No. 8

BASIC DESIGN STUDY

ON

THE ESTABLISHMENT PROJECT

OF

THE AGRICULTURAL PROMOTION COMPLEX

IN BOHOL, THE REPUBLIC OF THE PHILIPPINES

MARCH, 1983

JAPAN INTERNATIONAL COOPERATION AGENCY

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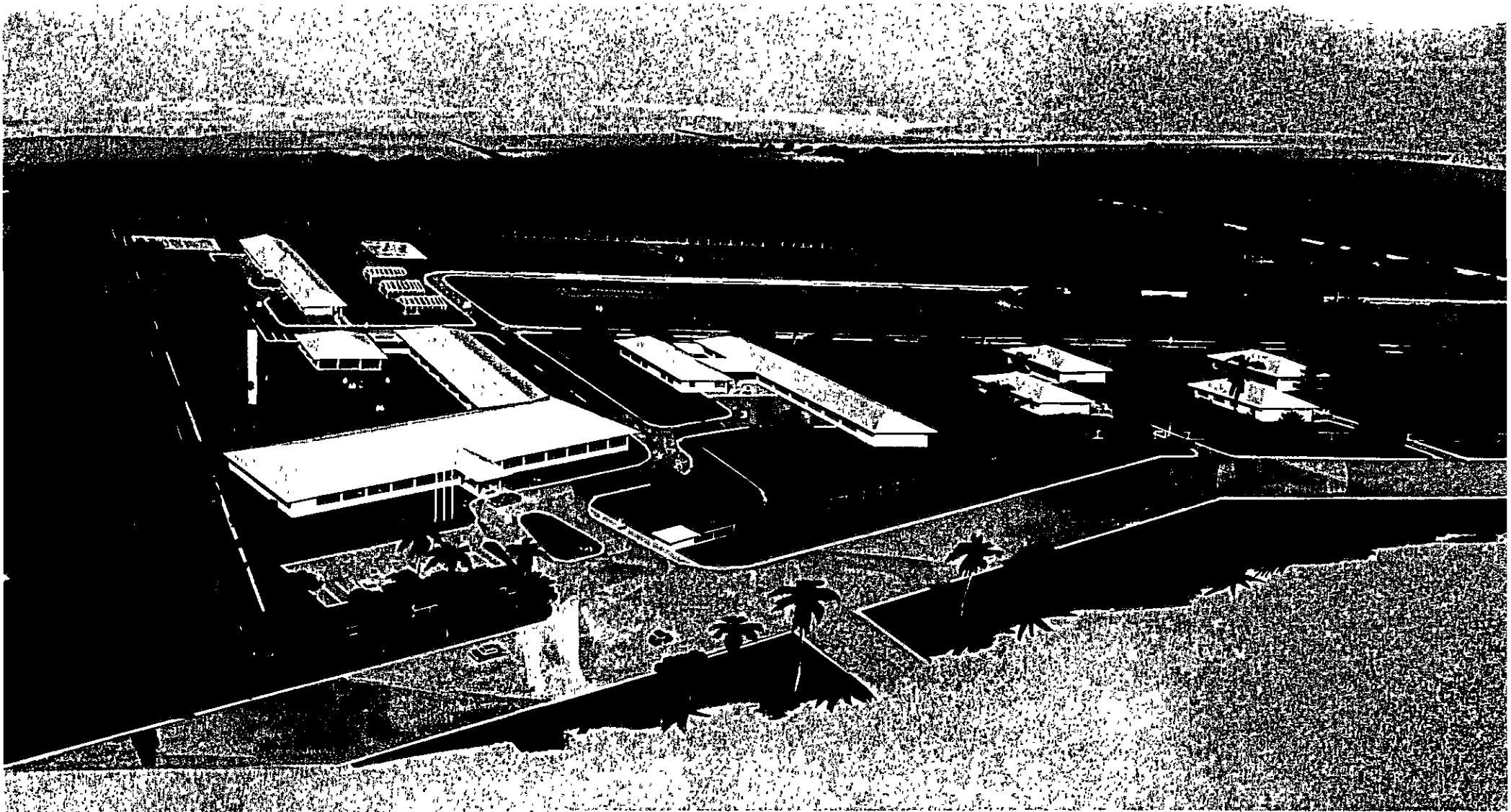

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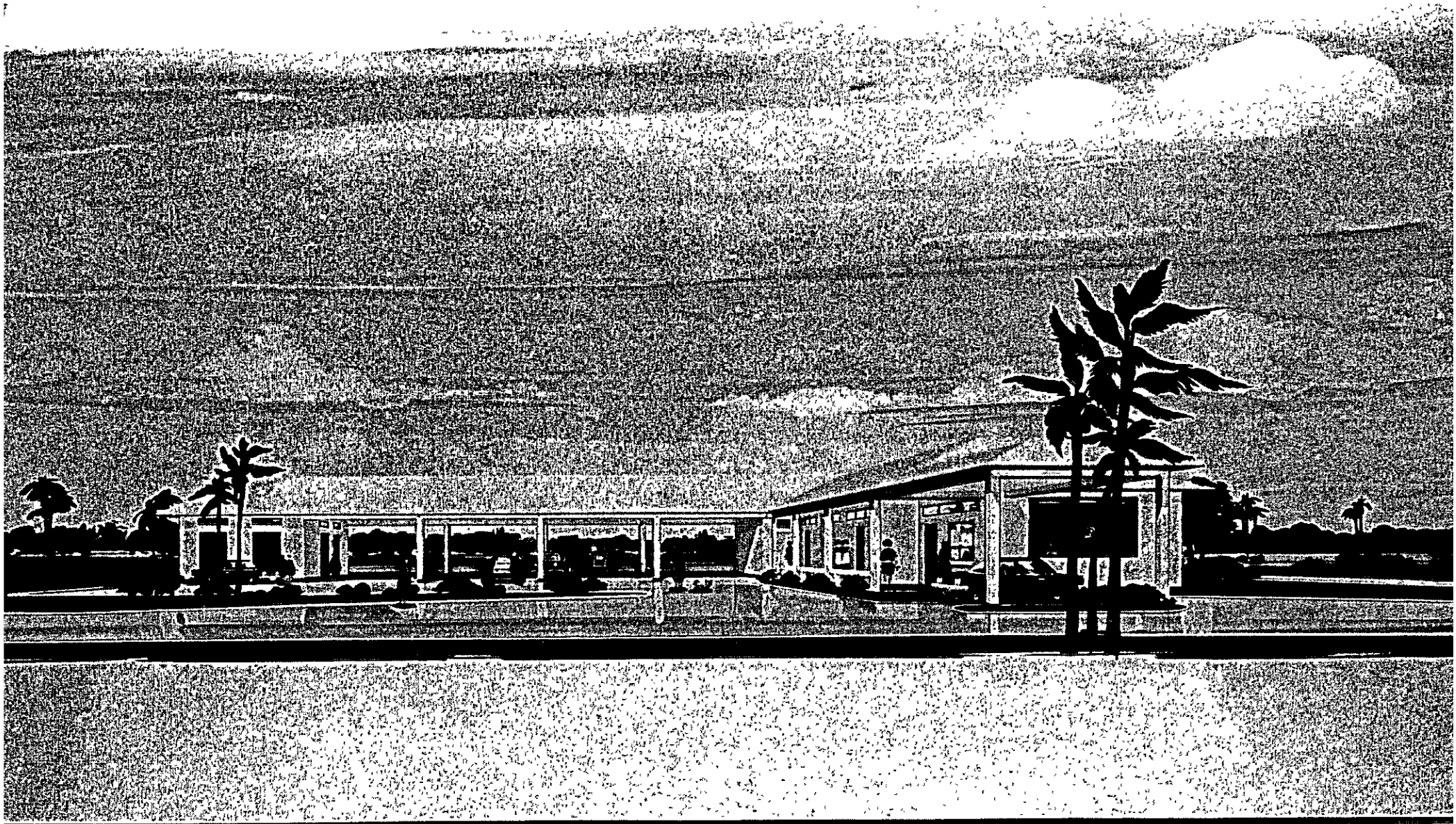

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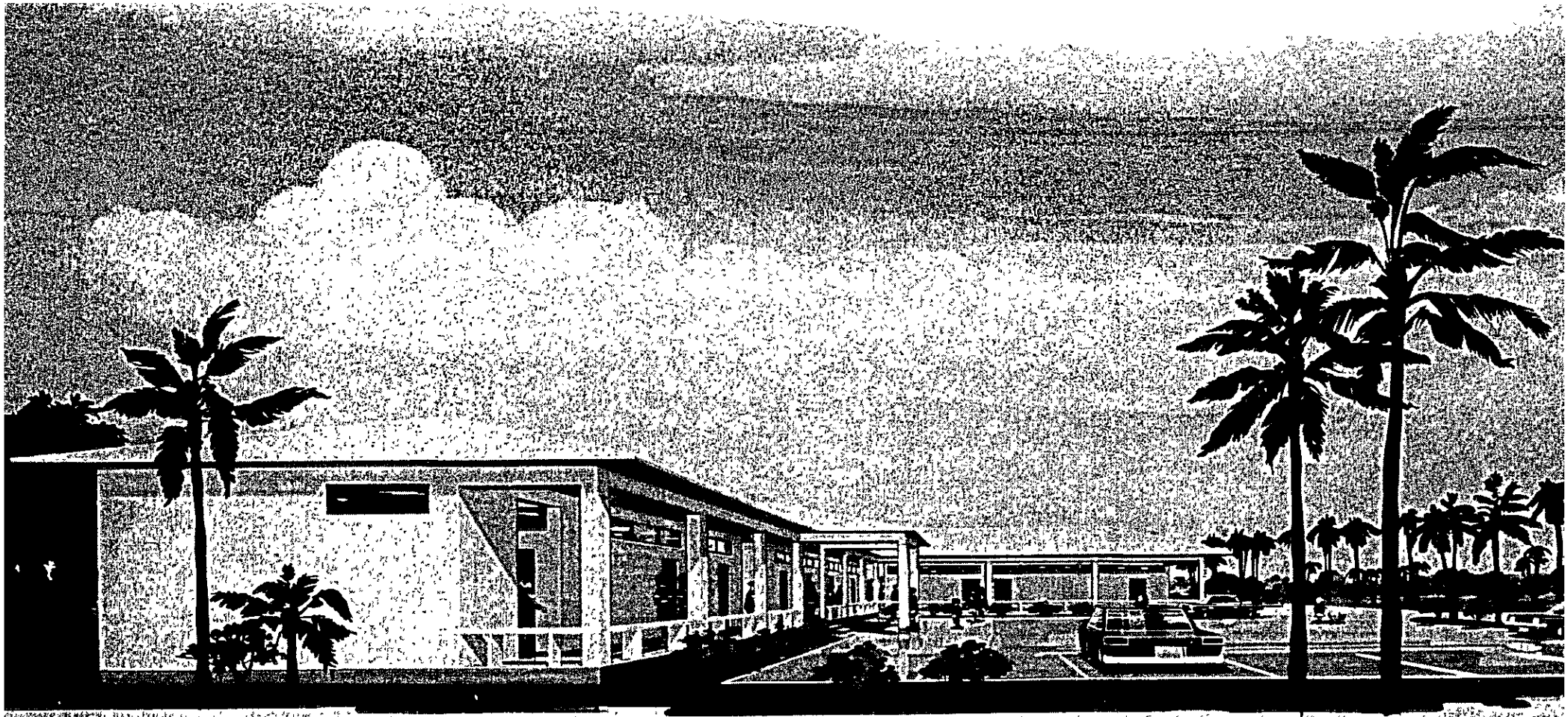

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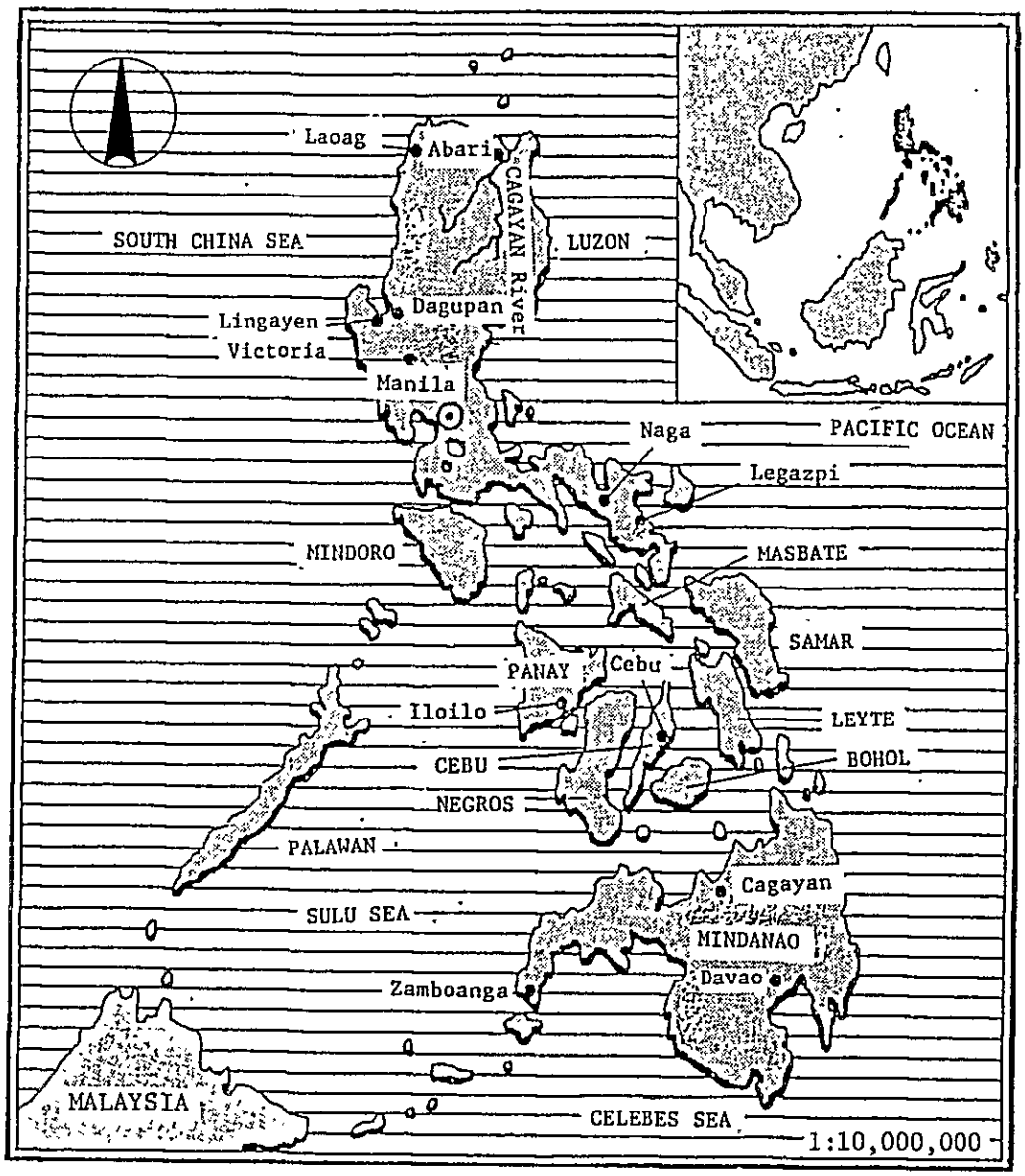
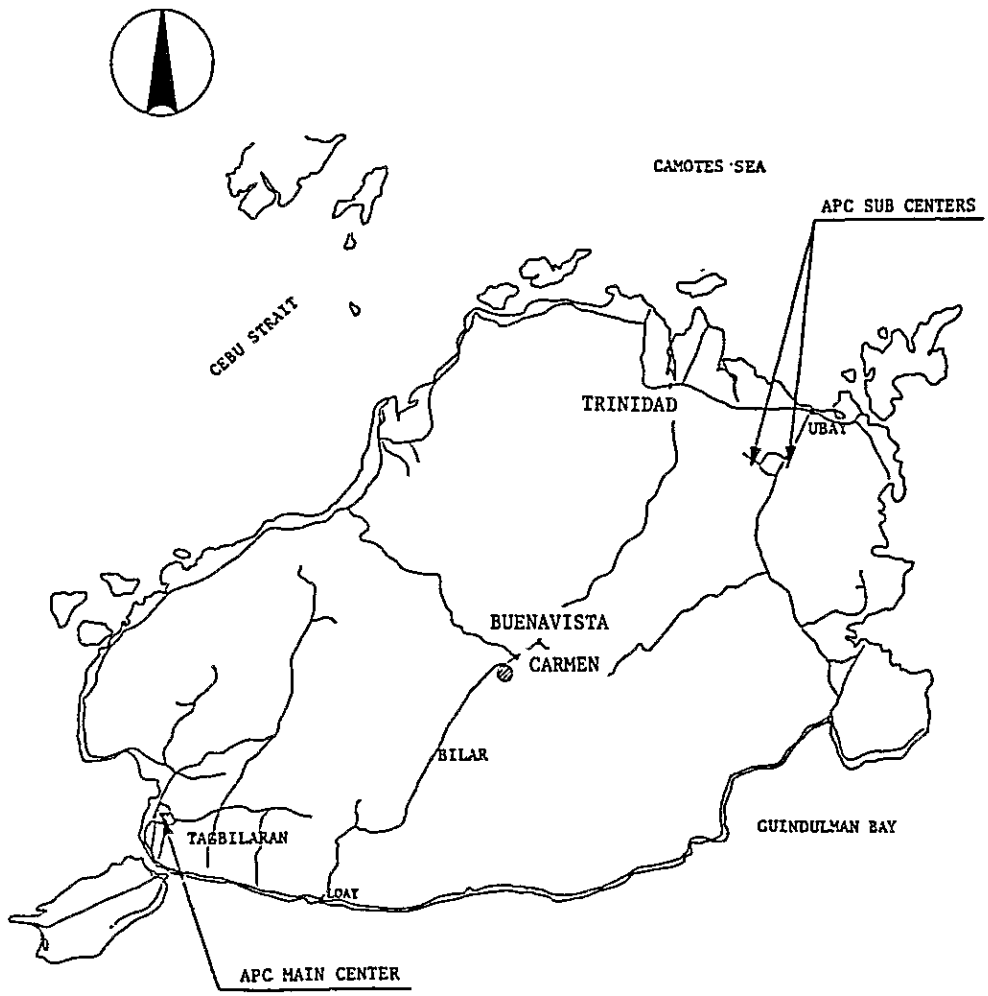
THE REPUBLIC OF THE PHILIPPINES





BOHOL ISLAND 1:750,000

PREFACE

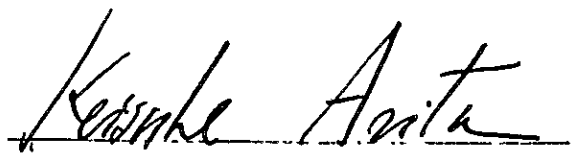
In response to the request of the Republic of the Philippines, the Government of Japan decided to conduct a survey on the Bohol Agricultural Promotion Complex Project and entrusted the survey to the Japan International Cooperation Agency. The J.I.C.A. sent to the Philippines a survey team headed by Mr.Kazuhisa MATSUOKA, Deputy Head, Basic Design Study Division, Grant Aid Department, J.I.C.A. from 28 September to 14 October, 1982.

