	14
Librarians	2
Clerk	1
Driver	1
	20

- Planning & Design Standardization Division

Manager	1
Secretary	1
Engineers	11
Clerks	3
Driver	1
	17

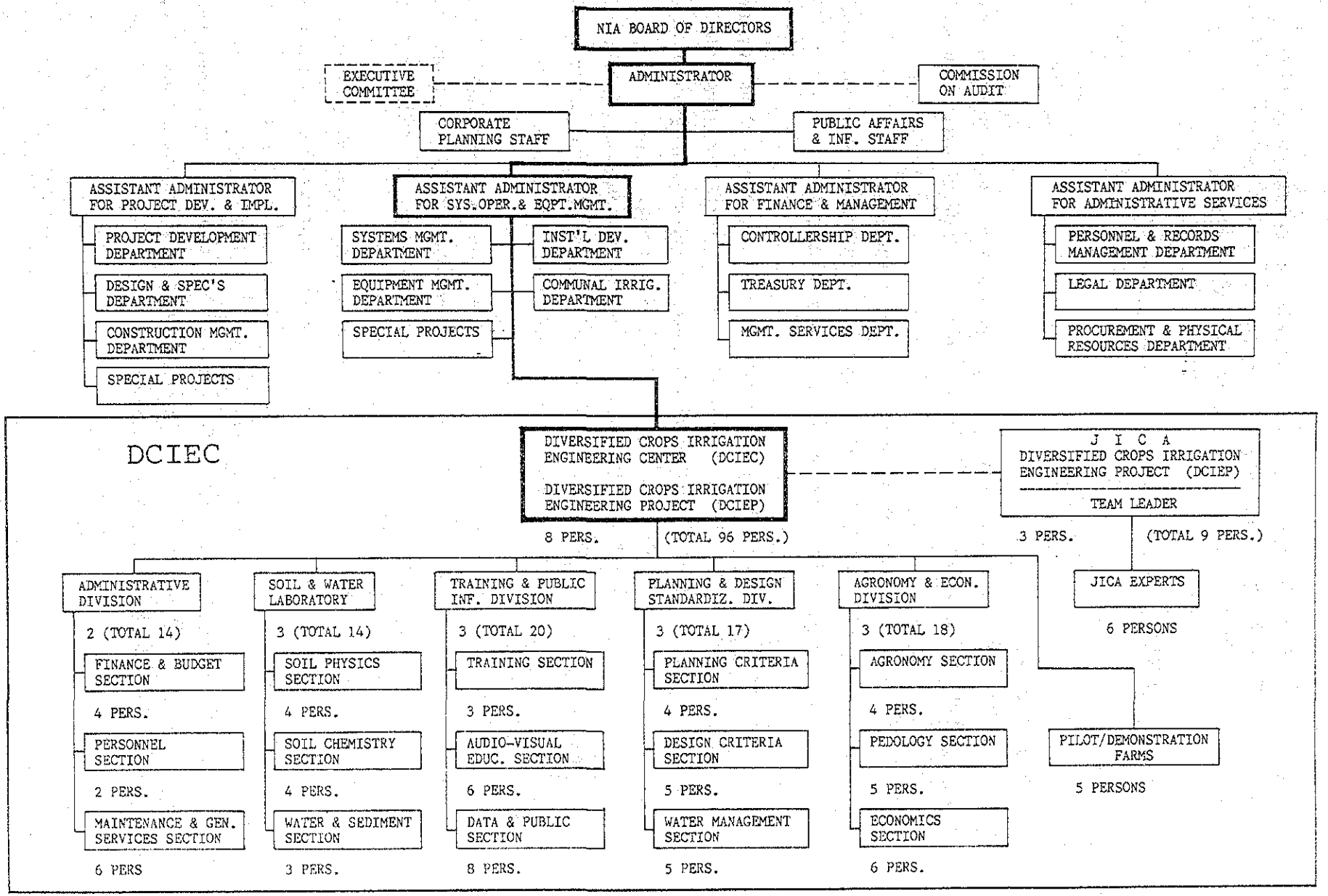
- Agronomy & Economics Division

Manager	1
Secretary	1
Engineers	12
Clerks	3
Driver	1
	18

- Pilot/Demonstration Farms Group

Manager	1
Researchers	2
Clerk	1
Driver	1
	5

FIGURE 3-2 ORGANIZATION OF THE DCIEC IN THE NIA



- JICA Experts Team

Team Leader	1
Experts	6
Secretary	1
Driver	1
	9

(3) Research Plan

The development of "irrigation engineering" for crop diversification to be executed by the Center is composed of three phases.

