No. 3

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE ESTABLISHMENT
OF
THE SOILS RESEARCH AND DEVELOPMENT CENTER
IN
THE REPUBLIC OF THE PHILIPPINES

AUGUST, 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to the request of the Government of the Republic of the Philippines, the Government of Japan has decided to conduct a Basic Design Study on the Project for the Establishment of the Soil Research and Development Center and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Philippines a study team headed by Dr. Satoru Motomura, Director of Soil Research Division, Japan Soil Resources Development and Research Association, from April 7 to April 27, 1988.

The team had discussions on the project with the officials concerned of the Government of the Philippines and conducted a field survey in Manila. After the team returned to Japan, further studies were made, a draft report was prepared, and for the explanation and discussion of it, a mission was sent to the Philippines. As a result, the present report has been prepared.

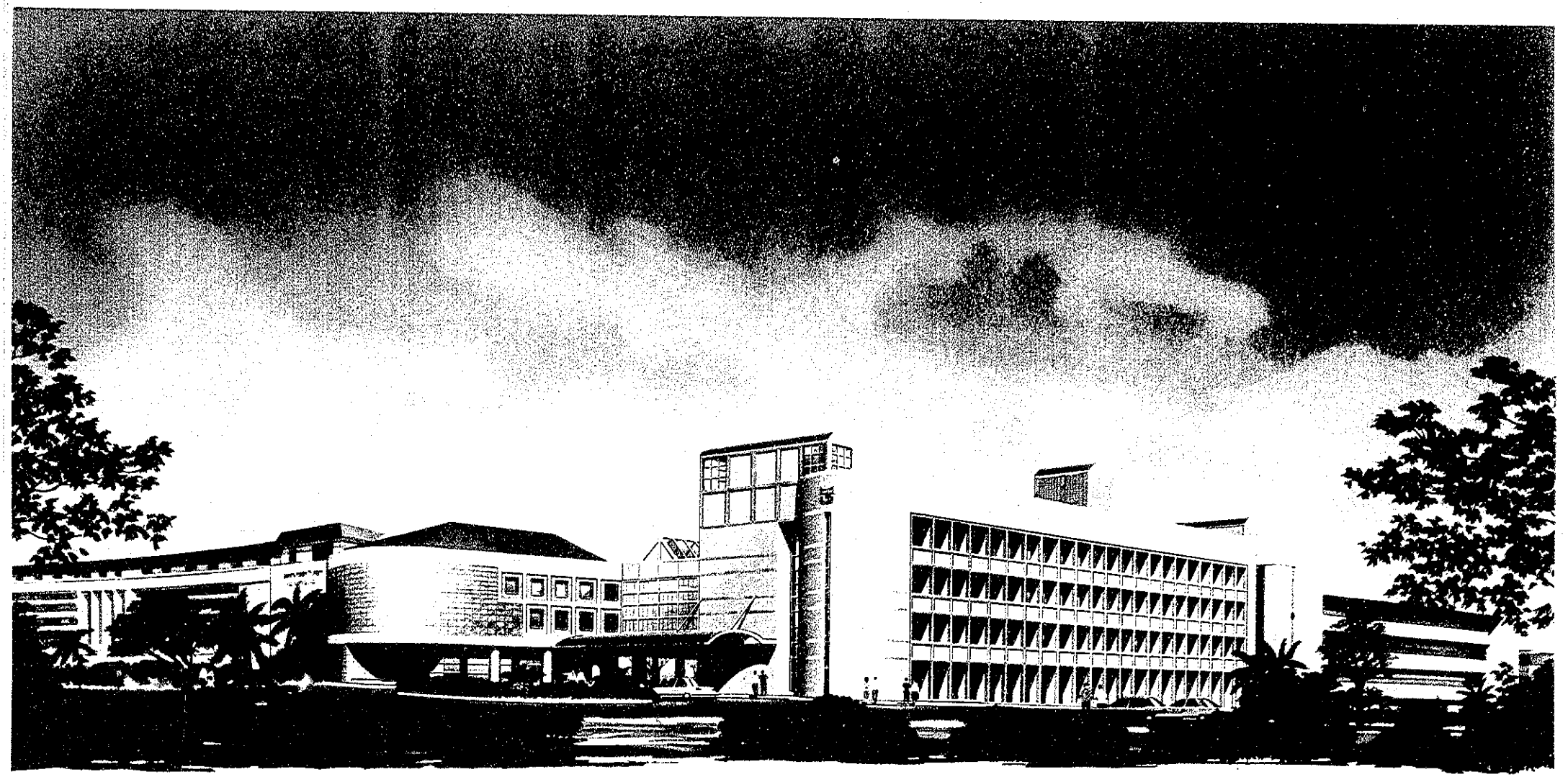
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between the two countries.