The team had discussions with the officials concerned of the Government of the Philippines and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the project 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 team.

March, 1983



Keisuke Arita
President
Japan International Cooperation Agency

SUMMARY

The Republic of the Philippines has planned and implemented Phase I through Phase V Economical Development Projects up to 1982. For Phase V Economical Development Project (1978 - 1982), improvement of the production capacity of food and raw materials and stability of food supply were indicated as targets for some time related to agriculture, and efforts were made to promote productive employment in rural areas and to increase farm income in a long run.

In 1978 National Council on Integrated Area Development (NACIAD) was established as an executing agency of area development program. NACIAD founded seven bases for area development in whole country and has promoted its activity with aid from Japan, World Bank, etc. Bohol, having a large place of consumption with Philippines' second largest city Cebu as the nucleus, has a large potentiality regarding agricultural development as viewed from its abundant land resources, and is positioned one of the seven bases for area development. The Government of the Philippines drew up the master plan for "Bohol Integrated Area Development Project (BIADP)" in 1980 with cooperation obtained from Japan International Cooperation Agency (JICA), in which emphasis is laid on development of agriculture and improvement of infrastructure aiming at developing unused land suitably, using limited water resources effectively, and elevating agricultural productivity.

Under the background stated above, the Government of the Philippines decided to materialize "Bohol Agricultural Promotion Complex Project (APC Project)" in order to promote agricultural development, and requested the Government of Japan in 1979 to provide technical cooperation related to BIADP. In response to this request, JICA dispatched a series of survey teams to the Philippines since 1980, surveyed the necessity of implementation of the project, studied the extent of technical cooperation Japan could offer, and decided to implement the project-oriented technical cooperation by signing the Record of Discussion in January, 1983. On the other hand, the Government of the Philippines requested the Government of Japan in March, 1982 to provide cooperation for construction of the APC in the manner of Grant Aid Cooperation. Based on this request, Basic Design Study Team was dispatched to the Philippines this time.

The targets for some time of this project are as follows.

1) Research and development of suitable agricultural technology over 85 subjects.
2) Technical training for 74 days to 126 days per year toward elevation of technology with regional agricultural technicians and outstanding good farmers as the object, as well as information activities.
3) Extension of agricultural technology to general farmers by making use of model farms located at 316 places.

It is expected that this project will make sufficient contribution to agricultural development with development and extension of agricultural technology in Bohol as the nucleus.

The facilities of the APC are composed of three centers, i.e., main center and two sub centers. The main center is scheduled to be constructed on the grounds of about 8.4 ha in Dao located at a point of about 2 km in the north-east direction from Tagbilaran, which is the capital city of Bohol. Regarding infrastructure for this place, supply of water through waterworks and lead-in of lines of electric power and telephone are easy. The sub centers, on the other hand, are composed of the rice research sub center planned to be located in Ubay which is at a point of about 130 km in northeast direction of Tagbilaran and the livestock research sub center, which is also planned to be located in Ubay. These two sub centers are scheduled to be located at different spots. However, water supply from existing wells can be used at both centers and power lines are scheduled to be led to these places in the near future. Telephone service is not available in Bohol outside of Tagbilaran, therefore, communication with other places should be made through telegrams.

The majority of research activities, training activities and extension activities are conducted at the main center, but test and research of rice cultivation are conducted at the rice research sub center in Ubay which is the rice crop area of Bohol having satisfactory ground conditions; and research of livestock farming are conducted at the livestock research sub center where existing facilities may be utilized.

The facilities of the main center are composed of research and training building, office for field trials, canteen, liaison office and dormitory, experts' house, green house and so forth. The research and training building will be used for the administration and welfare division

(administrative office, director's office, leaders' room, meeting room, library, etc.), research division (research office, laboratories, laboratory offices, sample rooms, anaslysis room, photo laboratory, etc.) and extension and information division (extension and training office, lecture room, audio-visual room, etc.). The office for field trials includes workshop, machinery house, storage for farm materials and mill & dry house. In addition, fields are consolidated as matched with farm products to be studied.

The rice research sub center is composed of research building (research room, laboratory, workshop, machinery shop, warehouse, etc.) and liaison house for visitors from the main center.

The livestock research sub center is composed of research building (research room, laboratory, workshop, etc.) and staff house.

The equipment required at the main center and sub centers are planned for the activities of research, experiments, extension and training.

The scales of facilities of the APC are as follows.

(Main center)		(Rice Research Sub center)	
Research & Training Bldg.	2,111 m^2	Research Bldg.	580 m^2
Canteen	230	Liaison House	120
Office for Field Trials	788	Sub total:	700 m^2
Green House	72	(Livestock Research Sub Center)	
Covered Way	25	Research Bldg.	585 m^2
Experts House	400		
Liaison Office and Dormitory	818		
Sub Total:	4,444 m^2	Grand total:	5,729 m^2

The governing agency on the Philippine side for planning and implementation of the APC project is BIADP. The length of time required for construction of facilities of the APC is considered as, after exchange of official notes between the governments of both nations regarding gratuitous fund cooperation from the Government of Japan, three months for development design, two months for tender and contract, and around twelve months for construction.

The APC will be composed of four divisions i.e., Administrative Division, Technology Research Division, Technology Extension Division and Training and Information Division. Administration, maintenance and control of the APC are conducted by 103 staff members selected mainly out of Region VII of the Ministry of Agriculture (MA). The required expenses are estimated as about 2,771,000 peso per year.

By the establishment of the APC, agricultural development and elevation of agricultural productivity, which are keypoints of Bohol integrated area development, are expedited. At the same time, contribution of the APC to the economical development of the whole country of the Philippines is not minor in the aspects of improvement of the capacity for domestic production of food and raw materials and stability of food supply in addition to elevation of standard of living of farmers, who occupy more than 60% of the total population of Bohol. It is largely significant that promotion of this APC project is materialized by grant aid cooperation from the Government of Japan, and tremendous assistance effects can be expected.

Constant cooperation from the Philippine side is essential for quick construction of facilities of the APC, and strengthening of administrative structure is essential for smooth conduct of the APC. It is desired that sufficient budget is provided for maintenance and control of buildings and equipment. Further, it can be largely expected that APC's functions are more effectively exhibited if project type technical cooperation from Japan such as dispatch of specialists, grant of equipment and training of counterparts in Japan is implemented.

ABBREVIATIONS

CENTRAL

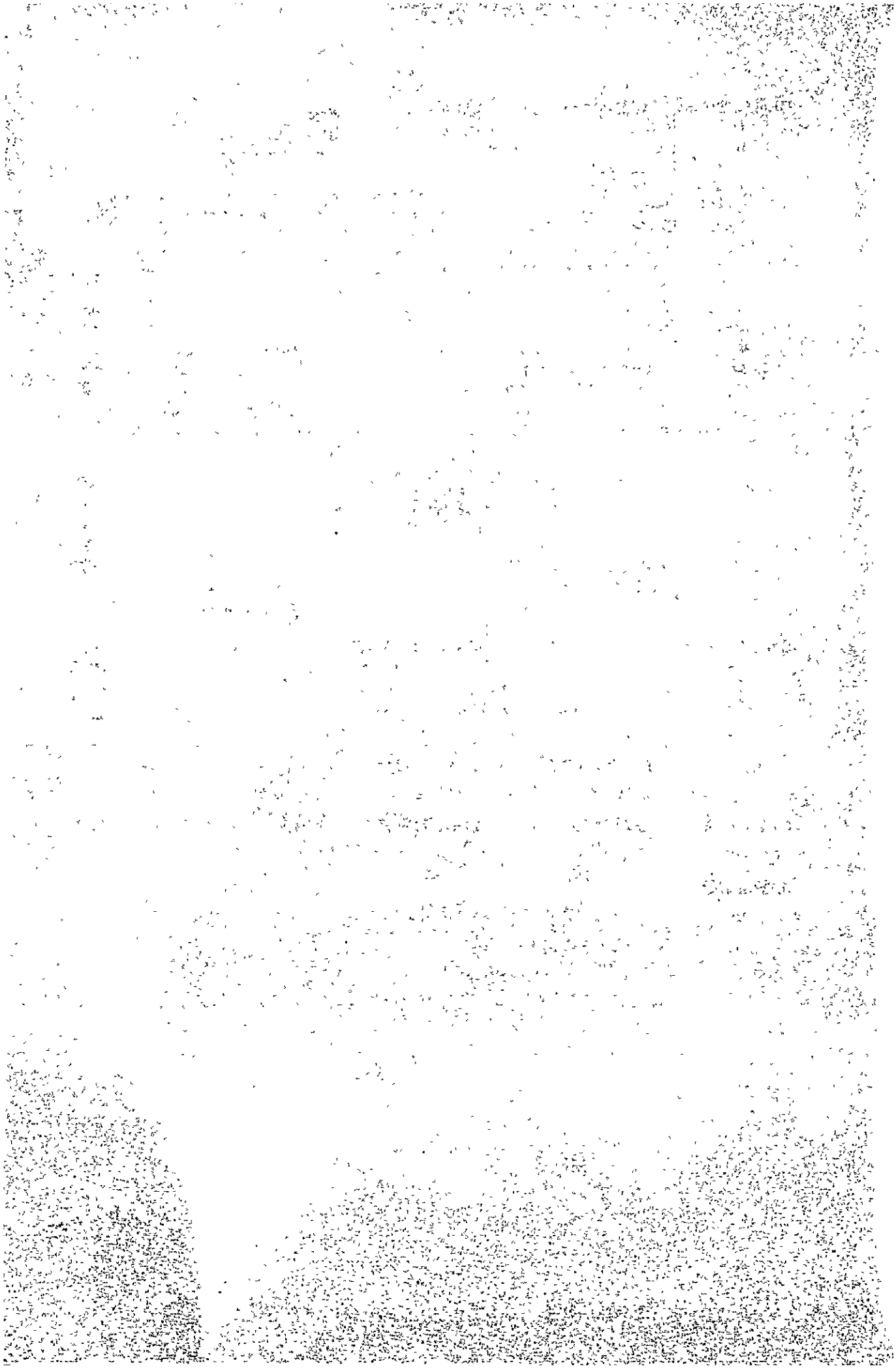
BAEX	Bureau of Agricultural Extension
BAI	Bureau of Animal Industry
BIADP	Bohol Integrated Area Development Project
BPI	Bureau of Plant Industry
BS	Burea of Soils
CCC-IRDP	Cabinet Coordinating Comittee - Integrated Rural Development
IRRI	International Rice Research Institute
MA	Ministry of Agriculture
MPWH	Ministry of Public Works and Highways
MOB	Ministry of Budget
NACIAD	National Council on Integrated Area Development
NEDA	National Economic and Development Authority
NFA	National Food Authority
NFAC	National Food Agriculture Council
NIA	National Irrigation Administration

LOCAL

APC	Agricultural Promotion Complex
APAO	Assistant Provincial Agricultural Officer
BAC	Bohol Agricultural College
BPES	Bohol Provincial Electric System
DAO	District Agricultural Officer
FL	Farmer Leader
FAT	Food Agricultural Technologist
FTC	Farmers Training Center
MAO	Municipal Agricultural Officer
MT	Maisan Technicians
PAO	Provincial Agricultural Officer
PCARRD	Philippines Council for Agriculture and Resources Research Development

PDC	Provincial Development Council
PDS	Provincial Development Staff
PWWS	Provincial Water Works System
PIO	Provincial Information Officer
PTC-RD	Philippines Training Center for Rural Development
RCPC	Regional Crop Protection Center
RIARS	Regional Integrated Agricultural Research Station
RTC	Regional Training Center
SMS	Subject Matter Specialist
SRIO	Supervising Regional Information Officer
VISCA	Visayas State College

CONTENTS



CHAPTER 1. INTRODUCTION

In 1975, the Cabinet Coordinating Committee on Integrated Rural Development Project (CCC-IRDP) Secretariat, which is the predecessor of National Council on Integrated Area Development (NACIAD) planned "Conception of the integrated area development of Bohol", and the Government of the Philippines requested the Government of Japan to provide technical assistance for establishment of the Bohol Integrated Area Development Project (BIADP) in the following 1976. In response to this request the Government of Japan dispatched through the Japan International Cooperation Agency (JICA) a series of survey teams since March, 1977, and completed a master plan in May, 1980. In this master plan the importance of agricultural development was pointed out, and the following projects were proposed to be implemented immediately: Irrigation project of Wahig-Pamacsalan areas which has the highest priority, and the establishment project of the agricultural promotion complex (APC) which has the second highest priority. For the Wahig-Pamacsalan irrigation project, feasibility study report was completed by JICA and fund aid in the form of yen loan is expected to be arranged.

On the other hand, for the APC, execution of technical cooperation under project system was requested by the Philippine side, and an advance survey team related to agricultural technical cooporation was dispatched in March, 1980 in order to confirm the contents of the request. The necessity of technical cooperation including training of technicians, development and extension of cultivation technology and soil amelioration was recognized as a result of this survey.

Further, preliminary design survey was carried out in June through July, 1981 in order to survey geological condition and to prepare preliminary design. As a result, the Philippine side prepared the necessary measures aiming at construction of the APC facilities as a precondition for provision of technical cooperation. However due to lack of fund, the Government of the Philippines requested to the Government of Japan to provide grant aid cooperation for construction of the APC in March, 1982 and it was determined to dispatch the basic design study team of this time. Long-term survey staff for technical cooperation related to the BIADP accompanied the study team of this time, and assistance and adjustment to the study were made from the standpoint of "technical cooperation" by this staff.

Table 2-1-1 Integrated Area Development of NACIAD

Project Name	Components	Foreign Assistance
Mindoro Integrated Rural Development Project (MIRDP)	·Roads ·Ports ·Agricultural Support Service ·Schistosomiasis Control ·Irrigation ·Watershed Protection	World Bank
Bicol River Basin Development Program (BRBDP)	·Road Construction ·Irrigation Systems ·Flood Control and Drainage ·Agricultural Development ·Health and Nutrition Services ·Water Supply ·Agro-Industrial Development ·Forest Development	U.S.A. ADB EEC etc.
Cagayan Integrated Agricultural Development Project (CIADP)	·Agricultural Development ·Irrigation ·Electrification ·Supplemental Infrastructure ·Roads ·Flood Control	Japan etc.
Samar Integrated Rural Development Project (SIRDP)	·Roads and Ports ·Water Supply ·Irrigation ·Schistosomiasis Control ·Electrification / Telecommunication Facilities ·Agricultural Development ·Catubig Valley Development Study	Australia World Bank
Zamboanga del Sur Development Programme (ZIADP)	·Roads and Bridges ·Irrigation Systems ·Potable Water Supply ·Agricultural Development ·Social Services	Australia
Palawan Integrated Area Development Project (PIADP)	·Development of Lowland and Upland Agriculture ·Improvement of Health and Nutrition ·Establishment of Rural Industries ·etc.	ADB EEC
Bohol Integrated Area Development Project (BIADP)	·Agricultural Development ·Irrigation ·Ports ·Forest ·Water Supply ·etc.	World Bank Japan

(SOURCE : NACIAD 1982)

CHAPTER 2. BACKGROUND OF THE PROJECT

2-1. 5th 5-Year Project (1978 – 1982)

The Government of the Philippines has planned and implemented economical development projects through a number of phases, and projects of up to the 4th phase were completed uneventually toward the end of 1977, after many turns and twists.
After completion of the 4th project, the Government of the Philippines planned a ten-year long-term development project applicable to the period of 1978 through 1987. The 5th Development Project (1978 through 1982) is positioned as a five-year period project to cover the first half of the ten-year project, and its targets are as follows.