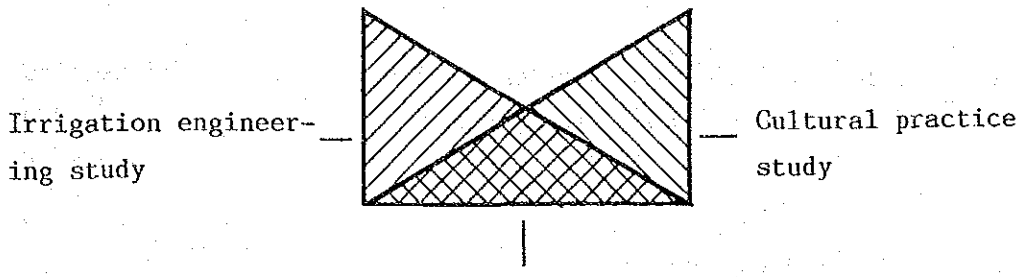
Phase 1 Collection and analysis of information and data;
Examination and research of irrigation methods along with tests at the experimental farms.

Phase 2 Formulating the standards of the project planning, and the design of the irrigation facilities, the principles of the water management, and the crop irrigation technology for the trial farm areas;
Establishing their methodology at the trial farms;
Training the NIA technical staff in the established methodology.

Phase 3 Application of the standards of the project planning and the design of the irrigation facilities, and the principles of the water management, and the crop irrigation technology nationwide;
Review and modification of the standards and principles based on the project application and its monitoring.

The research activities are expected to expand throughout the country by Phase 3. The study of the crop irrigation technology is characterized by:

1) Development of crop irrigation technology with the characteristics of both irrigation engineering study and cultivation study, which shall proceed in close relationship with each other.



Development of crop irrigation technology

2) The water management facilities are needed for non-rice crop irrigation to supply the proper amount of water to various crops, each of which has its own growth period. For this purpose, new farm ponds or renovation of earth canals will be necessary. They shall be designed and constructed according to the engineering tests for cost-saving with good quality.

These studies will be done by the planning and design standardization division and the agronomy & economics division of the DCIEC. These divisions will divide the work as follows:

Divisions	Work Areas
1. Planning & design standardization division	- Development of the plan and criteria of the projects - Development of the design criteria of the facilities - Formulation of water management policies - Soil physical tests

2. Agronomy & economics division
   - Establishment of the land classification and land utilization methods
   - Development of the crop irrigation technology; analysis of economics of crop irrigation; post-harvest technology and market distribution methods
   - Soil and water analysis

Table 3-2 shows the subjects and objectives of studies corresponding to the above study areas.

(4) Training Plan

1) Training courses

In the NIA, each department or office, both in the Central and in the field offices, identifies and decides the priority of the yearly training needs. These needs are submitted to the Training and Manpower Development Division (TDD) which consolidates them into an annual calendar.

As the central training coordinating unit of the agency, the TDD coordinates the design and implementation of all training courses except for farmers training which is the responsibility of the Institutional Development Department (IDD).

The NIA has not provided training in crop diversification. However, training has been conducted by the IDD in such fields as systems management, project management, construction management, project planning and in other related areas. Furthermore, the IDD has conducted training for farmer irrigators' associations in the operation and maintenance of irrigation systems.

In the future, the Center is expected to provide training not only for the NIA staff but also for the trainees from other institutions and other countries. The TDD has presented a training plan including the subject areas, courses, target trainees and training period, as shown in table 3-3.