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.

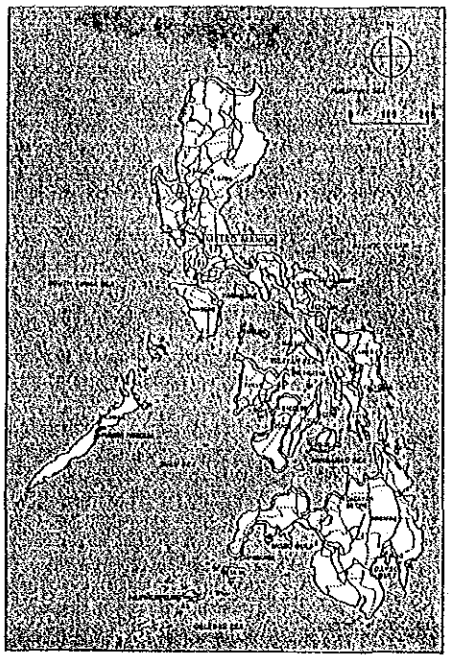
August, 1988

Kensuke Yanagiya

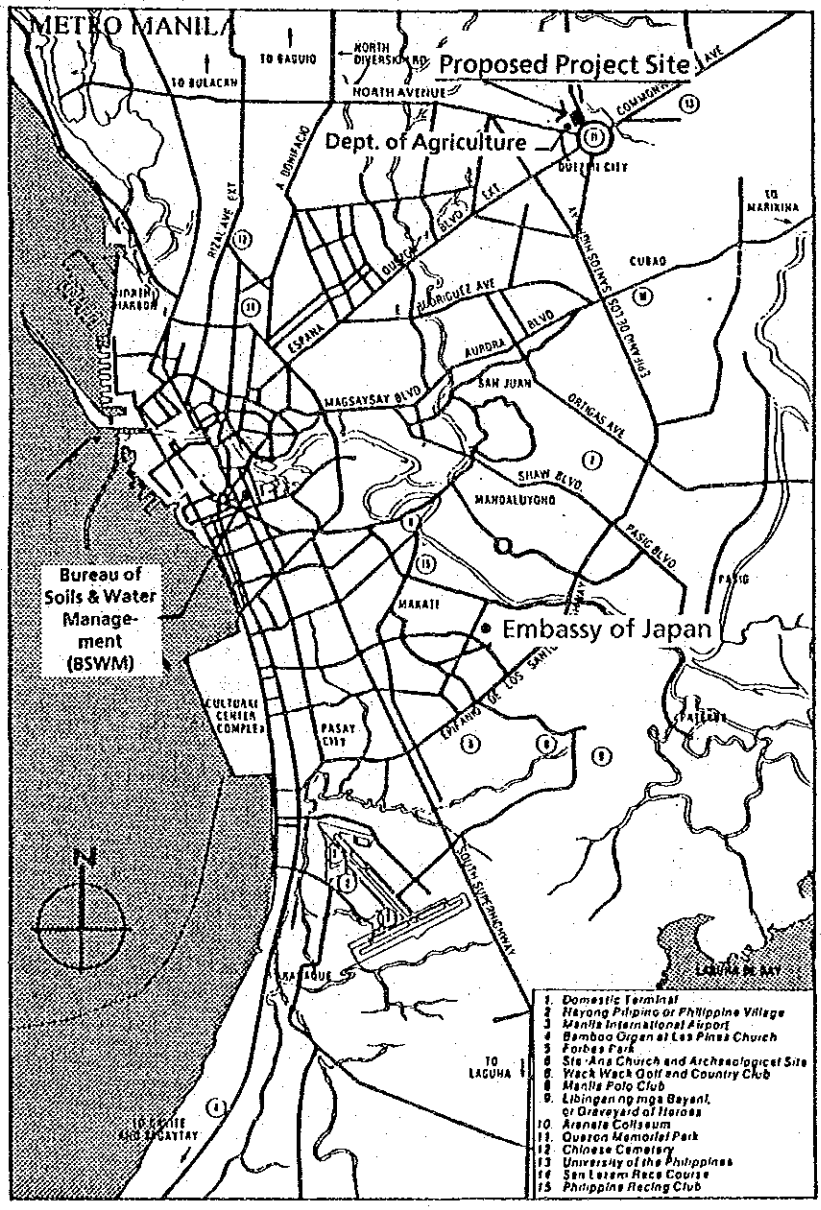
Kensuke Yanagiya
President
Japan International Cooperation Agency