1) To accomplish and promote social development and social justice.
   a. Creation of opportunities of productive employment
   b. Ease of unbalance of income
   c. Improvement of living standard for low income class
   d. Improvement and elevation of social and cultural level

2) To accomplish self-supply of foods, to reduce overseas dependence of energy consumption and to expand domestic supply of energy.

3) To accomplish high growth and continuous growth of economy.

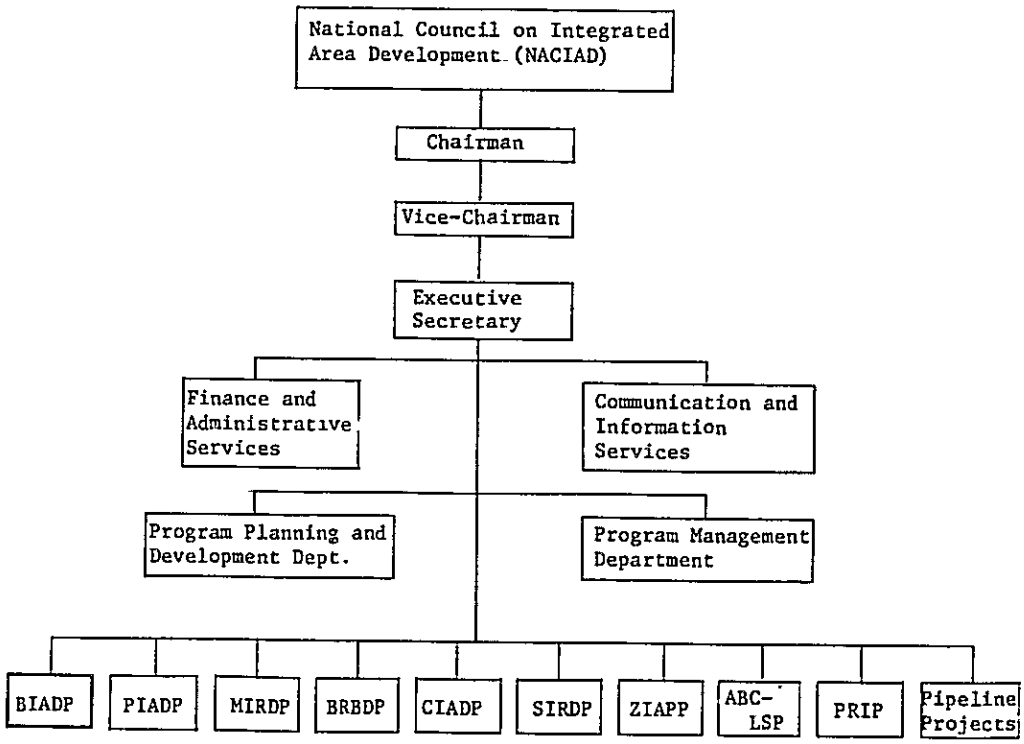
4) To stabilize prices, to improve use of domestic resources such as human resources and natural resources as well as improvement of international balance of payments.

5) To promote development of developing areas and agricultural areas in particular.

6) To improve living areas through human settlement, that is, suitable control of environment.

7) To suppress rate of increase of population.

Fig. 2-1-2 Organization of NACIAD



As for development of rural area in order to improve the following situations, 1) increase of differencies of living level between urban areas and rural areas, 2) concentration of capital to town, 3) unbalance of national income, CCC - IRDP was established in 1973 as the organization to make plans and to execute suitable and well balanced integrated area development projects. Through five years' practical activities CCC -IRDP filled up its organization and established NACIAD in 1978, which laid its rolls on promoting and adjusting integrated area development. NACIAD planned seven important areas to be developed with high priority and they have been under implementation by assistance of foreign countries. (Refer to Table 2-1-1)

Among the seven important areas is Bohol, where the APC is to be established.

A master plan for "Bohol Integrated Area Development Project", which aims at elevation of general standard of living in Bohol, was framed out in October, 1980 with cooperation obtained from JICA, and high impact project, which lay necleus on the development of agricultural and infrastructure, have been materialized.

2-2. 6th 5-Year Project (1983 – 1987)

Under the 6th 5-year Plan being proposed with continuity to the preceding 5th 5-Year Plan there are national targets being aimed at the attainment of:

(1) Sustainable economic growth;
(2) Equitable distribution of the fruits of development; and
(3) Total human development

Major objectives toward those national targets above are to solve the following problems.

1) To reduce unemployment or non-employment
2) To increase productivity in agricultural and industrial sectors
3) To correct rural and regional growth disparities
4) To reduce higher dependence on imported oil
5) To develop infrastructure

6) To mobilize more domestic resources
7) To curb growth of population
8) To improve institutional bottlenecks

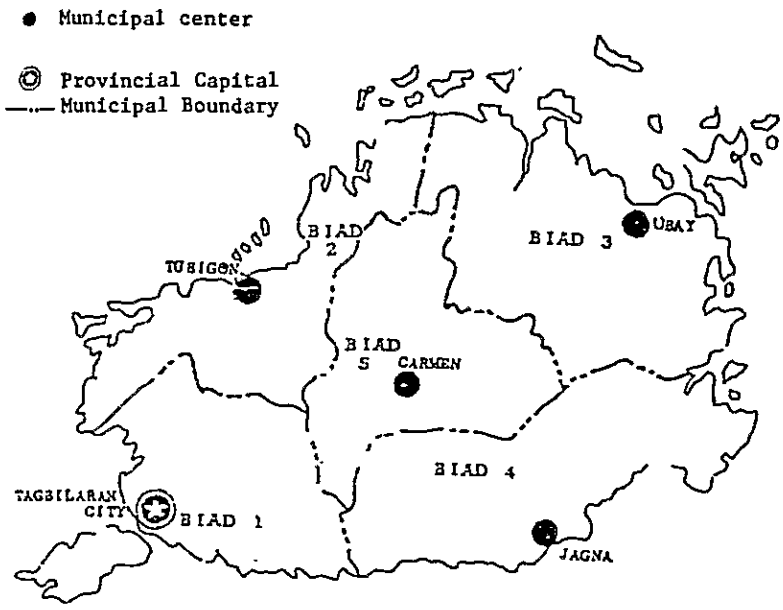
Many of planning objectives and aims are carried over successively from the 5th 5-Year Plan. In particular, the theme of rural development is taken over with equal importance as one of significant targets. It is further hoped that regional integrated development projects should be promoted so as to solve such various problems as 'increase of differences of living level between urban areasand rural areas', 'concentration of capital to town' and 'unbalance of national income'.

Table 2-3-1 Population Density and Population Growth Rate in Bohol

(Source : PDC 1981)

Municipal No.	Area (km^2)	Population (Number)	Density (Person/km^2)	Growth (%)	Change 1975-1980
BIAD I	789.71	192,270	243.46	.76	8.86%
BIAD II	777.03	192,725	248.82	.99	5.03%
BIAD III	874.45	167,126	191.17	3.5	18.6%
BIAD IV	764.35	139,624	181.96	.6	3.01%
BIAD V	908.72	114,171	125.63	1.8	4.43%

Fig. 2-3-2 BIAD Area



2-3. Current Situation of Bohol

2-3-1. Outline of Bohol

Bohol belongs to the Region VII, Central Visayas, out of the twelve regions of the nation, and is the tenth largest island located about at the center of Philippine Islands, at a point of about 600 km in the south of Manila.

1) Population

According to the population survey conducted in 1980, the population of Bohol is 805,916 persons, which is equivalent to 21.3% of the total population of the Region VII. This figure indicates an increase of 7.5% from the population in 1975 of 749,370 persons, and the annual growth rate is 1.5% which is pretty low compared to the rate of 2.9% of the whole country. The population density, which was 184 persons per square kilometer in 1975, increased to 195 persons in 1980, showing the anual groth rate at 1.2%.

The number of households also increased from 135,590 in 1975 to 147,334 in 1980.

The average number of persons per household in the statistics is 5.47 persons.

According to the Table 2-3-3 which shows labor force in Bohol, as many as 61.7% of the total labor force of 276,290 persons are engaged in agriculture. This figure is higher than the national average farming/forestry/fishery employment rate of 52.7% (NEDA, 1978 year book), and importance of agriculture in Bohol is indicated.

2) Land

The area of Bohol is 411,726 ha, which is classified as follows according to PDC data 1982.

Alienable and disposable area	309,152 ha	(75.0%)
Classified timberlands	80,725 ha	(19.6%)
Unclassified lands	21,849 ha	(5.4%)
Total	411,726 ha	

For agriculture, approximately 236,490ha out of alienable and disposable area of 309,152ha is used for plantation of rice, corn, coconuts, rootcrops, banana, and vegetable. (Refer to Table 2-3-6)

Table 2-3-3 Labor Force

(SOURCE : PDC 1982)

Urban	Number	Percent %
Total 10 Years old and over	72,561	100.0
In the labor force	34,860	48.0
Not in the labor force	37,701	52.0
In the labor force	34,860	100.0
Employed	34,757	99.7
Unemployed	103	0.3
Employed	34,757	100.0
In Agriculture	18,439	53.0
In non-Agriculture	16,318	47.0
Rural	—	—
Total 10 years old and over	414,390	100.0
In the labor force	241,430	58.3
Not in the labor force	172,960	41.7
In the labor force	241,430	100.0
Employed	239,091	99.0
Unemployed	2,339	1.0
Employed	239,091	100.0
In Agriculture	149,282	62.4
In non-Agriculture	89,809	37.6
Total	—	—
Total 10 Years old and over	486,951	100.0
In the labor force	276,290	56.7
Not in the labor force	210,661	43.3
In the labor force	276,290	100.0
Employed	273,848	99.1
Unemployed	2,442	0.9
Employed	273,848	100.0
In Agriculture	167,721	61.7
In non-Agriculture	106,127	38.8

The majority of the soil in Bohol is constituted by limestone and sedimentary rock, and the thickness of the topsoil that covers the baserock is relatively small.

3) Weather

The weather of Bohol Island has a minor distinction between rainy season and dry season, but both rainfall and atmospheric temperature are relatively equal throughout the year.

According to the meteorological data (Refer to Table 4-2-1) the wind velocity is relatively slow.

In addition, this area is suffered from almost no typhoons.

4) Water Resources

Bohol has four rivers which may be used as water resources. They are Loboc River and Abatan River in the south and Inabanga River and Ipil River in the north. Loboc River is under development with hydraulic power generation and irrigation as purposes, and other rivers were partially developed for irrigation.

5) Economy

According to table 2-3-4, persons of 64.8% out of whole labor force in Bohol are engaged in agriculture, forestry and fishery, and this figure indicates that economy in Bohol is largely depending on agriculture.

Average family income is 3,892 pesos per year, which is very low compared to the average family income of 5,172 pesos in Region VII and 5,840 pesos in the whole country. (Refer to Table 2-3-5)

There are some potentiality in mining resources and tourism in Bohol, however primary measures to elevate the economic level must be laid on the development of agriculture.

Table 2-3-4 Labor Force by kind of Industry (1975)

(Unit : 1,000 Persons)

	No. of Person	Percentage(%)
Agriculture,Forestry,Fishery	150.8	64.8
Mining, Quarrying	0.3	0.1
Manufacturing	28.6	12.3
Elec., Gas, Water	0.3	0.1
Construction	3.6	1.5
Commerce	14.6	6.3
Transport,Communication,Storage	4.4	1.9
Service	25.7	11.0
Others	4.7	2.0
Total	232.8	100.0

(Source : NCSO, 1975 Integrated Census of the Population and its Economic Activities, Bohol, P.223)

Table 2-3-5 Income and Expenditure at Urban and Rural Area in Bohol (1975)

(Peso)

EXPENDITURE GROUP	TOTAL	URBAN	RURAL
TOTAL INCOME	518.550.023	81.890.548	436.689.475
TOTAL EXPENDITURE	508.365.755	83.036.930	425.328.825
A. Food,beverages and Tobacco	324.185.063	47.291.290	276.893.773
B. Clothing, footwear and other wear	33.581.778	5.473.825	28.110.953
C. Housing	32.512.914	6.862.807	25.650.107
D. Household Furnishing and equipment	7.129.021	732.885	6.396.136
E. Household Operations	10.369.408	1.879.858	8.489.550
F. Fuel, light and water	26.729.256	4.265.704	22.463.552
G. Personal Care	5.723.423	1.041.602	4.681.631
H. Medical Care	3.673.552	944.126	2.729.426
I. Transport and Communication	12.421.597	2.632.746	9.788.851
J. Recreation	3.177.584	968.833	2.208.751
K. Education	11.742.726	3.001.848	8.740.878
L Gifts, Contributions, and Assistunce to Outsiders	2.448.954	724.230	1.724.724
M. Taxes paid	853.086	303.913	549.173
N. Special Occasions of Family	25.329.164	4.443.225	20.885.939
O. Personal Effects	1.320.850	827.034	493.816
P. Miscellaneous good and services	7.164.369	1.643.004	5.521.365
TOTAL NUMBER OF FAMILIES	133.249	17.324	115.925
AVERAGE INCOME	3.892	4.727	3.767
AVERAGE EXPENDITURE	3.815	4.793	3.669

(Source : Bohol Integreted Development Project Contact Mission Report (JICA 1978))

2-3-2. Present Agricultural Situation in Bohol

In the trend that the entire Philippines takes the cource of industrialization, and industrial production increases and agricultural production decreases in the whole country, this province is still of the social structure depending on the primary industry having agriculture and fishery as key items.

1) Agricultural Area, Production

The total area devoted to agriculture in Bohol in 1980 (Refer to Table 2-3-6) was approximately 236,490 hectares representing 57.4 percent of the province's total area.

Main crops in Bohol are rice, corn, rootcrops coconut, banana and vegetable, which are found in alluvial plains, narrow valleys, plateaus, river terraces, hillsides, etc. according to the kind of crops.

Total production of major crops in 1980 is 948,305 MT, in which rice and banana occupy 327,240 MT and 444,963 MT respectively.

2) Cropping Calendar

Cropping calender of main crops is summarized as follows:

Crops	Planted from	Horvested from
Irrigated paddy rice		
1st crop	Oct. - Nov.	Mar. - April
2nd crop	May - June	Sep. - Nov.
Rainfed rice		
1st crop	Oct. - Dec.	March - May
2nd crop	May - July	Sept. - Dec.
Corn		
1st crop	March - May	July - Sept.
2nd crop	Aug. - Oct.	Dec. - Jan.
Cassava		
Perennial crop	April - June	Sept. - Dec.

3) Earning Rate of Agricultural Products

According to Table 2-3-7, yield per hectare of agricultural products in Bohol is as much as that of the national average. However net income of agricultural products in Bohol is pretty low in comparison with that

of the national average because there needs more farm labors and fertilizers to the same area of agricultural farm in Bohol.

4) Marketing of Major Crops

In general, agricultural products are consumed in the province and their surplus are shipped to places such as Manila, Cebu, Cagayan, etc. As for rice of the total marketable surplus, about 80% are consumed in Bohol while the remaining 20% is shipped to other regions. Such crops as copra to be processed later are also shipped to other regions since there are no processors or manufactuers in the area.

5) Agricultural Organizations in Bohol

The core organization of agriculture in the Province of Bohol is the Bohol Administration Office of the Ministry of Agriculture (MA) which operates nine branch offices throughout the country. In the capital city, Tagbilaran, and in its suburbs there are gathered many local agencies of National Food Authority (NFA) and National Irrigation Administration (NIA), in addition to and except for the Bohol Administration Office and the Soil Research Institute under the jurisdiction of the MA. Furthermore, the provincial largest university of Bohol is also situated in the city of Tagbilaran. There are some other main institutions associated with agriculture in the Province, such as Regional Integrated Agricultural Research Station (RIARS), Bohol Experimental Station, Bohol Soil Conservation and Demonstration Station, and Ubay Stock Farm. All of them are situated within the Ubay area, the eastern part of Bohol Province. The provincial only agricultural college of Bohol is in Biar at the central part of the Province.