TABLE 3-2 STUDY SUBJECTS AND OBJECTIVES OF DCIEC

Area	Subjects	Objectives
Planning and Design Standardization Division		
1.Planning Criteria	a.Present planning/design criteria of NIA	Investigate the present methodology and design criteria.
	b.Present situation of diversified crops irrigation	Investigate the past studies of diversified crop irrigation.
	c.Diversified crops irrigatable land area	Estimate irrigatable land area based on analyzing natural conditions and other factors of the existing irrigated area.
	d.Project area of the diversified crops irrigation plan	Select land to be irrigated based on the priority in the project area of the irrigation plan.
	e.Irrigation water plan	Establish the irrigation water plan of the selected project area of the irrigation plan.
	f.Global irrigation system plan	Establish the optimum arrangement of irrigation facilities network.
	g.Water service plan	Establish the calculation of available water amount.
2.Facility Design Criteria	a.Design criteria of irrigation facilities	Establish the irrigation facility design criteria for the diversified crops irrigation.
	b.Design criteria of drainage system facilities	Establish the drainage facility design criteria for the diversified crops irrigation.
3.Water Management	a.Meteorologic and hydraulic analysis to assure transpiration rate of crops	Establish the meteorologic and hydraulic analysis method.
	b.Method of planning the amount of irrigation water per each time and the irrigation interval	Establish the method of planning the amount of water for each irrigation and the irrigation interval.
	c.Method of deciding the irrigation method	Research how to determine the irrigation method.
	d.Water management method	Research how to determine the optimum irrig. water management method.
4.Soil Engineering (design of earth canal and farm pond)	a.Consistency test (liquid, plastic, shrinkage limits)	Judge the safety of soil structure based on soil characteristics like liquid, plastic and shrinkage limits.
	b.Consolidation test	Judge the safety of soil structure based on consolidated deformation of water-saturated soil.
	c.Shear test	Decide the angle of slope and the construction of soil structure based on shearing strength of soil materials.
	d.Permeability test	Decide whether the soil can be used as cut-off or impervious zone based on the permeability of materials.
	e.Compaction test	Find the relation of density and moisture content ratio when soil is compacted, based on the compaction of soil materials
Agronomy and Economics Division		
5.Land Utilization	a.Soil physical test method as per the irrigation program	Establish the soil physical test method for the irrigation project planning and facility design.
	b.Soil moisture test method as per the irrigation program	Establish the soil moisture test method for the irrigation facility design.
	c.Land classification method as per the irrigation program	Establish the land classification method of the projected diversified crops irrigation area.
6.Agronomy & Economics	a.Irrigated cultivation control method	Establish the cultivation method by the diversified crops irrigation.
	b.Analysis of growth and crop yield in diversified crops irrigation	Establish the analysis method of growth and yield of crops by the diversified crops irrigation.

TABLE 3-3 TRAINING COURSE PROGRAM (Draft)

Area	Course	Level	Trainees (No.)	Period (week)
1.Orientation	General divers. crops irrig. engineering	Senior Engineers A	40 - 45	1
2.Irrigation Development Program	Divers. crops irrig. development programs	ditto	45	4
	Divers. crops land classification & soil program	Senior Engineers B	50	2
	Divers. crops irrig. facilities construction	Senior Engineers A (construction engineer)	45	2
	Computerized planning/design	ditto	45	4
3.Irrigated Cultivation	Diversified crops irrigation method	Senior Engineers B	45 - 50	2
	Diversified crops cultivation method	ditto	45	2
	Post-harvest treatment technology	ditto	45	1
	Market distribution of crops	ditto	45 - 50	2
	Divers. crops irrig. facility const. machinery	ditto (construction machinery engineer)	50	1
4.Water Management	Diversified crops water management method	Senior Engineers B	45 - 50	1
	Hydrology for water management	ditto	50	3
	Operation & maintenance of irrig. facilities	Junior Engineers	45	2
	Improvement method of water management	Senior Engineers B	45	2
	Moisture contents of crops	ditto	45	2
	Irrigation water quality	ditto	45	2
5.Irrigators' Associations	Formation of irrigators' associations	leaders of beneficiaries or irrigators' associations	45	2
	Management of irrigators' associations	Senior Engineers A, B (those in charge of organizing irrigators' associations)	45 - 50	2
6.Project Monitoring	Monitoring of divers. crops irrig. projects and assessment of the projects	Senior Engineers B	50	4

Note : Senior Engineers A : Senior engineers of the NIA Central Office; Regional Office and Irrigation Office (directors, deputy directors)
Senior Engineers B : Senior engineers other than above (mainly operation and maintenance staff)
Junior Engineers : Mainly operation and maintenance staff
Water Masters : Irrigators' Associations (leaders of irrigators' associations, etc.)