THE SOIL RESEARCH DEVELOPMENT CENTER IN THE REPUBLIC OF THE PHILIPPINES



Map of the Location of the Proposed Project Site



SUMMARY

Since 1967, the Government of the Republic of the Philippines has prepared six consecutive National Development Plans to promote the socio-economic development of the country. With the second oil shock in 1979, however, the Philippine economy became stagnant while the GNP recorded minus growth in 1984 for the first time ever, partly because of the debt crisis initiated by the political unrest in August, 1983.

The Government of the Philippines subsequently reviewed its economic development policy and announced the Medium-Term Economic Development Plan (1987 – 1992) in December, 1986, as a measure to restore the economy. The Plan aims at facilitating economic growth and improving national life with the basic objectives of alleviating poverty, generating more productive employment, promoting equity and social justice, and attaining sustainable economic growth. To achieve these objectives, the development policy of the Government of the Philippines gives first priority to the agriculture, forestry and fisheries sector, which accounts for some 30% of the GDP and which employs more than half of the country's workers. The basic policy targets are an increased income for small-scale farmers, productivity improvement and food supply self-sufficiency.

An increase in the number of independent farmers through agrarian reform, establishment of a rational land-use system, development of practical farming techniques and the promotion of related development projects are indispensable to improve agricultural productivity and profitability. While the total land area in the Philippines which is suitable for agriculture amounts to some 15 million ha, the soil characteristics of only some 0.6 million ha (4%) have so far been studied and, therefore, a proper understanding of the soil characteristics of all land suitable for agriculture through relevant research, studies on suitable crops and the understanding/diffusion of farming techniques among farmers is urgently required.

The facilities of the Bureau of Soils and Water Management (BSWM) of the Department of Agriculture are, however, inadequate and much of the equipment has deteriorated with the result that the BSWM, which must play a central role in soil research and the soil-related technical development of agriculture, is unable to respond properly to the various demands which are of direct benefit to farmers.

Against this background, the Government of the Philippines prepared the Soil Research and Development Center Project to expand the soil survey and research

functions of the BSWM, to establish a soil information system and to consolidate the training of farming techniques; and the Government of the Philippines made a request to the Government of Japan for the provision of grant aid and technical cooperation for the Project.

In response to this request, the Japan International Cooperation Agency (JICA), commissioned by the Government of Japan, sent a preliminary study team for grant aid cooperation to the Philippines in January, 1988. Following the subsequent decision to conduct a basic design study for the Project, JICA then sent the Basic Design Study Team to the Philippines for the period between April 7 and April 27, 1988.

The Study Team had discussions with officials of the Government of the Philippines on the background, objectives, implementation system, suitability of the Project and the scope of cooperation. In addition, the Study Team studied the related facilities, planned construction site, conditions of the infrastructure and conditions of the construction industry and also collected Project-related materials. On its return to Japan, the Study Team conducted the basic design of the facilities, selection of the equipment and preparation of the maintenance plan, etc. through domestic analysis and evaluation of the field study results and subsequently prepared the Draft Final Report.

JICA then sent a mission to the Philippines for the period between July 24 and July 30, 1988, to explain the contents of the Basic Design Study Draft Final Report to the Philippine counterpart.

The objective of the Project is to facilitate the following activities by reorganizing the BSWM in a developmental manner in order to establish the Soil Research and Development Center.

1) Soil and water research and surveys

2) Development of farming techniques for soil and water utilization

3) Provision of reliable soil and water-related data

4) Teaching and diffusion of developmental technologies

5) Training of agricultural engineers

The Project site is located in the Diliman District of Quezon City, in turn located in the Metropolitan Manila area, and is adjacent to the main building of the Department of Agriculture. The site covers an area of approximately 1.2 ha and

its ownership was officially transferred from the Department of Agriculture to the BSWM on July 3, 1987. The size of the facilities and the scope of the granted equipment have been determined to be as follows.

1. Facilities

° Main Building ..... 7,975m^2

RC four stories (five stories in part) housing the Agricultural Land Management and Evaluation, Soil Survey, Soil Conservation and Management, Water Resources and Management, Laboratory Services, Soil and Water Research and Cartographic Operations Divisions, Special Projects and Services Department, ISRIS Department and Administration Department, etc.