Table 2-3-6 Area, Production and Yield of Major Crops, 1980

	Crops	Area (Hectares)	(%)	Production (MT)	Yeild (MT/HA)
Short-Term Crop	1. Rice	49,048	20.7	327,240	6.7
	2. Corn	18,475	7.8	34,085	1.8
	3. Rootcrops	40,684	17.2	86,331	2.1
	4. Vegetables	3,008	1.3	24,302	8.0
	Sub Total	111,215	47.0	471,958	-
Long-Term Crop	5. Coconut	97,680	41.3	31,384	3.2
	6. Banana	27,595	11.7	444,963	16.1
	Sub Total	125,275	53.0	476,347	-
	Total	236,490	100.0	948,305	- -

RETURN AND COST OF AGRICULTURAL PRODUCTS, PHILIPPINES AND BOHOL

(Soucce : NACIAD)

ITEM	Rice				Corn		Cassava		Rice-based		Corn-based	
	Phil.		Bohol		Phil.	Bohol	Phil.	Bohol	Phil.	Bohol	Phil.	Bohol
	Irrg.	Rainfed	Irrig.	Rainfed								
A. RETURNS												
Yield/ha.(cavans)	54.64	40.9	40	30	26.8	20	140	60	52.70	38.58	54.66	52.56
Value of Production(₱)	₱2,588.25	₱1,954	₱2,800	₱2,100	₱1,171.04	₱1,159	₱3,815	₱1,500	₱4,993.08	₱1,627.52	₱2,482.68	₱2,387.17
B. COSTS												
Total Cost(₱/ha.)	₱1,654.20	1,128.73	2,229	1,520	420.29	1,833.55	1,216	1,352.5	2,261.18	515	990.46	1,492.09
Farm Labor	816.73	795	1,050	1,022.16	304.05	1,100	1,032	1,152.5	1,586.83	420	709.27	795.95
Seeds/cuttings	91.00	97.48	100	107.13	17.97	37.50	184	200	-	95	-	-
Fertilizer	283.47	183.12	679.8	439.15	498.37	546	-	-	400.43	-	248.51	698.14
Chemicals	463	52.73	400	45.56	-	150	-	-	273.92	-	32.68	-
C. NET INCOME(₱/ha.)	934.05	825.27	571	579.06	750.65	674.50	2,599	147.5	2,731.9	1,312.52	1,492.22	895.08

6) Extension of Agriculture

Extension of agricultural technology is conducted mainly by Bureau of Agricultural Extension (BAEX), in which about one hundred persons are devoted as extension staffs. In Bohol agricultural area covered by one extension staff is about 24 square kilometers while in Japan about 12 square kilometers, which indicates that number of extension staffs is pretty few. As for the training method, such measures are carried out that farmers are trained by group. However training activity can not be sufficient because:

(1) Detailed training in accordance with respective divisions can not be expected as majority of training staff are generalists.

(2) There is no established training method and scale of training is pretty small.

(3) Little transportation convinience for training activity is available.

7) Agricultural Feature in Bohol

As stated in the preceding sections, agricultural features in Bohol are summarized as follows:

(1) Rice dependability is extremely high and there are few crops which produce high profits other than rice.

(2) Although cultivation rate has been increasing year after year, there still are broad unused lands which amount to nearly one half of the total area of Bohol

(3) Being blessed by annual precipitation of 1,500 mm at average, and seasonal fluctuation of rainfall is relatively minor.

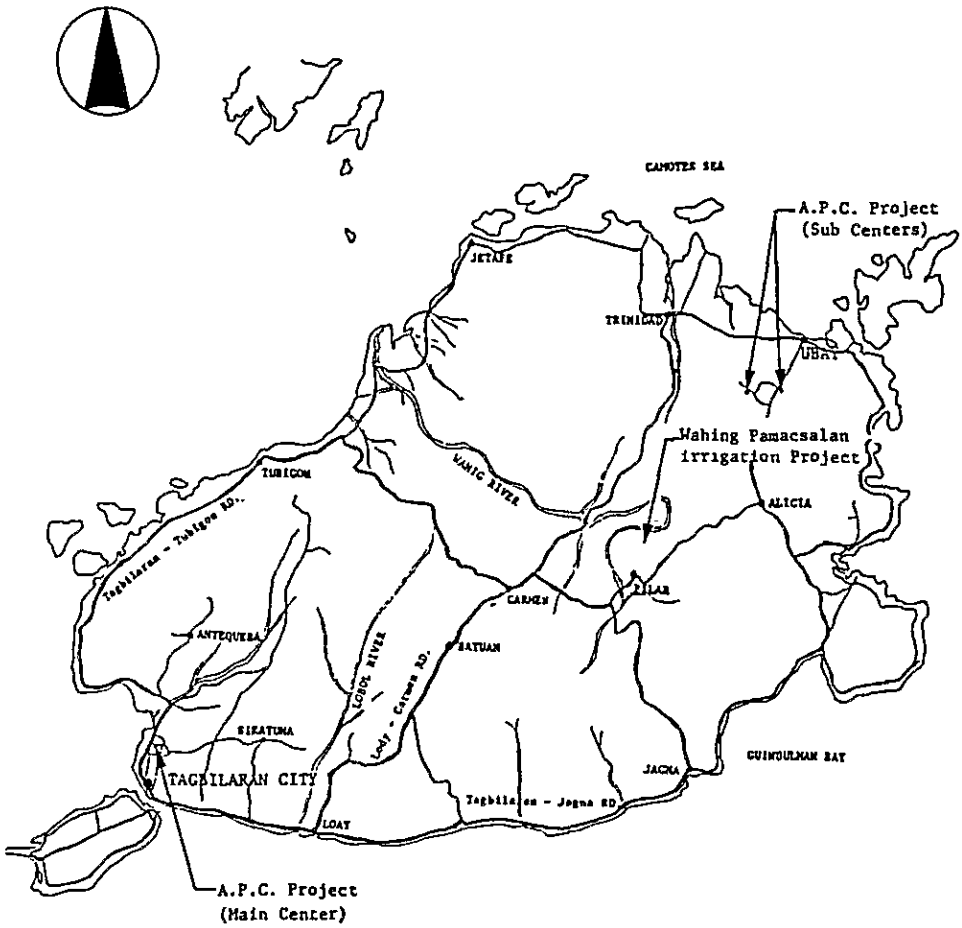
(4) Technical guidance and assistance by government agencies are conducted at high levels.

(5) A large place of consumption having Cebe as the center is located nearby.

(6) Places such as rivers which permit development of water resources are not equally located;

(7) and therefore uniform agriculture of large water consumption type is unsuitable.

Fig. 2-4-2 Project Location Map in Bohol



2-4. Bohol Integrated Area Development Project and Promotion of Agriculture

Agriculture is positioned as the most important industry in Bohol as is apparent in the description of the preceding section. However, favorable progress of agriculture is obstructed because establishment of relevant infrastructure is delayed and there are many problems in the extension of agricultural technology. Accordingly, the family income of residents of Region VII including Bohol is 5,172 pesos per year, which is considerably lower than the national average of 5,840 pesos per year (both figures are based on NEDA, 1982 year book). In order to improve such a situation NACIAD drew up a master plan for the BIADP under the technical assistance provided by the Government of Japan in March 1980 and established a division of BIADP in which director, deputy director, industry specialist, economist, social development planner, etc. were arranged. In this master plan, emphasis is laid on the development of agricultural department and in the development of infrastructure under such circumstances that main industries cannot be considered in Bohol other than agriculture and Philippines' second largest city Cebu, which is a large place of consumption of agricultural products, is located behind it.

This APC project, which aims at research and development of agricultural technology suitable for Bohol and elevation of skill of agricultural technicians, is particularly positioned as the undertaking having the highest priority with the Wahig Pamacsalan Irrigation Project.

For the Wahig-Pamacsalan Irrigation Project, engineering service was implemented in 1980 with the 8th yen loan, and now construction is in progress with the 11th yen loan of 1982.

Table 2-4-1 Priority of High Impact Projects

Priority	Sub-Sector	Project
AA - Highest Priority	Water Management	·Wahig Pamacsalan Irrigation
A - Top Priority	Agriculture	·Exploitation of Soil Technology and Establishment of Agro Promotion Center ·Wahig Pamacsalan Pilot Farm ·Research on Land Characteristics ·Promotion of Beef Cattle Production
	Fishery	·Cogtong Bay Fishery Processing Complex
	Mining and Manufacturing	·Technology Dev. for Small-scale Industries
	Water Management	·Cohayag Communal Irrigation ·Tagbilaran Waterworks ·Rural Water Supply
	Transportation	·Tagbilaran Port Improvement ·Tubigon Port Imprv. and Terminal ·Jagna Port Improvement
	Energy	·F/S on Alcogas Refinery Plant
	Public Health	·Strengthen Shistosomiasis Program ·Mobile Medical Service

(Source : Final report related to survey of master plan for the Bohol Integrated Area Development Project in the Republic of Philippines issued in February, 1980 by Japan International Cooperation Agency (JICA).)

CHAPTER 3. OUTLINE OF THE PROJECT

3-1. Purpose

The purpose of this project is to establish the APC and to make contribution to development and extension of technologies suitable for the area and to efficient implementation of relevant tests and studies in order to promote agriculture in Bohol as a part of the BIADP.

3-2. Contents of Activities

In the APC, the following activities are to be implemented:

i) Research activities for the purpose of improvement of agricultural technologies suitable for natural conditions of Bohol.

ii) Training activities for the agriculture technicians to elevate their skillfulness.

iii) Extension activities for spreading most updated agricultural technologies.

3-2-1. Research

Research activities are composed of the basic research section for seeking technologies suitable for the area, and applied research section for verifying and penetrating the technologies.

Basic researches will lay emphasis on the following points.

1) Research related to development of new effective technologies
2) Surveys and improvements related to analysis of special soils and microelements classified by area
3) Tie and joint researches together with other public agricultural organs

Applied researches will be conducted with emphasis laid on the following points.

1) Test of technologies which are considered effective and suitable under special conditions.

Table 3-2-1 Research Program

Items	Basic	Applied
Cereals	1. Fertilizer utilization 2. Trace element 3. Varietal study corn 4. Varietal study sorghum	1. Fertilizer utilization, rice 2. - " - corn 3. - " - sorghum 4. Compost trial 5. Fertilizer verification(rice) 6. Azolla 7. Pest & disease control, rice 8. - " - corn 9. - " - sorghum 10. Spacing & distancing 11. Multiple cropping, rice 12. - " - corn 13. Water management (rice) 14. Utilization/processing (corn)
Vegetables and Legumes	1. Varietal 2. Fertilizer Utilization & Nitrogen Fixation 3. Pests and Diseases Control 4. Pesticides Tolerance and Residues 5. Utilization/Processing	1. Adaptability 2. Fertilizer Verification & Trace Element 3. Pest and Disease Control 4. Organic Fertilizer 5. Relay Planting 6. Spacing/Distancing 7. Marketin 8. Utilization/Processing 9. Multiple Cropping
Fruits	1. Fertilization and Trace Element 2. Utilization/Processing	1. Pests and Disease Control 2. Intercropping 3. Pruning 4. Fertilizer Placement 5. Fertilization and Trace Element 6. Utilization/Processing
Beverages and Spices	1. Fertilization and Trace Element 2. Utilization/Processing	1. Fertilization and Trace Element 2. Utilization and Processing 3. Intercropping

Research Items	Basic	Applied
Root Crops	1. Fertilization and Trace Element 2. Varietal Trial	1. Fertilization and Trace Elements 2. System 3. Spacing 4. Weed Control 5. Disease Control 6. Time of Planting 7. Varietal Trial
Soils	1. Trace Element, Calcareous Soils 2. Toxicity (Acid Soils)	1. Zinc 1.1 Rice 1.2 Corn 1.3 Root Crops 2. Liming 1.1 Corn 1.2 Root Crops 1.3 Sorghum 1.4 Vegetables 3. Sulfur(Acidic Soils) - rice 4. Zinc (Rice) 5. Other trace elements (manganese, boron, etc) 6. Vegetative and Mechanical Erosion Control 7. Siltation on Water Impounding 8. Water Management 8.1 Rice 8.2 Corn 8.3 Legumes and Vegetables 9. Soil Improvement/Amendment /Conditioning 10. Organic Matter - Azolla, Compost and other plant residues
Livestock	1. Carabao (Water Buffalo) a. Breeding b. Feeding management 2. Cattle a. Deworming b. Nutrition c. Breeding 3. Goat a. Breeding (Upgrading) b. Nutrition	1. Nutrition 2. Feeding and Management 3. Pasture Improvement and Management 4. Breeding 5. Deworming

Table 3-2-2 No. of Researchers & Studies

Section	No. of Studies			No. of Researchers	
	Basic	Applied	Total	Basic	Applied
Gereals	4	14	18	2	3
Vegetables & Legumes	5	9	14	2	2
Fruits	2	6	8	1	2
Beverages & Spices	2	3	5	1	1
Root Crop	2	7	9	1	2
Soils	2	17	19	1	4
Livestock	7	5	12	3	2
Total	24	61	85	11	16

2) Confirmation of adaptability of improved technologies at test farms. Comparison of improved technologies with conventional methods.
3) Conduct of researches tied with other agriculture research agencies for effective conduct of tests and researches.
4) Conduct of tests and researches related to effective use of lands and labor force.

3-2-2. Training and Extension

The purpose of these activities is to back up agriculture technicians with materials for promotion of extension activities supplied, together with elevation of knowledge and skill of agriculture technicians. Activities for publicity of information related to agriculture are performed at the same time.

1) Method for training

The main objective persons of training are agricultural technicians who are practically in charge of local extension activities. As they can not be out of their office for many days, long-term training is not conducted in this complex. Accordingly, short-term training system to conduct intensive lectures and practices for a number of days is adopted. Further, it is possible to conduct middle-term training if circumstances permit. Implementation of technician upbringing program with freshmen who have just finished schools as the object may be considered in the future. As contents of training are extensive including upbringing of technicians, training of operations for personnel of relavant agricultural agencies and training of professional technologies for agricultural technical staff, trainees vary by the contents of training.

2) Persons to be trained

The following persons shown in Table 3-2-3 are included in the object of training with emphasis laid on penetration activities for spreading agricultural technologies to farmers in each area.

Table 3-2-3 Persons to be trained

Persons to be trained	No. of person
District Agriculture Officer (DAO)	9
Municipal Agriculture Officer (MAO)	50
Subject Matter Specialist (SMS)	8
Masagana-99 Technicians (M-99)	30
Maisan Technicians	30
Farmer Leaders	50
Farmers	50

Table 3-2-4 Demonstration Plots Program

Crop	No. of Instructor	No. of Demo.	Location Area (M^2)	Substance of Trial
Rice	2	128	500	Fertilizer and Varietal trial
Corn	2	73	500	Pesticide and spacing trials
Cassava	2	42	1,000	Fertilizer and varietal trials
Rice-based	2	40	500	Cropping Systems
Corn-based	2	20	500	Cropping Systems
Coconut-based	2	13	10,000	Cropping Systems
TOTAL	12	316	——	——

3) Trainers and lecturers

The personnel of research division (4 persons), training and extension division (5 persons) and administration division (6 persons) of the APC will also act as trainers for training agricultural technicians depending on the contents of training. However, there are cases where lecturers are invited from other agricultural agencies as required.

4) Contents of training

Training by themes of broad ranges is planned as a part of extension activities at this complex which aims at promotion of agriculture in Bohol. Re-educational lectures for supplementing the knowledge learned at school, agriculture in general, most updated technologies, method of extension and so forth are held for about 50 persons as a unit on these subjects. Titles of training courses scheduled for five years are shown in Table 3-2-5.

5) Training program

Agricultural officers of relevant agencies and technicians are mainly trained in the initial two-year period, and emphasis will be laid on farmer leaders in the third year and subsequent. Six courses are set as training items per year, and in the initial two-year period training of each course is conducted twice (training of one course only is made six times), and thus training of sixteen times is conducted in a year. As training of six courses is conducted six times each, training of 36 times is conducted in a year in the third year and subsequent.

6) Information activities

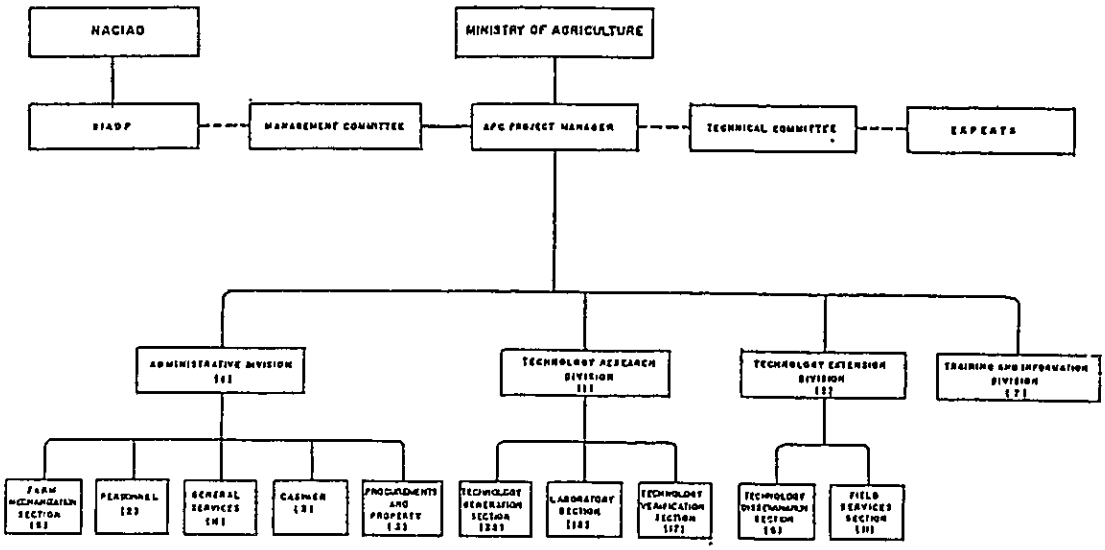
Activities for release of information on agriculture are conducted by issuing printed matters with agricultural technicians and farmers as the objects tighter with training activities conducted for the purpose of elevation of knowledge and skill of agricultural technicians. These activities are conducted in a close tie with relevant agencies located in Bohol.