2) Training method

The target personnel of the training among the NIA staff in diversified crops irrigation technology to be held in the Center are assumed to be as follows:

Target Trainees	Number (persons)
a) Senior engineers of the NIA Central Office (including managers and assistant managers of the divisions)	240
b) Directors and assistant directors of the regional offices	22
c) Directors, asst. directors and senior engineers of the national systems offices	190
Sub-total (Senior engineers A)	(452)
d) Other senior engineers (mainly staff of operation and maintenance, including the provincial irrigation engineers, "Senior engineers B")	490
e) Construction engineers	100
f) Construction machine operators	150
g) Junior engineers	400
h) Soil and agro engineers (including water masters)	440
T O T A L	2,032

Training of the above engineers and the NIA staff will be given in the Center, and that of the local management staff and the members of the irrigators' associations will be done at the regional offices by those trained in the Center.

The five-year training program is scheduled as in table 3-4. It shows over 55 training weeks per year after the second year, sharing one classroom of 40 to 50 person capacity. As the maximum number of training weeks for one classroom is recommended at 50 weeks per year, 2 classrooms of the above capacity

TABLE 3-4 FIVE-YEAR TRAINING PROGRAM

Course	Duration	No. of Class									
		Total	1st.Yr.		2nd.Yr.		3rd.Yr.		4th.Yr.		5th.Yr.	
1.General divers. crops irrig. engineering	1	10	(2)	2	(2)	2	(2)	2	(2)	2	(2)	2
2.Divers. crops irrig. development programs	4	8			(8)	2	(8)	2	(8)	2	(8)	2
3.Divers. crops land classif. & soil programs	2	5	(2)	1	(2)	1	(2)	1	(2)	1	(2)	1
4.Divers. crops irrig. facilities construction	2	3					(2)	1	(2)	1	(2)	1
5.Computerized planning/design	4	5	(4)	1	(4)	1	(4)	1	(4)	1	(4)	1
6.Diversified crops irrigation method	2	8			(4)	2	(4)	2	(4)	2	(4)	2
7.Diversified crops cultivation method	2	3					(2)	1	(2)	1	(2)	1
8.Post-harvest treatment technology	1	8			(2)	2	(2)	2	(2)	2	(2)	2
9.Market circulation of crops	2	8			(4)	2	(4)	2	(4)	2	(4)	2
10.Divers. crops irrig. facil. const. machinery	1	4			(1)	1	(1)	1	(1)	1	(1)	1
11.Divers. crops water management method	1	8			(2)	2	(2)	2	(2)	2	(2)	2
12.Hydrology for water management	3	10	(2)	2	(6)	2	(6)	2	(6)	2	(6)	2
13.Operation & maintenance of irrig. facilities	2	4			(2)	1	(2)	1	(2)	1	(2)	1
14.Improvement of water management	2	8			(4)	2	(4)	2	(4)	2	(4)	2
15.Moisture contents of crops	2	5	(2)	1	(2)	1	(2)	1	(2)	1	(2)	1
16.Irrigation water quality	2	5	(2)	1	(2)	1	(2)	1	(2)	1	(2)	1
17.Formation of irrigators' associations	2	8			(4)	2	(2)	2	(2)	2	(2)	2
18.Management of irrigators' associations	2	4			(2)	1	(2)	1	(2)	1	(2)	1
19.Monitoring of divers. crops irrig. projects and assessment of the projects	4	5	(4)	1	(4)	1	(4)	1	(4)	1	(4)	1
T O T A L		119	(18)	9	(55)	26	(57)	28	(57)	28	(57)	28

Note : 1. Figures in parentheses mean the number of training weeks per year.

2. Figures in the 4th and 5th years include trainees from institutions other than the NIA.

will be needed to realize the above training program. Another room for 20 to 30 persons will be used for group discussions, dividing the trainees into small groups.