° Training and Information Building ..... 3,516m^2

RC three stories housing Training Rooms, Convention Room, Soil Museum, Main Office, Dormitories and Canteen, etc.

° Other

Greenhouse ..... 165m^2

Total ..... 11,656m^2

2. Equipment

° Research and Survey Equipment

- Soil Survey Equipment
- Soil Analysis Equipment (Chemical, Physical and Biological Characteristics)
- Water Resources Survey Equipment
- Surveying Equipment
- Cartography and Copying Equipment

° Special Projects and Services Equipment

- Remote Sensing Equipment
- Meteorological Observation Equipment

- Information Equipment
  - Host Computer, Personal Computers and Computer Peripherals
- Training Equipment
  - Audio-Visual Equipment
  - Editing Equipment
- Common Equipment
  - Vehicles
  - Radio Communication Equipment

The implementation of the Project in two phases has been judged to be suitable in view of the size of the facilities and the estimated construction period, etc. The construction of the Main Building and the provision of the survey/research equipment will be conducted in the first phase while the construction of the Training and Information Building and the provision of the training, special projects, and information equipment will be conducted in the second phase. In view of the fact that the Philippine side will require technical cooperation to apply remote sensing technology to soil related surveys and cartography, the relevant equipment is listed here, assuming that the Government of Japan will provide project-type technical cooperation in these fields. The required construction period for the completion of the Project, i.e. from the commencement of the detailed design following the conclusion of the Exchange Notes between the two governments to the completion of the construction work, including the tender and contracting procedure prior to it, is estimated to be 17 months for the first phase and 14 months for the second phase.

The estimated project cost for the Philippine side (site preparation, provision of electricity, water and telephone services to the site, sewage connection, landscaping and exterior work and the provision of fixtures and furniture) is approximately 29 million pesos.

The implementation body for the Project is BSWM until the completion of the facilities, henceafter the BSWM will move to the new buildings and will be responsible for the management of the facilities under the revised name of the Soil Research and Development Center.

The Center is expected to play a crucial role not only in ordinary activities, including the fostering and settlement promotion of small-scale farmers, promotion of soil research, which is necessary to support such government policies/ measures as land reform and various development projects, technical developments applicable to farmers and the dissemination and training of farming techniques, but also in responding to the diverse demands from various public and private organizations as the central agricultural research institute. The Project is important for the improvement of agricultural productivity and profitability, which is the basic policy objective of the Government of the Philippines, as well as for subsequent socio-economic development, including the fostering and settlement promotion of small-scale farmers created by agrarian reform, increased income levels, increased employment opportunities, etc.

The implementation of the Project with the grant aid cooperation of the Government of Japan is, therefore, extremely significant and further effects of the cooperation can be anticipated, if project-type technical cooperation, the feasibility of which is currently being examined by the Governments of the Philippines and Japan, is also provided.

CONTENTS

Abbreviations

ADB	:	Asian Development Bank
ALMED	:	Agricultural Land Management and Evaluation Division
BAEX	:	Bureau of Agricultural Extension
BSWM	:	Bureau of Soils and Water Management
CARP	:	Comprehensive Agrarian Reform Program
DA	:	Department of Agriculture
DFA	:	Department of Foreign Affairs
DNR	:	Department of Natural Resources
DPWH	:	Department of Public Works and Highways
E/N	:	Exchange of Notes
GDP	:	Gross Domestic Product
GIS	:	Geographical Information System
GNP	:	Gross National Product
IRRI	:	International Rice Research Institute
ISRIS	:	Integrated Soil Resources Information System
JICA	:	Japan International Cooperation Agency
LRC	:	Land Reform Council
MERALCO	:	Manila Electric Company
MWSS	:	Metropolitan Waterworks and Sewerage System
NCSO	:	National Census and Statistics Office
NEDA	:	National Economic and Development Authority
NIA	:	National Irrigation Authority
PCARRD	:	Philippine Council for Agricultural Resources Research and Development
PLDT	:	Philippine Long Distance Telephone Company
PMO	:	Project Management Office
P/Q	:	Prequalification
PSC	:	Project Steering Committee
RASCOMO	:	Rain Stimulation Coordinating and Monitoring Center
UP-LB	:	University of the Philippines-Los-Banos
USDA	:	United States Department of Agriculture
WB	:	World Bank

CHAPTER 1. INTRODUCTION

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Since 1967, the Government of the Philippines has prepared six consecutive National Development Plans to promote the socio-economic development of the country. However, the Philippine economy became stagnant with the second oil shock in 1979 while the GNP recorded minus growth in 1984 for the first time ever, partly because of the debt crisis initiated by the political unrest in August, 1983.