Table 3-2-5 Training Program (5 years)

Year	Course Title	Duration (Days)	Frequency (per Year)	Target Trainee	No. of Trainee	No. of Instructor
1	Refresher course on extension education	4	2	DAO/MAO	57	5
	Subject matter specialist Orientation seminar	5	2	SMS/DAO	17	6
	Leadership and social technology training	4	2	MS/DAO/MAO	65	4
	Refresher course on recent advancement on rice production and extension	5	6	M-99 technicians	30	4
	Refresher course in livestock production	5	2	DAO/MAO technician	50	4
	Basis concepts in soil fertility	4	2	MAL technician.	50	4
2	Project management seminar	4	2	SMS/DAO/MAO	65	4
	Recent advancement on corn production and extension	5	6	Maisan technician	30	4
	Establishment/conducting applied research and demo. project	4	2	MAO/DAO	57	3
	Seminar-workshop on effective communication	3	2	DAO/MAO	57	3
	Farm planning & budgeting	2	2	MAO technician	50	3
	Plant propagation & distribution	4	6	Farmer leaders	50	3
3	Azolla culture/ utilization	3	6	Farmer leader	50	3
	Seed production, utilization and distribution	4	6	Farmer leaders	50	3
	Cassava and rootcrop production	3	6	Farmer leaders	50	4
	Plantation crops production	4	6	MAO/ technicians	50	5
	Cattle and goat fattening	4	6	Farmer leader	50	4
	Harvest & post harvest operation	3	6	Farmer leader	50	4

Year	Course Title	Duration (Days)	Frequency (per Year)	Target Trainee	No. of Trainee	No. of Instructor
4	Compost making & utilization	4	6	Farmer leader	50	3
	Fertilizer & fertilizer application	3	6	Farmer leader	50	3
	Farm marketing & financing	3	6	MAO technician	50	3
	Vegetable production	3	6	Farmer leader	50	3
	Pest & diseases of major crops and their control	3	6	MAO/ technician	50	4
	Cooperative development	5	6	DAO/MAO	50	3
5	Multiple cropping & upland crops	2	6	Farmer leaders	50	3
	Pest & diseases of livestock and their control	3	6	MAO/ technician	50	3
	Pasture management & devt.	3	6	Farmer	50	3
	Soil conservation & water management	3	6	Farmer leaders	50	3
	Legume production and utilization	4	6	MAO/ technicians	50	4
	Storing/processing of farm products	4	6	MAO/ technician	50	3

Fig. 3-3-1 APC Organizational Set-up



7) Demonstration Activities

Activities for extension of agricultural technologies to farmers in each area are mainly conducted by technicians. Activities are conducted by release of relevant information, and in addition, demonstration farms for exhibit are set up in cooperation with farmers and new technologies are directly introduced to these demonstration farms. The effects of new technologies are verified by comparing new methods of plantation with conventional methods of plantation.

It is planned to set up demonstration farms for exhibit at 316 places in total in a five-year period, and their details are planned as shown in Table 3-2-4.

3-3. Organization for Activities

The project manager appointed by the MA is in charge of generalization of conduct of this complex. Management committee and technical committee are established for assisting the project manager.

The management committee plans guidelines for conduct of the complex, and at the same time, makes adjustment with researches, training and extension activities conducted by other agricultural agencies. The director of BIADP acts as the chairman and the regional director of the MA acts as the vice-chairman. Other members of the committee are representatives from other agencies (PCARRD, MA, IRRI, VISCA, BAC, RIARS, RCPS, NFA, NIA).

The technical committee makes advice from the aspect of technology regarding research, training and extension activities of the complex. In particular, this committee plans the annual activity program. The chief officer of the Province Agricultural Office (PAO) acts as the chairman of this committee, and other members of the committee are chiefs of Crops, Livestock, Soils and Extension Sections of the MA of Bohol and Japanese specialists dispatched from Japan under technical cooperation.

Table 3-3-2 Staff Organization

Division	Section	No. of Personnel	Items
Administrative (25)	Director	1	
	Chief	1	
	Farm Mechanization	5	3-Tractor Ope., 2-Mechanician
	Personnel	2	
	General Services	11	3-Driver, 3-Guard, 5-Utility
	Cashier	2	1-Casher, 1-Asst.
	Precurements and - Property	3	2-Supply Procurement, 1-Preperty
	Sub-total	24	——
Technology Research (53)	Chief	1	
	Technology Generation	23	1-Chief, 11-Technical Staff 11-Research Aid
	Laboratory	12	4-Trace Element, 4-Lief Crop Fertilizer, 4-Chemical Analysis
	Technology Verification	17	1-Chief, 16-Supporting Staff
	Sub-total	53	——
Technology Extention (18)	Chief	1	
	Technology Dissemination	6	1-News Caster, 1-Scriptwritor 1-Clerk typist, 1-Draftman 1-Record clerk 1-Mimeographtor
	Field Services	11	10-Instructor, 1-Supervisor
	Sub-total	18	——
Training and Information (7)		7	1-Chief, 1-Typist, 1-Trainig Officer, 1-Asst. Officer, 1-Information, Officer, 1-Photographer, 1-AV Operator
Grand total		103	——

3-3-1. Organization of Activities

Four divisions are organized in this complex, which is under the control of the MA and is supported by Management Committee and Technical Committee, in order to execute its activities effectively and smoothly.

1) Technology Research Division

This division performs planning of subjects of researches and implementation of researches. Research activities are conducted with mutual adjustment made with other agencies (PCARRD, MA, IRRI, VISCA, BAC, RIARS, RCPS, NFA, NIA).

It is composed of three sections, that is, research, experiment and verification.

2) Training and Information Division

This division performs planning of training program for improvement of agriculture, and execution and adjustment of training. Training activities are conducted with ties maintained with other agencies (RTC, PTC-RD, FTC).

3) Technology Extension Division

This division is composed of extension section and field practice section. This division develops and promotes efficient methods for transmission of agricultural technologies.

4) Administrative Division

This division upkeeps and administrates the complex. It includes personnel, general, cashier, procurement and property and farm mechanization section.

3-3-2. Staff Arrangement Plan

With thorough functioning of activities of this complex and with scales of facilities and so forth taken into account, arrangement of staff shown in Table 3-3-2 is planned.
As for recruitment of these staff members, researchers and senior officers such as division managers will be dispatched from Region VII Agricultural Administration Bureau of the MA, and research assistants and so forth will be gathered out of fresh graduates from Bohol University and Bilar University.

3-4. Functions and Facilities

Functions of facilities in the APC are generally classified into technology research function, technology extension function, training and information function and administration and welfare function. It is important to establish facilities which are deeply rooted in the area as the base of integrated agricultural development of Bohol which provides harmony of contents of these different functions and which allows exhibition of multiplied effects of these functions.

1) Technology research function
The APC is positioned as the nucleus agency for integrated development of agricultural technology matched with the regional characteristics of Bohol. Eighty five subjects in total of basic researches and applied researches have already been planned for seven items, i.e., cereal, vegetables & legumes, fruits, beverage & spices, rootcrops, soils and livestock.
It is necessary to produce research facilities capable or making correspondence to diversified subjects of researches over a broad range as the only base of integrated agricultural researches in Bohol.

2) Technology training and extension function
Various training activities are planned at the APC for elevation of agricultural knowledge and technology of technicians and representatives of farmers. As various forms of training will occur depending on the combination of contents of training, trainees, method of training, materials used for training and so forth. Accordingly, it is necessary

to set up suitable facility scale and to sufficiently elevate effective use of facilities.

Establishment of as many as 316 model farms for demonstration in the province is planned in order to promote extension of agricultural technology to general farmers in Bohol. It is scheduled that activities for extension of soils, insecticide, method of cultivation and so forth will be implemented at these farms with crops of six kinds, i.e., rice, corn, cassava, rice-based, corn-based and coconut-based as objects. It is necessary that the APC comprises the function to generalize administration and conduct of these farms as the center for promotion of these models farm for demonstration.

3) Administration and welfare function

APC's functions can be integrated to two functions described above. But administration and welfare function is additionally required in order to allow smooth exhibition of these functions. The administration division includes general services, personnel, cashier, procurements and property, farm mechanization and so forth. The welfare service is composed of the canteen for the staff and trainees, lodging for experts, staff house for clerical liaison between the main center and the sub center and dormitory for agricultural technicians who come to the APC to be trained from many places of Bohol.

Facilities for three functions stated above are constituted by the main center and two sub centers, which are located at different places. The main center, which is the base for research activities and training and extension activities, is located in Dao that is close to Tagvilaran, the capital town of Bohol and is planned as the facilities which permit ties with other facilities related to agriculture. The sub centers, rice research sub center and livestock research sub center, for tests and research of rice cultivetion and livestock farming are to be located in Ubay, which is the rice farming area of Bohol rice farming can be secured.

Fig. 3-5-1 External Linkages of the APC

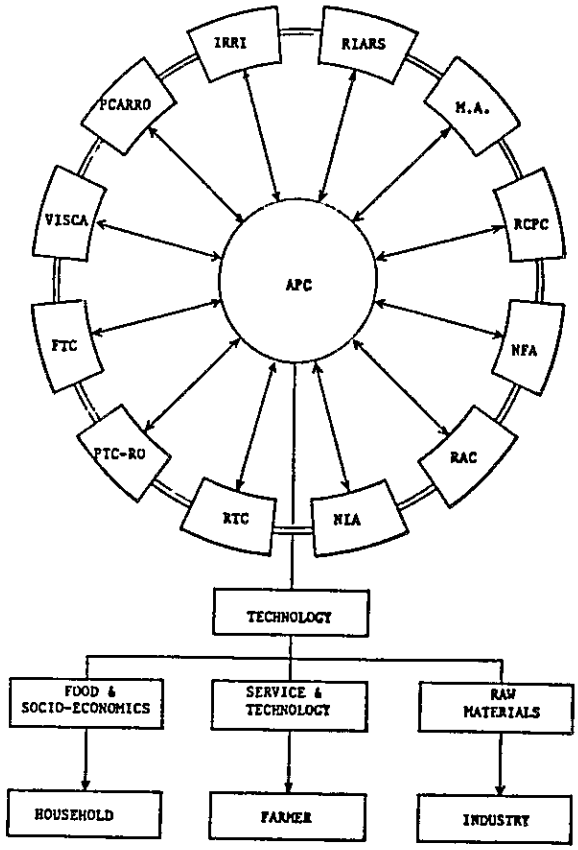
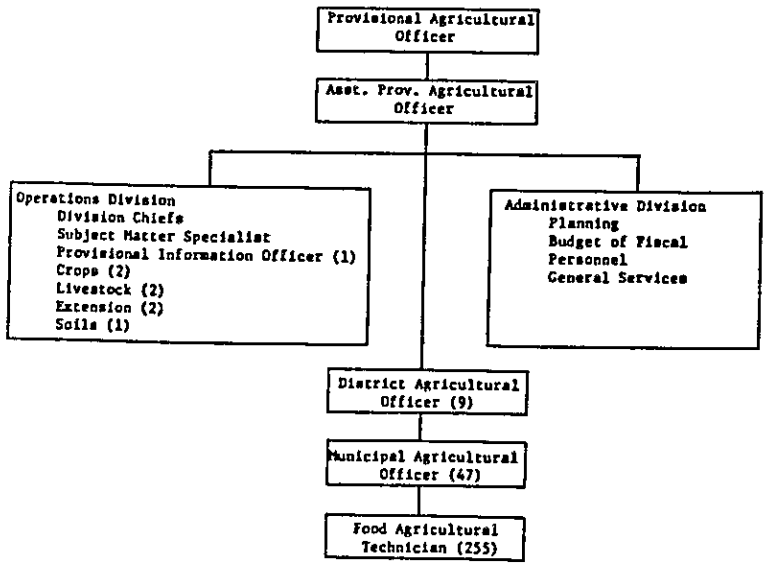


Fig. 3-5-3 Organization Chart of Ministry of Agriculture, Bohol



3-5. Related Agricultural Organizations in Bohol

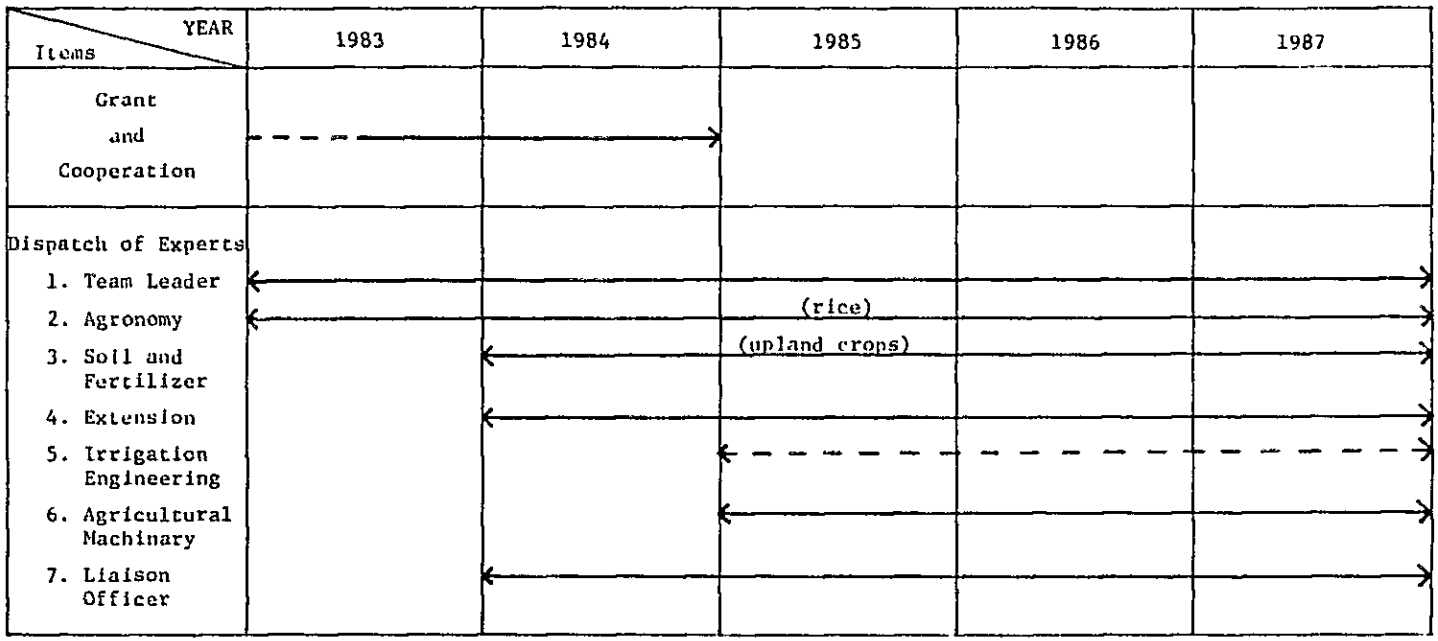
The APC will be operated mainly by both BIADP and MA and, if and when necessary, by collabration of twelve (12) related organizations as charted in Fig. 3-5-1.

The organic tie-up with such organizations is regarded as being indispensable to management and operation of the APC. The institutional facilities under the MA are the Soil Research Institute in Tagbilaran, and RIARS, Bohol Experimental Station and Ubay Stock Farm in the Ubai area. Furthermore, because of local agencies of both NIA and NFA existing in the city of Tagbilaran, this local condition can ensure close cooperation between those related organizations. It is also expected that both Bohol University and Bohol Agricultural College in Bilar will become closely coordinated, not only for research activities, but also for recruitment of eligible talents and experts.

Table 3-5-2 Related Agricultural Organizations in Bohol

Organization	No. of Branch Offices in Bohol	Location	No. of Staff	Activity
MA	9	Districts	225	Extension
RIARS	1	Ubay	5	Research
Bohol Exp't Station	2	Ubay	48	Research & Seed Production
Bohol Soil Conservation and Demo. Station	1	Ubay	5	Research
Ubay Stock Farm	1	Ubay	3	Research
Bohol Soil Lab.	1	Tagbilaran	NA	Research
NFA	1	Tagbilaran	NA	Marketing
NIA	NA	NA	NA	Irrigation

Table 3-6-1 Tentative Implementation Schedule



3-6. Technical Cooperation

The APC project has been planned and promoted from the beginning with provision of technical cooperation by the Government of Japan under project system, and Record of Discussion for the execution of technical cooperation was agreed between two countries in January, 1982.

The purpose of this technical cooperation is to conduct research and test of cultivation of crops and training of agricultural technicians for developing agriculture as a part of the BIADP.

The detailed contents of technical cooperation will be examined at the time of deliberation of implementation related to technical cooperation, but the following items can be considered as the contents of cooperation.

1) Dispatch of experts

Dispatch of several long-term experts and some short-term experts as required is scheduled with cultivation of irrigated rice as the nucleus.