Other than these training courses, movie film presentations, lectures, symposia, etc. will be often held, some of which may have 250 or more participants. A convention hall for this purpose will also be needed.

According to the schedule of the TDD, those who will use the training facilities of the Center from institutions other than the NIA (staff of other governmental agencies or students) are assumed at 300 to 350 persons a month, and 3,000 to 3,500 persons a year.

(5) Future Plans

The NIA plans that in the future, when the primary goals of the "Diversified Crops Irrigation Engineering Project" are attained, the Center will be used as an irrigation engineering development center for the water management of the areas of the existing farms. The Center is expected to provide following services.

1) Collection and analysis of geographical and climatological data, technical information and soil classification data as to water management.
2) Collection and review of the water management data of the existing irrigation systems.
3) Study of the raising of irrigation rates to be attained by the improvement of water management methods
4) Practical training and promotion of the improved water management by introducing developed water management technology and irrigation technology.
5) Soil and water quality tests, and soil engineering tests for design and construction of earth structures.
6) Study of the improvement of the irrigators' associations and formation of federated associations, and training in operation and maintenance.

3-3-3 Outlook for Facilities and Equipment

(1) Facilities

This Center will consist of the Main Building and the Dormitory.

1) Main Building

After an examination of the purpose and the management of the Main Building, it will be designed as a 5-storey building, accommodating garage on the ground floor, research and laboratory section on the second, promotion and training section on the third, administrative section on the fourth and a convention hall and library on the fifth floor. The principal rooms needed for each service are as follows:

- Administrative Section

  rooms for the director and executive staff, management and control room, conference rooms, clinic, information desk, storage, etc.

- Research and Laboratory Section

  computer room, line staff's room, research and study rooms, soil chemical test laboratories, soil physical test laboratories, sample preparation room, plant sample analysis room, storage, library, locker rooms, etc.

- Training Section

  instructors' room, classrooms, seminar rooms, convention hall and anterooms, A-V room, exhibit room, printing room, storage, etc.

- Garage

  parking area, drivers' room

- Common Facilities

  water tank room, pump room, main utility room, elevator machine room, fan room, storage, etc.

2) Dormitory

The canteen to be used both by the guests in the Dormitory and staff in the Center will be designed between the 2 buildings. Though the canteen was to be placed in the Main Building according to the original request from the NIA, it will be better to arrange it on the ground floor of the Dormitory considering exhaust air and smells from the kitchen, sanitary arrangements for food delivery, as well as the management and circulation of people.

The Dormitory will be a 3-storey building, accommodating guest rooms and caretaker's room on the ground floor, men's sleeping quarters on the second and women's on the third floor.

(2) Equipment

The following equipment will be provided in this project.

1) Equipment for research and tests (to be installed in the laboratories)
   a) Equipment for water analysis
   b) Equipment for soil chemical analyses
   c) Laboratory furniture
   d) Books and documents

2) Equipment for training
   a) Simple A-V equipment (to be installed in the classrooms, seminar rooms and the convention hall)
   b) Equipment for making teaching aids (in the Audio-visual room and the printing room)
   c) Printing equipment (in the printing room)
   d) A-V equipment for classroom use (in the classrooms and the seminar rooms)

3) Computer system
   a) Extension of the memory capacity of the VAX II/750 minicomputer from 1MB to 3MB (to be installed in the annex of the headquarters which the DCIEP now occupies)
   b) Magnetic tape drive (in the computer room)

c) Line printer (in the computer room)
d) Personal computers (in the computer room)

4) Others
a) Vehicles for outdoor activities (in the garage)
b) Exhibition materials (in the exhibit room)

3-3-4 Outline of the Project Site

(1) Project Site

The project site is located in the compound of the NIA in Quezon City, about 10 km northeast of Makati, the central business and shopping area.

The site is a sort of L-shape, with a 110 m long side and 23 to 45 m short side. The area is about 4,000 m^2. At present, there are a security quarter, T/B, gas pumps, a motor pool, covered parking space and a pelota court in the site. It is requested by the study team that these structures be removed by the NIA before the commencement of construction.