The Government of the Philippines subsequently reviewed its economic development policy and announced the Medium-Term Economic Development Plan (1987 – 1992) in December, 1986, as a measure to restore the economy. The Plan aims at the eradication of poverty and the improvement of national life by urgently achieving economic recovery and long-term economic growth and has the following basic objectives.

- alleviation of poverty
- generation of more productive employment
- promotion of equity and social justice
- attainment of sustainable economic growth

The Government of the Philippines has changed its policy priority from industry-oriented economic development with particular stress on manufacturing industries to agriculture-oriented development to achieve these objectives.

As agriculture is an important industry in the Philippines, accounting for some 30% of the GDP (agriculture, forestry and fisheries) and some 40% of the total export value, the development of the agricultural sector is extremely important for the sound progress of the Philippine economy. The development of a rational land-use system and practical farming techniques, the fostering of small-scale farmers and the promotion of land reform and various development projects are required to meet the policy priorities of the Government of the Philippines, i.e. improved agricultural productivity and profitability, which in turn urgently requires the promotion of soil research and the development of related technologies.

In regard to the soil research and development field, the BSWM has achieved certain results with the preparation of land-use and soil maps, evaluation of land

resources, provision of advice on fertilizer use for individual farmers and the provision of soil analysis services through soil surveys, analysis and on-site farming experiments with the cooperation of regional/provincial agricultural experiment stations. Due to insufficient provision of testing facilities and deterioration of equipment, however, the collection and analysis of basic soil data are unsatisfactory, because of failing to meet the administrative and technical requirements.

In view of the above, the Government of the Philippines prepared the Soil Research and Development Center Project to reorganize the BSWM in a developmental manner, to expand its research function and to introduce training and information service functions; and the Government of the Philippines made a request to the Government of Japan for the provision of grant aid and technical cooperation for the implementation of the Project.

In response to this request, JICA sent the Preliminary Study Team, headed by Dr. Satoru Motomura (Director of Soil Research Division, Japan Soil Resources Development and Research Association), to the Philippines for the period between January 18 and January 30, 1988, to study the planned site and Project-related facilities and also to confirm the contents of the request and discuss the Project contents and the possibility of cooperation with the related organization on the Philippine side.

The Government of Japan subsequently decided to conduct a basic design study to determine the concrete contents of the Project; and JICA accordingly sent the Basic Design Study Team, headed by Dr. Satoru Motomura, to the Philippines for the period between April 7 and April 27, 1988.

The Study Team discussed the background of the Project, objectives, implementation system, related facilities, conditions of the Project site and the points to note suggested by the Preliminary Study Team with representatives of the Department of Agriculture, BSWM, University of the Philippines and the IRRI, etc. in both Manila and Quezon City. The Study Team also visited the Project site in the Diliman District in Quezon City and the current facilities of the BSWM to collect the necessary data.

On receipt of the Study Team's report, JICA sent a mission, again headed by Dr. Satoru Motomura, to the Philippines for the period between July 24 and July 30, 1988, to explain the contents of the Basic Design Study Draft Final Report.

The present Report compiles the results of the Basic Design Study on the Project for the Establishment of the Soil Research and Development Center in the Republic of the Philippines based on the domestic analysis of the field study results. The list of the team members, field study schedule, the list of those assisting the study and the Minutes of the Discussions are given in the Appendices.

CHAPTER 2. BACKGROUND OF THE PROJECT

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2-1 Socio-economic Conditions and Medium-Term Economic Development Plan

The Government of the Philippines has implemented six consecutive National Development Plans since 1967 and has been promoting extensive economic development from long-term perspective. With the initial protection of specific industries, import controls and high import duties, the industrial output showed annual average growth of 8% in the years between 1971 and 1980. However, the rapid development was only made by, in fact, limited industries. The second oil crisis in 1979 resulted in an inflated price of imported raw materials, which caused a debt crisis due to the shortage of foreign currency reserves and inflation. Consequently Philippine industrial glowth became stagnant.