2) Acceptance of counterparts to Japan

Counterparts required before and after completion of the facilities will be accepted every year, and required training will be conducted in Japan.

3) Supply of equipment

Equipment which are judged as required for activities will be supplied on the technical cooperation basis.

4) Experimental farms

Consolidation of infrastructure for opening experimental farms of suitable scales on necessary grounds is scheduled.

CHAPTER 4. OUTLINE OF PROJECT SITE

4-1. Site Location

Facilities of the APC are composed of the main center and two sub centers. The main center, which is to assume the majority of activities of the APC, is located in suburbs spaced apart in northeast direction by about 2 km from Tagbilaran, capital town of the province. A land of about 8.4 ha facing national route 335 that connects Tagbilaran and Dao has been secured. Many facilities such as province offices of the MA and of the Ministry of Public Works and Highways (MPWH), NIA office, soil test institute, provincial hall and civil engineering and construction office are located in the vicinity of the project site so that the main center is very conveniently located for linkage with relevant agencies.

The sites of sub centers for rice research and livestock research farming are scheduled in Ubay, which is the rice plantation area of Bohol, located at a point of about 130 km in northeast direction by land from Tagbilaran. The scheduled site of the rice research sub center is located nearby the Bohol Experimental Farm under the control of Region VII Agricultural Administration Bureau of the MA, and administration office, seed storage, fertilizer storage, machinery building, elevated water tank and so forth are available as existing facilities. The site of the livestock research sub center is scheduled nearby the existing Stock Farm under the control of Region VII Agricultural Administration Bureau, and administration office, staff lodging, machinery building, feed warehouse, elevated water tank and so forth are available as existing facilities.

4-2. Climatic and Geological Conditions

In Bohol there is no clear distinction between rainy season and dry season. Precipitation is relatively small (annual precipitation 1,430 mm), the monthly precipitation is around 200 mm even in a month of relatively frequent rainfalls, and monthly distribution of rainfall is comparatively equal. (Refer to Table 4-2-1)
Many of typhoons are of the extent of tropical atmospheric pressure before expansion of the power. About 60% of typhoons which hit this province are concentrated to August-October period. Almost all typhoons pass through the middle and north parts of the Philippines, and there are rare cases where Bohol is hit by typhoons.
As the province is of high temperature and high humidity of annual mean atmospheric temperature 27.4°C and annual mean humidity of 84%, well ventilated space composition is favorable.

The lands in the vicinity of Tagbilaran is composed of Maribojoc limestone of Oligocene, Tertiary period through Diluvium, Quarternary period and Carmen formation of middle through end of Oligocene, Tertiary period. At the proposed site of the main center, bedrock (porous weathered limestone) is located under the surface soil of thickness 0 - 170 cm as a result of test pits. (Refer to Table 4-2-2)

Table 4-2-1 CLIMATE CONDITIONS

Satation: Tagbilaran
Lat: 09°36.6'
long: 123°51.3'
Date: 1981

Item	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Maximum Temperature (°C)	29.7	30.9	33.1	33.8	33.2	33.3	32.6	33.2	32.5	32.0	31.8	31.3
Minimum Temperature (C°)	22.3	21.5	22.2	23.2	24.3	25.2	24.1	24.9	24.1	23.6	23.2	22.4
Mean Temperature (C°)	26.0	26.2	27.7	28.5	28.8	29.2	28.3	29.1	28.3	27.8	27.5	26.9
Mean Rel. Humidity	84	82	75	74	25	76	80	24	82	85	86	88
Rainfall (mm)	110.1	82.3	7.2	11.1	90.5	64.0	49.2	57.2	188.5	174.7	183.0	184.9
Average Wind Velocity (knots)	3	3	3	3	1	2	2	3	2	2	2	3
Prevailing Wind Direction	N	N	N	N	SSE	VAR	SSE	SSW	VAR	NNE	VAR	N

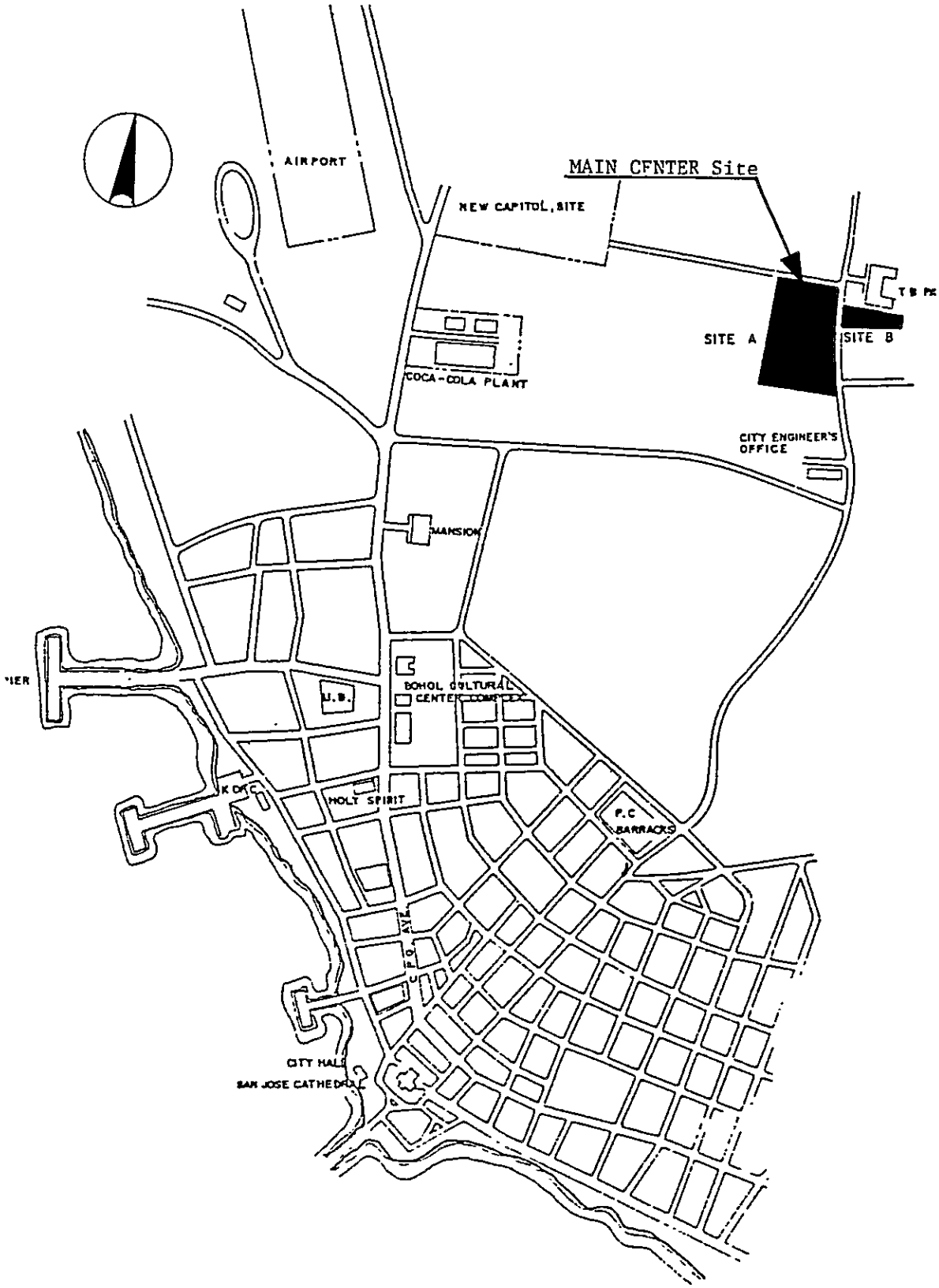


Fig. 4-1-1 TAGBILARAN CITY 1 : 15,000

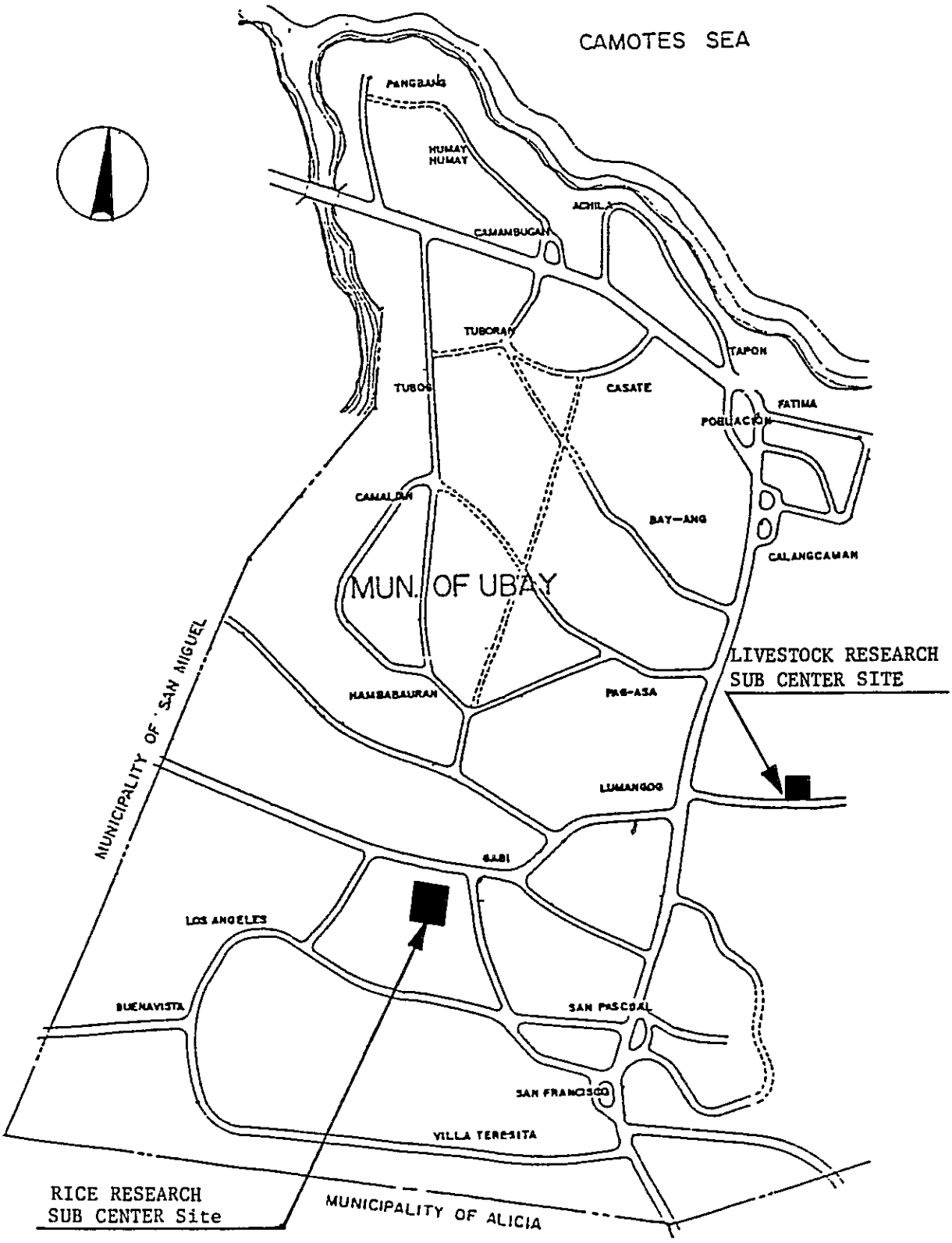
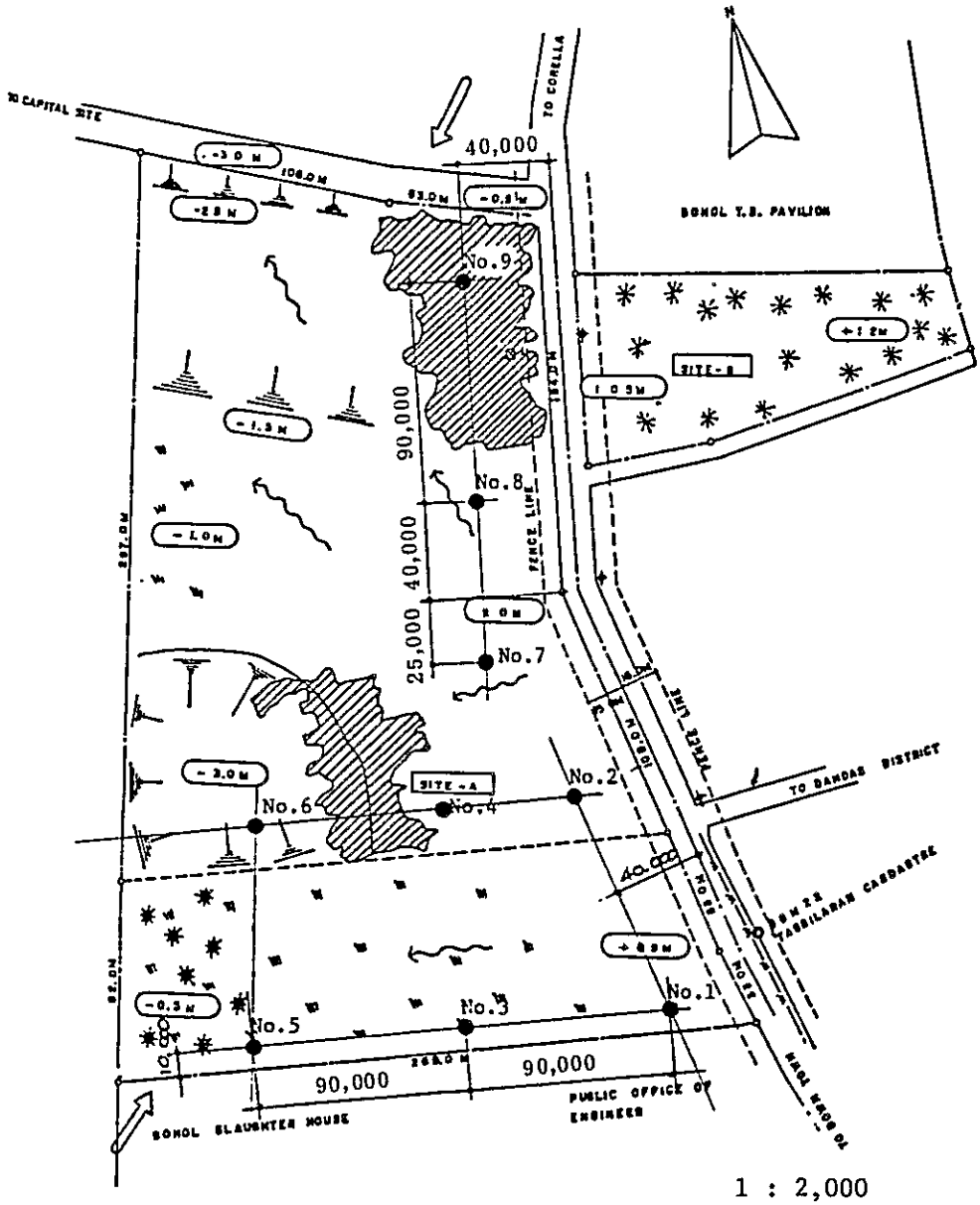


Fig. 4-1-2 MUNICIPALITY OF UBAY 1 : 75,000

Fig. 4-2-2 LOCATION OF TEST PIT



No. of Test Pit	1	2	3	4	5	6	7	8	9
Depth of Hard Rock(M)	0.1-0.5	0.1-1.0	0-0.7	1.0	0-0.4	1.6	1.3	1.7	1.0

4-3. Situation of Infrastructure

4-3-1. Main Center

Electric power of 240V, 60Hz is supplied along national route 335 by Bohol Provincial Electric System. However, it often involves power failure and voltage drop and supply is not stable. Accordingly, measures such as provision of standby generators are required for the equipment which always require electric power for their functions.

Water is supplied through a 6" hume pipe buried along national route 335 by Provincial Water Works System. As a result of a pumping test conducted at a test well in the site (casing diameter 5 inches, depth 195 feet), it was found that it is possible to secure well water of about 160 tons per day.

But care should be exercised not to excessively use well water when such situation of Bohol that there is a limit in the security of suitable water for general use is taken into account.

There is a shallow drain ditch running along the national road 335, the size of which is not big enough to flow rain water thoroughly. Care must be exercised for the design of drainage system of rain water, taking into consideration the ground condition that the entire site has a gradient toward the north. For drainage of sewage, it is necessary to provide a septic tank in the grounds.

As for gas supply, it is possible to obtain LPG cylinder.

4-3-2. Sub Center

It is scheduled that a power line of 240V 60Hz is brought into the site of the rice research sub center through the Bohol Experimental Farm from the national road in the near future, although the present situation is such that power is supplied at night time only by non-utility generation in the Farm. A well is existing in the Farm and a water line of 1 1/2" is laid for water supply from the existing elevated water tank. It is available for the rice research sub center. Sanitary sewage requires treatment by a septic tank.

The ground nearby the Ubay Stock Farm scheduled as the site of the livestock research sub center is almost of identical situation. Although supply of power is made using portable type non-utility generators at necessary places only, it is scheduled that a power line will be brought into the ground in the near future. A well is existing in the Farm and water may be supplied from the existing elevated water tank in the Farm, pumping of well water is manually performed at the present time due to pump failure. It is necessary that sanitary sewage is treated by means of a septic tank.