The ground of the project site is almost flat. As the ground of the NIA headquarters is about 70 cm higher, a provision needs to be designed so that rain water may not flow into the project site in heavy rains.

Natural breezes are not much expected, as the 9-storey NIA headquarters, of about 20,000 m^2, stands southeast of the Center, with a court in between. As for natural lighting, the project site lies about 45 degrees off the north-south axis. The sun shines into the rooms in the morning and the evening from the southeast side, which may be unfavorable for the capacity of the air conditioning system and its running cost.

The NIA service road runs along the northwest border of the site. As the traffic is not heavy, pollution such as traffic noise and exhaust gas is no worry. The southwest side borders EDSA Street, which is very convenient. There are no high-rise buildings around

the site. The Center, and the NIA headquarters, will be easily visible from the roads nearby.

The adobe layer (hard sandy tuff rock) lies under the ground, 1.5 m to 4.5 m deep, and can be used as the foundation bed. The water table is from 2.5 m to 6.5 m deep. Trouble with spring water is no worry, since the basement floor idea has been canceled.

(2) Infrastructure

1) Water supply system

A water main of 300 ϕ runs along EDSA St. toward EAST Ave. The water supply condition of the area around the compound of the NIA is not very good. At present, a water intake pipe of 100 ϕ leads from the EDSA St. side, but the water supply is often interrupted because of low water pressure. A deep well is now under construction.

2) Drainage system

A drainage pipe (combined rain water and drainage type, 750 ϕ) for the existing buildings runs through the compound into a stream nearby.

3) Power supply system

An MERALCO electric power line (aerial, 3 ϕ 3 W 34.5 KV) runs to a pole on the NIA service road.

4) Telephone system

The PLDT telephone line runs to the pole on the NIA service road.

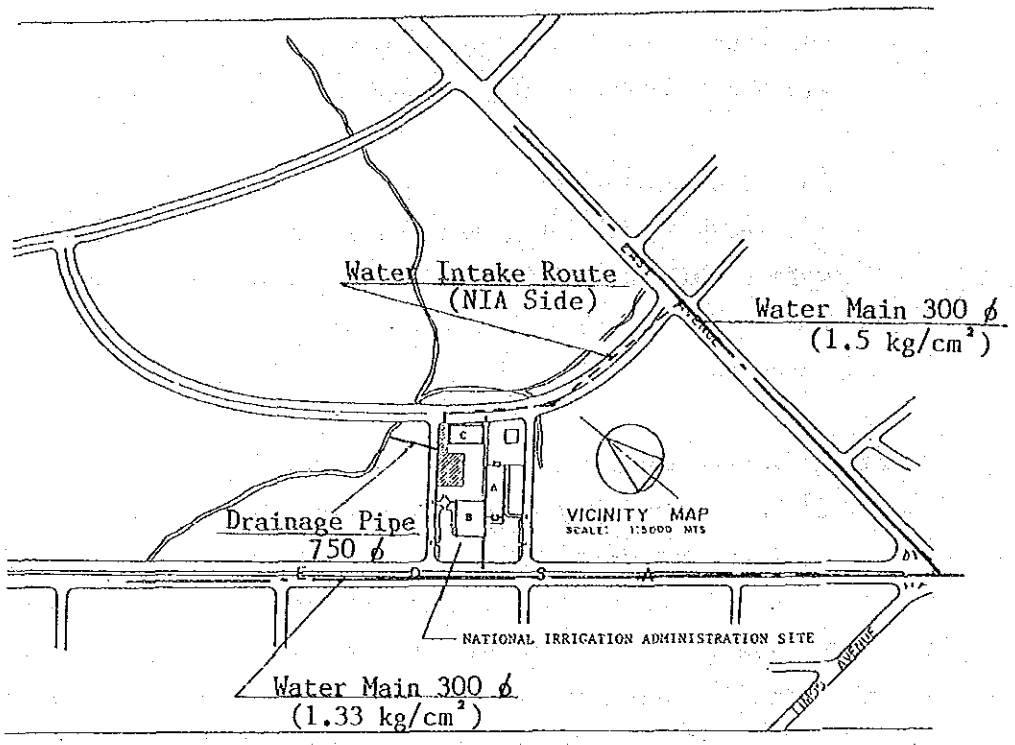


FIGURE 3-3 WATER INTAKE

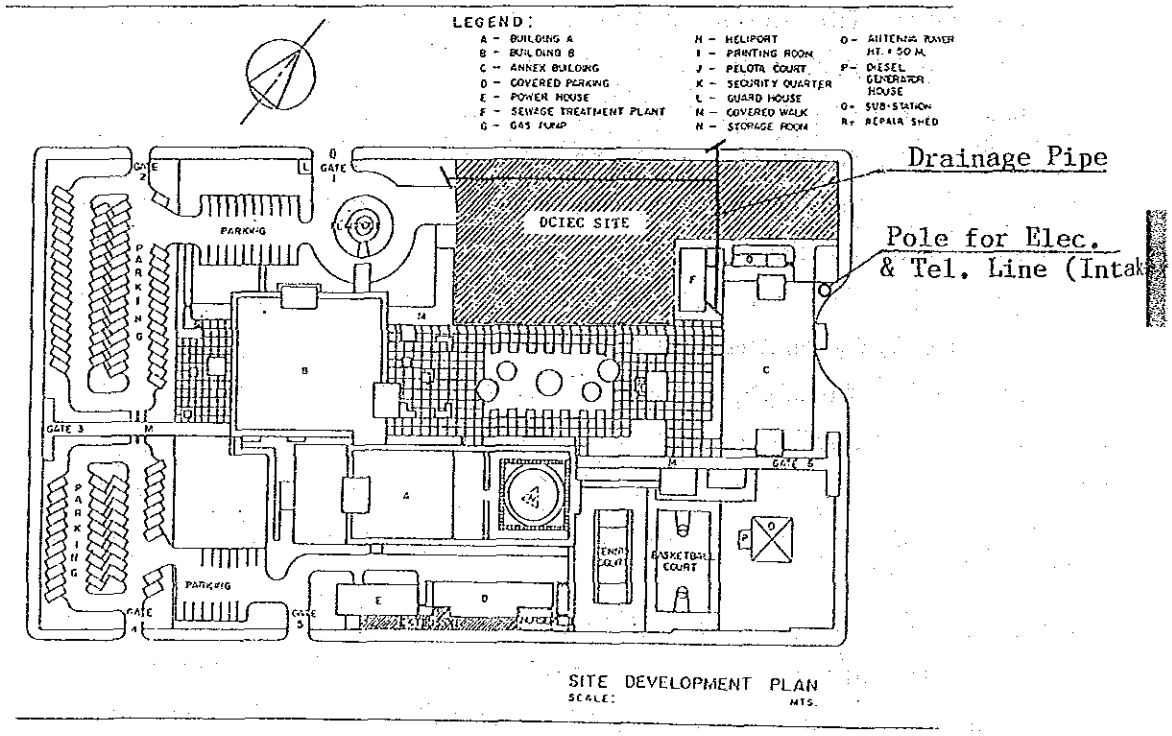


FIGURE 3-4 EXISTING PIPING AND ELECTRIC POLE IN THE NIA COMPOUND

(3) Other Environment Factors

EDSA St., running along the southwest of the compound of the NIA, is planned to be widened by about 36 meters. This plan may affect the area which is now used for the parking of heavy machines, but will not directly affect the project site.

The access from EDSA St. is wide enough for the transportation of heavy construction machines and materials. The opposite side of this access is national land, but it seems to be occupied by squatters, and children play there taking advantage of light traffic.

The project site is near the civic center, with the Quezon City Hall, Mint Bureau, and various hospitals, etc. nearby.

3-3-5 Technical Cooperation

The present project type technical cooperation is described as follows in the R/D signed in May 1987.

(1) Objective of the DCIEP

The objective of the project is to develop "irrigation engineering" for crop diversification and the flourishing of agriculture in the Philippines.

(2) Nature of the Cooperation

Technical cooperation will be given at the existing water-fed fields equipped with irrigation systems, regarding the following activities related to the development of diversified crops irrigation engineering.