4-4. Circumstances of Construction

Little construction materials are available in Bohol, and the only locally available material is aggregate (sand, gravel, crushed stone) for concrete. All of other construction materials are brought in from Manila, Cebu Island, Mindanao Island and so forth. Unit prices of materials, therefore, are higher by the cost of marine transportation and troubles required for loading, unloading and so forth.

General workers can be gathered by a large number, but there are no skilled workers at all in Bohol. All of skilled workers should be brought from Manila and Cebu Island.

Constructors located in Bohol are only up to Class B capital of company is less than five million pesos, and many of them also operate jobs of other categories of business. Although dump trucks, bulldozers, motor-operated concrete mixers, concrete block manufacturing machines and so forth are available, there is a limit in their quantity. There are more than twenty Class A constructors company capital is five million pesos or more on Cebu Island.

Constructors of top class in particular have almost all kinds of necessary construction machineries. Construction machinery leasing companies are also available. There are no high-rise buildings at all, and the majority of buildings are of one to three-storied in Tagbilaran. Many buildings of reinforced concrete frameworks with walls made of concrete blocks and roofs made of corrugated iron sheet are often observed.

CHAPTER 5. EVALUATION AND EXAMINATION OF PRELIMINARY DESIGN

5-1. Bases for Evaluation

A preliminary design survey was conducted in June, 1981 and facilities planning along with contents of activities which was planned at that time was made. (Refer to Philippine Bohol Agricultural Development Preliminary Design Survey Report - JICA September, 1981)
Suitable basic design should be established by making evaluation and examination of the existing preliminary design based on the contents of activities which were submitted there after by the Government of the Philippines and confirmed in the basic design study of this time.
For evaluation and examination, emphasis will be laid on functionality, economy and durability based on the natural features and tradition of Bohol as well as social realities.

"Functionality" Suitable scale matched with contents of activities
It is important that facilities composition is such that the scale of facilities is well balanced with respect to contents of activities without excess or shortage wholely and also partially.
Accordingly, whether room composition and scale planning matched with personnel plan has been made or not is examined.
Furthermore, techniques such as mutually shared use of facilities and so forth among divisions will be seeked in order to provide facilities of higher functionality through elevation of degree of effective use of facilities.

"Economy" Reduction of construction expenses and running cost
Materials and construction methods matched with local conditions should be adopted for reducing construction expenses. Further, care should be exercised so that contents of facilities are not excessive compared to realities of the area for reducing the running cost. Accordingly, comparison is made with similar facilities in the Philippines.
It is examined whether facilities grades are suitably selected or not and whether contents of facilities and contents of equipment are matched with the grade or not.

"Durability" Easy maintenance

Consideration should be made to permit easy maintenance of facilities in both technical aspect and economical aspect for upkeeping and managing facilities for a long period of time. Accordingly, materials with sufficient durability which have been used for a long time in the area are positively adopted, and if construction methods permit easy replacement of building components is examined.

5-2. Evaluation and Examination of Preliminary Design

According to the preliminary design survey report, training of technicians and officers of government agencies is mainly conducted at the main center. In addition, it is planned to provide a simple test farm at the main center for conduct of introduction of suitable species, seizure and exhibit of relationship between typical soils and growth of plants, as well as practical researches related to improvement of cultivation technology. Principal facilities for the main center are composed of a series of buildings comprising research, lecture and administration building as nucleus facilities, cafeteria building, farm related facilities such as workshop, machinery room, storage and so forth as well as lodging facilities such as expert house, guest house and dormitory.

The sub center, on the other hand, is planned to be composed of two buildings, i.e, lecture house and guest house as facilities to become the nucleus for concrete field experiments and for extension of technology to farmers in the neighborhood, with organic relations maintained with existing research facilities.

However, as a result of discussions and confirmations with the Philippine side of roles of the main center and of the sub center at the time of the survey, it was determined to assume the function of extension activities, which was originally considered as a function of the sub center, belongs to the main center and to assume the function of rice research and livestock research, which was planned as a function of the main center, is included in two sub centers. Evaluation and examination for the sub center are not made in this chapter as the function and contents of activities were changed and it is necessary to reconsider new facilities planning.

5-2-1. Building Layout

Limestone is the bedrock in the grounds of the main center, and many limestones are exposed on the ground surface at a part of the grounds, particularly in the southern part of the grounds. It is therefore logical to plan the southern part of the grounds for construction of facilities and to use the northern part as the farm. Access road is provided on the east side of the grounds along which national route 335 is running. If this ground on the east side of the road is used for lodging facilities, it will become possible to separate lodging from working facilities with daily life of the staff taken into account. However, it is unavoidable that this ground on the east side of the road is planned as the ground for farm because a sanatorium is located adjacent to this ground on the north side. Accordingly, arrangement of facilities and farm in the ground indicated in the preliminary design is considered suitable.

5-2-2. Facility Arrangement

The main center is of such a plan that principal divisions of the APC are accommodated with research and administration building and lecture building as the nucleus. In other words, the majority of activities of technology research division, technology extension division, training and information division and administration division are conducted in these two buildings. As a result of examination on the scale of each room is accordance with the contents of activities of the APC, it turned out that each room had pretty big spaces compared to the suitable space and could be reduced to pretty extent. In the plan of basic design, all rooms of the lecture building will be arranged into the research and administration building to obtain close linkage among divisions.

As for the composition of workshop, machinery house, drying and milling house, storage, etc., it seems to be more rational and adequate if those houses are concentrated into one building by taking into consideration the scale and function of each house.

Guest house is planned to be used for the visitors mainly from Manila and Cebu. However, as this APC has two sub centers which are to be established in Ubay, about 130 Km far from the location of the main center, it seems to be more effective and convinient to provide liaison

office, which is also available as accomodation facility for the visitor, for the mutual liaison activity between main center and sub centers as main purpose.

Dormitory is composed of combination, single bed rooms and multi-bed rooms. However it can be unified to one type, multi-bed rooms only, as this facility seldom accomodates persons (trainee) of different levels at the same time. Liaison office can be connected to dormitory building in order to make facility maintenance simple.

It will be desired to separate experts' houses each other in order to keep privacy of respective family.

As main facilities are of center corridor type, care must be taken into consideration to aim at creation of facilities of high living comfort at low running costs with excessive mechanical equipment eliminated by considering partial employment of one-side corridor system or alike, for instance.

5-2-3. Scale of Facilities

For setup of scale and composition of each room in the main center, it is necessary to examine the preliminary design in accordance with the contents of activities to be conducted in each room and personnel arrangement program.

Setup of compact laboratories which are capable of making correspondence to diversified subjects and are of high effective utilization rate without excess is required from the contents of researches to be conducted at the main center.

The realities of research systems in the Philippines are different from those in Japan, and researchers are not experimentalists. As laboratories are always used by experimentalists it is necessary to secure a space that permits provision of desks for experimentalists and so forth, but each laboratory equipment may be freely used by any researcher, and it is possible to elevate the effective utilization rate of laboratories. It was confirmed that necessary and sufficient research activities could be conducted if the following four laboratories were provided.

Table 5-2-1 Examination of Scales of main rooms

Department	Required Rm.	Criteria for Calculation	User	Capacity (persons)	Required floor Space(M^2)	Floor Space in Preliminary Design (M^2)	Planned Floor Space(M^2)	Remarks
Research	1.Laboratory	Set up in correspondence to contents of experiments	Laboratory	12	300	720	293	Number of rooms was reduced to 4 from 8.
	2.Lab. Office	3 M^2/person	Lab. section and a part of supporting staff	40	120	72	148	
	3.Research Office	5.5 M^2/person	Technical staff and a part of supporting staff	18	99	180	100	Also used by Japanese specialists.
	4.Photo Lab.	Set up in correspondence to equpment to be used	Lab. section, photographers,etc.	-	20	25	23	
Extension & Training	5.Extension and Training Office	5 M^2/person	Extension Chief. Technology Dissemination, Training and Information	14	56-84	(216)	75	Commonly used with Training Division
	6.Lecture Rm.	1.5 M^2/person	Technicians and farmer leaders	65	97	140	150	It is used by multiple departments.
	7.A-V Rm.	1.5 M^2/person	ditto	65	100	110	125	
	8.Printing Rm.	Set up in correspondence to equipment to be used	Staff for Training and Information	-	10	15	14	
	9.Office	4 M^2/person	Farm Mech. Field Service	16	64	293	68	
Administration & Welfare	10.Administrative Office	5 M^2/person	Administration Chief, Personal, Casher, Procurement	8	40	(216)	50	
	11.Library	1 M^2/100 Books	Staff of APC	-	-	28	55	
	12.Meeting Rm.	1.5 M^2/person	APC staff and outsiders	10	15	92	28	
	13.Canteen	1.5 M^2/person	Staff of APC	80	120	63	150	Considered as assuming
	14.Experts' House	100 M^2/family	for Experts	4families	400	719	400	
	15.Laison Office	35 M^2/person	for Sub-Center Staff	6	310	402	240	Canteen is used for dinning.
	16.Dormitory	12 M^2/person	for outsiders	42	504	938	578	ditto

1) Rice laboratory
2) Upland crop laboratory
3) Soil and fertilizer laboratory
4) Agriculture mechanization and irrigation laboratory

Accordingly, although eight rooms were assumed for research division in the preliminary design, the design is changed to four rooms of single-storied building composition.

As for rooms for general administration and clerical works, space composition of large room type is more rational for making effective space utilization.

If rooms related to clerical works of various divisions are combined to a single room, it is possible to organically link functions of all divisions. It is therefore necessary to consider suitable integration of office spaces.

As for the training department, planning was made with short-term training of four to five days as the nucleus, and the number of days of training per year has been planned as 74 days, 74 days, 126 days, 126 days and 114 days respectively in the coming five years. As training will be of short-term intensive type and it is considered that overlap of training dates must be avoided for some lecturers will engage in both research and training activity, it is rational to basically set up minimum number of training rooms. However, it is necessary to make consideration to permit use of the lecture room for multiple purposes other than training by providing a space that permits holding of film shows and assemblies. The utilization rate of the lecture room is rather row, as it is a little less than 30% in the first and second year and a little less than 50% in the third year and subsequent. However, it is possible to secure a utilization rate of around 60%, as the lecture room will be used for multiple purposes other than training and it will also be used as a place for meetings for communication with facilities related to agriculture.

Furthermore, examination of suitable scale of each one of main rooms is made in the Table 5-2-1.

5-2-4. Structure Plan

Assignment of column spans in the span direction is determined by the application and functions of the building, material strength, economy and so forth. As for column span in ridge direction, it is desirable that the basic module is set up and assignment is made by its multiple. When functions, economy and so forth are taken into account, the basic module of 5 m which is planned in the preliminary design is a suitable column span. The floor height of each building is determined from the application and functions of each room. Floor height of 6.0 m for practice building, storage for farm materials, machinery house, milling and drying room and so forth is considerably higher than values which satisfy dimensions, functions and so forth of machinery to be used.

Such a system of structure that reinforced concrete is used for columns and beams and concrete blocks are used for partitioning is suitable for situations of construction in the area.

5-2-5. Plumbing and Electrical System

1) Water Supply, drainage and sanitary plan

Water supply is made by making use of wells. It is considered that the requirement is 25 m^3/day at the main center, but this figure should be replanned as matched with the personnel arrangement and contents of activities at facilities. In general, it is considered that requirement of water supply is larger than the values indicated above. Although it is planned in the preliminary design that drainage is made through discharge to the side ditch of the road, the existing side ditch is what was provided without timbering and is small, and it is considered inappropriate for discharge. It is necessary to plan another means such as penetration drainage system.

2) Electrical equipment plan

Standby generator is planned for facilities which require measures against power failure. That is, total load capacity of 1,500KVA and generator load of 600KVA are assumed at the main center. If all loads are reviewed, however, it is considered that the full load capacity will drop to a level of 600KVA or less. As for generator load, a level of around 100KVA is sufficient if use of generator is limited to research equipment and pumps related to infrastructure which should be continuously used.

CHAPTER 6. BASIC DESIGN

6-1. Policies for Basic Design

Evaluation and examination of the preliminary design were made in the preceding chapter with emphasis laid on functionality, economy and durability of facilities. In this chapter, based on the evaluation and examination of the preliminary design, suitable basic design is drawn up by making itemized examination for formation of facilities matched with functions and contents of activities of the APC clarified as a result of the survey for basic design.

6-2. Building Layout Plan

Under the weather conditions specific to a southern country, it is desirable to adopt such a method that the long axis of each building is laid in east-west direction and sunlight is provided on south and north faces. It is because such a method is considered to be a very rational arrangement for effectively introducing the wind, which blows in south-north direction into building. Strong direct sunlight can be easily shielded by means of eaves or alike of short depths, although there may be minor differences in the direction. Therefore, in the case where the long axis of a building can not be located in east-west direction, it is necessary to consider a construction technique that avoids direct sunlight in east and west directions of small angles of elevation into principal rooms.

Many limestones appear on the ground surface at the site of the main center. There are many exposed rocks particularly in the southern part of the grounds and this part is not suitable for the farm. Accordingly, if necessary farm land is secured in the northern part of site in which rocks are minor, it is reasonable that buildings are laid in a group in the southern part of the site. It may not be possible to lay the long axes of all buildings in east-west direction. In that case, consideration is made not to cause principal rooms to face the west side and to install sun shading equipment of vertical louver type under unavoidable circumstances.

The research and training building, which is the main office building of the APC, is located in front to permit direct approach from national route 335. The canteen building and office building for field trials are located adjacent to this building to constitute the main block. Furthermore, liaison office and dormitory, four experts' houses are located on the east side of the site to separate living space from the working space. Experimental farm are arranged in the center and northern part of the site and in the isolated site on the east side of the national road.

The rice research sub center is provided by the ground of the existing Bohol Experimental Farm located in Ubay. Research building is located close to existing facilities of the Farm for accomplishing an organic tie with them. Convenience of water supply is also good because of being close to the elevated water tank.

The livestock research sub center is provided by the existing Stock Farm in Ubay. Ups and downs of the ground are large in the existing stock farm and suitable places are minor, but research building is to be located near existing facilities of the Farm for establishing an organic tie with other facilities.

6-3. Facilities Plan

6-3-1. Main Center

1) Research and training building

This is the central facilities for implementing the majority of nucleus functions of the APC activities including technology research division, technology extension division, training and information division and administration division. The building is composed of angle shape, that is, front wing and north wing. The front wing contains rooms of research division (research rooms), extension division (office), training and information division (office, lecture room, audio-visual room, printing room, etc.) and administration division (office, library, meeting room, broadcasting room, superintendent's room, etc.), and the north wing contains rooms of research division (laboratories, laboratory office, photographing room, etc.). Consideration is made so that Japanese experts use a research room same as the room of their counterparts for permitting smooth human intercourse. For the lecture room a sufficient marginal space that permits use as a multi-purpose room for film shows and gatherings is secured in addition to training of about 60 trainees.

2) Canteen

The canteen is capable of holding about 80 persons in two turns with the APC staff and trainees as the object. Planning is made with self-service system taken into account.

This building will be connected to the research and training building through connecting corridors with covers for organic linkage along buildings.

3) Office for field trials

Different rooms (workshop, machine room, drying, milling, storage, etc.) are provided in one building in accordance with the purpose of use for effective utilization of maintenance and control of farm activity. Green house is planned besides the above.

4) Experts' houses

Four houses, each for a family of 5 to 6 persons, are planned. They are aligned separate each other in order to keep privacy of dwellers.

5) Liaison office and dormitory

Seven bed rooms for 6 persons each will be provided for permitting accommodation of 42 persons in total for trainees who come from various places of Bohol. Canteen, stated above, is to be used for dining service.

Liaison office which will provide 2 bed rooms for 2 persons, and 2 single bed, is used for communication with the sub center, by the staff of the sub center and the stock farm located in Ubay, who come to the main center for liaison or as lecturers. It may also be used by external lecturers invited from outside of Bohol.

6-3-2. Rice Research Sub Center

1) Research house

The research house to be used mainly for researches of rice cultivation will be composed of research office working room, laboratory, meeting room, etc. Fertilizer storage, unhulled rice storage, dry house, etc. are provided on the side opposite to the machinery shop and workshop, for avoiding influence of dust and odor over the research department. The machinery shop and workshop provides a space that permits servicing and inspection of farm machinery.

2) Liaison house

The liaison house is the facility that permits accommodation of those who visit the sub center for a short period. Two bed rooms are provided for accommodation of three persons.

6-3-3. Livestock Research Sub Center

With research and test of livestock farming as the objective, the research house is composed research office, laboratory, workshop (one of them is used as anatomizing room) and meeting room. This sub center is conducted by resident staff.

6-4. Scale of Facilities

Scale of each facility is established as follows.

A) Main-Center

1) Research & Training BLDG.