1) To collect and analyze data and information
2) To conduct field studies on establishment of appropriate irrigation methods, diversified crops cultivation techniques and others
3) To prepare technology criteria
4) To conduct technical training for technical staff members of the NIA

The technical cooperation is especially emphasized for item 3), preparation of technology criteria, among the above. Items 1) and 2) are preparatory activities for standardization, and 4) is composed of activities to transfer the standardized design criteria and basic skills and technology for standardization. The design criteria and standards intended by the DCIEP are not highly technical ones like the Japanese standards, but are like technical manuals or instructions for orientation of the NIA's technical staff who design the diversified crops irrigation system and technology.

(3) Project Site

1) Central Office : in the compound of the NIA, Quezon City
2) Experimental Farm , approx. 3 hectares : San Rafael, Bulacan
3) Site Office & Laboratory : San Rafael, Bulacan
4) Soil & Water Laboratory : Muñoz, Nueva Ecija
5) Training Center : The National Training Center, San Rafael, Bulacan

(4) Basic Principles

The role of the DCIEP can be summarized as:

1) to carry out research in irrigation water amounts, and basic and practical studies of irrigation methods, technology, tertiary facilities at the experimental farm to prepare technical criteria on diversified crops irrigation;

2) to collect meteorologic and hydraulic data for the whole country, to analyze research and documents of the related organizations, and if necessary, to carry out field surveys to categorize areas for preparation of design and standards and to examine the possibilities for crop diversification;

3) to draw up standard instructions and design criteria for diversified crops irrigation in certain areas, based on the meteorologic and soil data gathered from the trial and other areas, and to transfer the methodology to stimulate standardization of the criteria in other regions; and

4) to develop training programs for the NIA staff and other persons concerned in diversified crops irrigation.

(5) Implementation Schedule

The process of standardization of the design criteria will consist of two steps. The first step is to collect and analyze existing data on geography and climate, to collect and edit reports and documents concerning crop diversification, and to categorize the target areas by field surveys. At the same time, research will be made at the trial farm to prove and supplement these data and reports. The second step is to furnish the plan and design standards, and to carry out practical activities to confirm the applicability of the furnished standards.

(6) Implementation Period

The implementation period of the technical cooperation is scheduled for five years from May 28, 1987.

(7) Equipment to be Provided

The following equipment will be provided under the technical cooperation:

Equipment	Quantity
1. Personal computers IBM Model (with a color display and a printer)	2
2. Typewriter (96 characters, 31 kb memory)	1
3. Cultivation machinery (tractor, sprayer, etc.)	1 set
4. Generator 24 kVA, diesel engine	1
5. Instruments for geographic and climatological measurement	1 set
6. Equipment for soil survey	1 set
7. Survey instruments (plate, level, transit, etc.)	1 set
8. Equipment for soil physics	
1) Constant Temperature Drier, 40 to 210 °C	1
2) Pycnometers	10
3) Stirrer	1

4) Humidity Control Tank			1
5) Specific Gravity Meter			1
6) Sand Column Method PF Meter	PF 0 -- 1.5		1
7) Pressure Plate Method PF Meter	PF 2.0 -- 3.0		1
8) Centrifugal Method PF Meter	PF 2.7 -- 4.2		1
9) Permeameters			2
10) Liquid Limit Test Sets			2
11) pH Meters, portable			2
12) Electric Muffle Furnace			1
13) Conductivity Densitometer, portable			1
14) Balance	200 g (0.001 g rate)		1
15) Balance	300 g (0.001 g rate)		1
16) Balance	500 g (0.1 g rate)		1
17) Balance	2000 g (0.1 g rate)		1
18) Water Purifying Apparatus			1 unit
19) Glassware (beakers, pipettes, etc.)			1 set
20) Chemical Reagents			1 set
21) Supersonic Cleaner			1
9. Audio-visual Equipment			
1) Video Camera		VHS system	1
2) Video Cassette Recorder		VHS system	1
3) Color TV Set		20"	1
4) Single-lens Reflex Camera		35 -- 105 mm	1
5) Overhead Projector			1
6) Slide Film Projector			1
10. Vehicles			
1) Station Wagons	4WD	4,000 cc	2
2) Station Wagons	4WD	2,000 cc	2
11. Word Processor, with a printer			1 set
12. Software for the Personal Computer			1 set