		Floor Area (M^2) for basic design	Shown in the preliminary Design
Administrative Office	(8 persons)	50	(216)
Director's Rm.	(1 person)	35	60
Senior Staff Rm.	(1 person)	35	60
Printing Rm.		14	15
Meeting Rm.	(1 Rm.)	28	92
Library		55	28
Extension Training Office	(14 persons)	75	(216)
Research Office	(18 persons)	100	180
Agricultural Mech. and Irrigation Lab.		45	
Rice and Upland Crop Lab.		135	720
Crop Protection Lab.		45	
Soil and Fertilizer Lab.		68	
Drying Rm.		23	-
Analysis Rm.		23	-
Fume Hood Rm.		23	-
Photo Lab.		23	25
Stock Rm.		18	-
Lecture Rm.	(75-100 persons)	150	140
Audio-Visual Rm.	(50-80 persons)	125	110
Lab. Office	(40 persons)	148	72
Others (corridor, etc.)		893	1,468
	Sub-Total	2,111 (M^2)	3,186(M^2)

2) Canteen

Canteen	(80-100 persons)	150	63
Kitchen		25	21
Others (STG. etc.)		55	-
	Sub-Total	230(M^2)	84(M^2)

3) Office for Field Trials

Office	(16 persons)	68	293
Elec. Rm.		25	45
Locker Rm.		18	13
Milling Rm.		75	180
Drying Rm.		75	270
Machinery and Workshop		200	590
Storage for Farm Materials		100	360
Others (corridor, etc.)		227	229
	Sub-Total	788 (M^2)	1,980 (M^2)

4) Green House	(1 BLDG.)	72(M^2)	216(M^2)
5) Parking		-	240(M^2)
6) Covered Way		25(M^2)	198(M^2)
7) Liaison Office and Dormitory	(48 persons)	818(M^2)	1,341(M^2)
8) Experts' House	(4 Houses)	400(M^2)	719(M^2)
Main Center (1)-(8) Total		4,444(M^2)	7,964(M^2)

B) Rice Research Sub-Center

9) Research BLDG.			
Research Office	(7-12 persons)	36	-
Meeting Rm.	(1 Rm.)	45	-
Laboratory		45	-
Working Rm.		58	-
Machinery and Work Shop		240	-
Others (corridor, etc.)		156	-
		580(M^2)	(684(M^2))
10) Liaison House		120(M^2)	402(M^2)
Rice Research Sub-Center (9)-(10) Total		700(M^2)	1,086(M^2)

C) Livestock Research Sub-Center

11) Research BLDG.			
Research Office	(7 persons)	33	-
Meeting Rm.	(10-20 persons)	33	-
Laboratory		84	-
Lab. Office-1	(6 persons)	21	-
Lab. Office-2	(2 persons)	21	-
Work Shop	(2 Rm.)	126	-
Others (corridor, etc.)		267	-
Livestock Research Sub-Center Total		585(M^2)	-
Grand Total (1)-(11)		5,729(M^2)	9,050(M^2)

For implementation. however. minor changes may be required upon examination of scales in detail.

6-5. Building Element Plan

Weather conditions and interior environment conditions of the area are large factors for decision of building elements. In Bohol in which solar radiation, ventilation and rainfall extent major influence over buildings, the technique for suitably treated these factors is important for element planning.

1) Roof

The roof of building is strongly affected by solar radiation. Therefore, it requires waterproofing that withstands strong solar radiation and violent rainfall for a long period of time. For preventing transmission of radiant heat to the interior, provision of a heat insulation layer between roof surface and interior and security of sufficient ventilation are effective for maintaining the interior temperature at a suitable level.

2) Outside walls

Outside walls are also largely affected by solar radiation. It is necessary to take measures for avoiding solar radiation by provision of eaves or louvers besides use of materials largely resistive to heat transmission. Openings which are effective for ventilation will be suitably provided in outside walls for introducing seasonal wind which is available throughout the year into the interior, for making natural ventilation as the main means of ventilation.

3) Floor level

Sufficient consideration is required for setup of the floor level in order to avoid flooding of buildings at occasions of localized torrential downpour during the rainy season.

6-6. Construction Material Plan

Each building will basically be of reinforced concrete structure. Roof will be covered by galvanized iron sheet or corrugated asbestos cement sheet, which is matched with natural conditions of the area, and light gauge steel or timber truss will be used for the roof truss. Use of concrete blocks finished with mortar and paint is the popularly used method for outside walls and it is also favorable from the standpoint of construction cost.

Color mortar and washed aggregate finish can be used for the floor. Use of PVC sheets can also be considered for some rooms.

Use of materials and construction techniques which are fixed in the area is considered to leads cost reduction and extension of durability of buildings as a whole. However, because of the limit in the construction period it may be necessary to bring equipment, materials, reinforcing bars and so forth from Japan. Moreover it is necessary to select materials that permit easy maintenance.

6-7. Structure Plan

6-7-1. Background of the Plan

The Philippines belongs to the Pan-Pacific Earthquake Zone and occurrence of earthquakes is recorded in the vicinity of the scheduled site of construction. Accordingly, it is necessary to take aseismatic design into account for the structure design of the APC.

Scales of typhoons are relatively small and the frequency of arrival of typhoons is small. But wind pressure is taken into consideration based on the design guideline.

A bedrock (weathered limestone) is located underneath the surface soil of thickness 0 - 170 cm in the grounds of the main center. This bedrock does not make stratification, it is porous and is of very irregular form. Therefore, care should be exercised in the design of the foundation.

6-7-2. Structure Design

Laws and regulations which should be satisfied in the structure design include Building Standards Act, Architects Law, National Structural Code, etc. As it specifies various matters in details to a considerable extent, structure design is made mainly in correspondence to this code.

1) Dead load

Weights of structural materials, finishing materials and fixed equipment in the building are calculated.

2) Live load

The following values are used in accordance with National Structural Code as the live loads to work onto floors of the following rooms.

Room	Movable Weight Pa (Kg/m^2)
Research room	2,400 (245)
Office	2,400 (245)
Laboratory	2,900 (296)
Training room	2,900 (296)
Living room	1,900 (294)

3) Wind pressure

According to National Structural Code, the scheduled site of construction belongs to wind area II, in which wind velocity of 175 km/h (48.6 m/sec) is assumed. It is specified that a value of 150 kg/m^2 is adopted as the wind pressure applied to a building, as the height is lower than 9 m.

4) Seismic force

The seismic force is calculated by the following formula from the National Structural Code.

$$V = Z \times I \times K \times C \times S \times W$$

V represents design seismic force. Z means regional coefficient and Z = 0.8 when the building is built on a rockbed in Bohol. I represents application coefficient of the building and I = 1.0 for this center. K, C and S represents coefficients which are determined by the relationship with building's structure type, ground's prevailing natural period of

vibration and building's natural period of vibration respectively. W represents building weight.

5) Bearing Soil Layer

Each building should be supported by bedrock (weathered limestone). As this bedrock is porous and is of very irregular form, a value of 30 t/m^2 will be adopted with effective ratio of 60% taken into account as the bearing capacity of soil for foundation design.

6-7-3. Structural Materials and Construction Methods

Reinforced concrete structure will be used for principal frameworks such as columns and beams of each building, and hollow concrete blocks will be used for partition walls. The roof will be supported by a roof truss made of wood or light gauge steel. The following materials will be used as the structural materials of this center with quality, supply capacity, prices and so forth of materials taken into account.

1) Aggregate for concrete

Sea sand is usually used as fine aggregate, but its particle size is very small and the problem of salt inclusion is involved. Use of river sand which can be collected in the southeast part of Bohol Island is desirable.

Crushed stone produced by crushing weathered limestone is often used as coarse aggregate. However, it is porous and the form is very irregular. Accordingly, the river gravel produced at Garcia in the southeastern part of Bohol Island will be used as the coarse aggregated for concrete.

2) Concrete

Cement is obtained from Manila, Cebu, Mindanao, etc. Mixing is made on the field, and the design strength of concrete is 180 kg/cm^2, as the majority of buildings are single-storied.

Work specification that is matched with a high temperature zone will be considered for mixing, placing, curing and so forth in order to secure quality of concrete under high temperature conditions.

3) Reinforcing Bars

As the unit price of reinforcing bars is over twice as much as that in Japan, reinforcing bars will be shipped from Japan. As the structure has few parts of high stress member, hot rolled steel bar of material grade SD30 will be used for the entire structure.

6-8. Air Conditioning and Ventilation System

The air conditioning and ventilation system will be planned with economy such as equipment running expenses as well as ease of maintenance taken into account.

6-8-1. Air Conditioning System

Minimum limited rooms only are air conditioned using window type air conditioners for reducing the running cost.

The rooms to be air conditioned will be limited around to director's room, senior staff's room, one of laboratories and audio-visual room of the main center.

6-8-2. Design Conditions

Outdoor design conditions

Temperature 35°C

Humidity 75%

Indoor design conditions

Temperature 23.8 $\pm$ 2°C

Humidity 50 - 60%

6-8-3. Ventilation Equipment

Natural ventilation is adopted as a rule, but forced ventilation will be provided at each kitchen and laboratories.

6-9. Plumbing System

6-9-1. Water Source

As waterworks mains of 6" (city water) is buried along National Route 335 to which the site faces, water will be introduced to the site from this pipe for the main center.
Water for the rice research sub center and the livestock sub center will be supplied from the existing elevated water tanks.

6-9-2. Calculation of Required Water Volume

Main Center						
Personnel	103 persons	x	250	liter/man.day	= 25,750	liter/day
Trainees	50	x	80		= 4,000	
Liaison office	10	x	250		= 2,500	
Dormitory	42	x	120		= 5,040	
Experts house	4 houses	x	1,000	liter/house day	= 4,000	
				Total	= 41,290	
					= 42,000	liter/day
Rice Research Sub Center						
Personnel	15 persons	x	250	liter/man.day	= 3,750	liter/day
Liaison office	4	x	250		= 1,000	
				Total	= 4,750	liter/day
Livestock Research Sub Center						
Personnel	20 persons	x	250	liter/man day	= 5,000	liter/day

6-9-3. Water Supply Equipment

At the main center, an incoming water reservoir tank having a capacity good for daily consumption (about 42 m^3) will be provided under ground. Water in this reservoir tank will be pumped up to the elevated water tank and is then supplied to each building by gravity. The existing elevated water tanks will also be available for the rice research sub center and the livestock research sub center.

6-9-4. Draining System

Drainage from buildings will be made in four systems, i.e., sewage, miscellaneous waste water, rain water and laboratory waste water.

Sewage:

The sewage from each lavatory is introduced to a septic tank, and after purification, the water is caused to make penetration to the ground as converged with miscellaneous waste water.

Miscellaneous waste water:

Miscellaneous waste water used in the main center is collected outdoors and is discharged to the regulating pondage.

Miscellaneous coaste water used in the sub center is collected outdoors and permeated into grounds.

Rain water:

Rain water from roofs and grounds is collected out doors and is discharged to the regulating pondage.

Laboratory waste water:

Of experiment waste water out of laboratories, waste liquid is treated separately, and experiment waste water containing acid and alkali is neutralized and is then caused to penetrate into the ground.

Sanitary equipment:

Sanitary equipment such as toilet stools and wash bowls will be provided at lavatories, wash rooms and so forth as matched with the construction plan.

Septic tank equipment:

Septic tanks of decomposition type will be provided for purification of sewage, two units at the main center and the rice research sub center respectively and one unit at the livestock research sub center.

Gas equipment:

Gas will be supplied to each kitchen and laboratories with LPG cylinders installed.

6-10. Electrical System

6-10-1. Power Receiving Substation

At the main center, lead-in of electric power will be made by 3-phase, 3-wire, 13.8KV, 60Hz from existing transmission cables to the grounds using overhead cables.
Then areal transmission is made to a station service pole transformer, the voltage is stepped down to 3-phase, 3-wire, 240V by transformers before supply of electric power to each load.
At the rice research sub center and the livestock sub center, aerial lead-in will be made by 3-phase, 3-wire, 13.8KV, 60Hz from existing cables, step-down to 3-phase, 3-wire, 240V will be made by station service pole transformers for supply to each load.
Electrical loads for facilities are classified as follows.

(1) General lighting and receptacles
(2) Power for air conditioning and pumping
(3) Power supply for audio-visual equipment
(4) Power supply for farm machinery

It is estimated that the entire equipment capacity is about 335KVA at the main center, about 55KVA at the rice research sub center, and 40 KVA at the livestock research sub center.

6-10-2. Generator

A standby generator powered by a stationary diesel engine for indoor use will be provided for securing power supply during power failure of commercial power supply, in order to elevate reliability of the power supply.
A generator of 3-phase, 3-wire, 240V, 60Hz of a capacity of around 60KVA will be installed for experiment and test equipment requiring constant running as the object in the main center. Planning will be made so that switching of power supply is made automatically.
At the rice research sub center, planning will be made so that power is supplied from the generator (70KVA) in existing facilities on occurrence of power failure. No generater will be installed at the livestock research sub center.

6-10-3. Power Circuit System

Power will be distributed through aerial cable from transformer of electrical pole to building. Interior main wiring will be connected to each distribution panel and power switchboard through the metal conduit wiring system.

The voltage classification are graded as follows:

Power load: 3-phase, 3-wire, 220volts

Lighting receptacle load: 1-phase, 2-wire, 220 volts

6-10-4. Lighting Wiring System

Wiring will be laid through conduit after distribution panel to lighting fixture, switch plug and ceiling fan on the secondary side. Section switches will be provided for each small zone so as to switch on/off the lighting circuit at each room for saving running cost. Switches will be installed so as to thin out lighting for halls and corridors.

6-10-5. Lighting Fixtures

Fluorescent lamps will be provided as major lighting source considering of running cost saving. Incandescent and mercury lamps will be used if required for specific purposes.

The intensity of illumination in main rooms are as follows:

Office, conference room and laboratories:	300 lx
Lecture room:	250 - 300 lx
Workshop:	200 lx
Corridor and lobby:	100 - 150 lx
Storage:	50 lx

6-10-6. Telephone Line Installation

Telephone line is installed in the main center only, and the telephone line will be connected overhead by the lead-in pole in joint use with the power line. Then, the line is led through underground conduit up to the Main Distribution Frame (MDF) in the office room of the research and training building. The cable conduit shall be used from the MDF to the Intermediate Distribution Fram (IDF) board or each wall outlet.

Telephone equipments are provided in the main rooms of the research and training building and residential buildings.

6-10-7. Telephone Exchange Equipment

The telephone exchange system in the main center will be button telephone exchange system, and planning is made to install about ten extension telephone sets. Lead-in of two subscriber's lines is being considered.

6-10-8. Broadcasting Equipment

Planning will be made so that paging broadcasting in buildings can be performed with an amplifier provided in an office in the main office building.

6-10-9. TV community Antenna Equipment

TV outlets will be provided in main rooms of the research and training building and lodging facilities in the main center and also at the liaison office of the sub center.

6-10-10. Interphone Equipment

Interphones will be provided for communication among buildings.

6-10-11. Fire Alarm Equipment

A system that permits ringing of alarm bells by manual operation on occurrence of a fire will be planned for permitting the people in buildings to take refuge.

6-10-12. Outdoor Lighting Equipment

Outdoor lighting equipment will be planned for security of the center. Wiring will be made by aerial cables with power posts suitably used. ON-OFF of lighting equipment is controlled by automatic switches.

Table 6-11-1 List of Required Equipments for APC

I. RESEARCH ACTIVITY

1. Tractor
2. Plow
3. Harrow
4. Rotavator
5. Grain Drill
6. Lime Spreader
7. Fertilizer Spreader
8. Knapsack Sprayer
9. Power Sprayer
10. Shelling Machine
11. Throsher
12. Grain Drier
13. Scale Balance
14. Calculator (scientific)
15. Typewriters (electric and manual)
16. Livestock Weighing Scale
17. Livestock Restrainer (squeezer)
18. Filing Cabinets
19. Water Facilities
    a) Water pump
    b) Water tank
    c) Water pipes and outlets

For Livestock
a) Drenching Gun
b) Stomach tubes
c) Veterinary pharaphamelia
d) 1. metal syringes - 50 cc. cap.
   2. metal syringes - 20 cc. cap.
   3. metal syringes - 10 cc. cap.
   4. Fypo needles (various gauges)
   5. Forceps (various sizes)
   6. Scalpel
   7. Scissors (curved and straight)
   8. Veterinary themometer
   9. Glass syringes, 50, 20, 10 and 5 cc. cap.

*With all accessories

II. LABORATORY ACTIVITY

1. Spectrophotometer
2. Atomic Absorption Photometer
3. Kjeldahl Nitrogen Analyzer
4. Ph Meter
5. Ph Meter
6. High Speed Centrijuge
7. Analytical Balance
8. Biological Compound Microscope
   *With all accessories
9. Refrigerator
10. Window Oven
11. Oven (big)
12. Camera
13. Typewriters
14. Moisture Meter
15. Calculator
16. Autopsy Instruments Set

III. EXTENSION AND TRAINING SERVICES

1. Camera
2. Slide projector
3. Overhead Projector
4. Audio-visual Unit
5. Tape recorder
6. Copy machine
7. Mimeographing machine
8. Vehicles
9. Pick ups
10. Mini-bus
11. Single side band radio
12. Moving camera
13. Filing cabinet
14. Paper cutter
15. Photo Lab. Kit Developing
16. Megaphone
17. Field demo Kit
18. Visual Aide Materials
19. Grinder
20. Castration Kit