To alleviate this situation, the Government of the Philippines revised its industrial policy in 1981 to put stress on effective industrialization to obtain international competitiveness. Also the Government of the Philippines announced a review of import duties, import liberalization, readjustment of indirect taxes, rationalization of industrial complexes, sectoral development plans and the introduction of major industrial projects. Import duties was reduced from 43% to 28% between 1980 and 1985 while import liberalization was gradually introduced for 3,049 items. The Government also decided on 19 priority sectors for investment and promoted private investment in these sectors.

Despite these measures, however, the world recession caused a decline of export prices, a drop in consumption, high interest rates and a steep rise in import prices. The political unrest in 1983 resulted in a large outflow of capital from the Philippines and a rapid decline of the foreign currency reserves, which badly affected the economy. As a result, the outlook for the implementation of the Project became bleak.

The new administration which took over in February, 1986 announced the Medium-Term Economic Development Plan (1987 – 1992) in December that year with its development policies for the next six years. The Plan aims at the eradication of poverty and the improvement of national life by the urgent achievement of economic recovery and long-term economic growth and has the following four basic objectives.

Table 2-1-1. Compositon of Philippine GDP by Industrial Sector, 1979~1986

mil. Peso

	79		80		81		82		83		84		85		86	
Agriculture, forestry and fisheries	22,595		23,732		24,603		25,378		24,845		25,409		26,252		27,233	
	25.6	4.5	25.6	5.0	25.6	3.7	25.6	3.1	24.8	-2.1	27.0	3.2	29.2	1.0	30.0	3.7
Industries	32,343		33,471		34,963		35,812		36,048		32,282		29,000		28,204	
	36.6	9.3	36.1	3.5	36.4	4.5	36.1	2.4	36.0	0.7	34.6	-10.4	32.3	-10.1	31.1	-2.7
Mining	2,134		2,236		2,175		2,016		2,082		1,755		1,768		1,558	
	2.4	18.0	2.4	4.8	2.3	-2.7	2.0	-7.3	2.1	3.3	1.9	-15.9	2.0	0.7	1.7	-11.9
Manufacturing	22,239		23,175		23,959		24,535		25,084		23,319		21,541		21,717	
	25.2	5.4	25.0	4.2	24.9	3.4	24.8	2.4	25.0	2.24	24.8	-7.0	24.0	-7.2	23.9	1.0
Construction	7,121		7,139		7,830		8,177		7,705		5,866		4,258		3,382	
	8.1	20.4	7.7	0.3	8.1	9.7	8.3	4.4	7.7	-5.8	6.2	-23.9	4.7	-27.4	3.8	-21.6
Electricity Gas, Water	849		921		999		1,084		1,177		1,342		1,433		1,547	
	1.0	10.5	1.0	8.5	1.0	8.5	1.1	8.5	1.2	8.6	1.4	14.0	1.6	6.7	1.7	8.0
Services	33,408		35,603		36,613		37,907		39,232		36,236		34,551		35,333	
	37.8	5.8	38.3	6.2	38.1	3.1	38.2	3.5	39.2	3.5	38.6	-7.6	38.5	-4.7	38.9	2.3
Transportation Communication Storage	4,613		4,827		5,040		5,165		5,328		5,032		4,953		5,084	
	4.9	2.5	5.2	4.6	5.2	4.4	5.2	2.5	5.3	3.2	5.4	-5.6	5.5	1.6	5.6	2.6
Commerce	18,085		19,345		19,695		20,355		21,438		19,207		18,051		18,399	
	20.5	7.3	20.9	7.0	20.5	1.8	20.5	3.0	21.4	6.02	20.4	-10.4	20.1	6.0	20.3	1.9
Others	10,710		11,331		11,878		12,387		12,466		11,997		11,547		11,850	
	12.1	4.8	12.5	5.8	12.3	4.8	12.5	4.1	12.5	0.64	12.8	-3.8	12.6	3.8	13.0	2.6
GDP (market price) 1972 fixed price	88,346		92,706		96,184		99,097		100,125		93,927		89,803		90,770	
		6.7		4.9		3.8		3.0		1.0		-6.2		-4.4		1.1

1987 Philippine Statistical Yearbook, NEDA. 1987 Philippine Development Report, NEDA.

Table 2-1-2 Gross Domestic Product by Industrial Origin, 1986-92

(In billion pesos, at constat 1972 prices)

	Estimate	Targets						Annual average
	1986	1987	1988	1989	1990	1991	1992	1987~92
Gross Domestic Product	90.0	96.8	103.8	110.8	118.7	126.9	135.3	115.4
Growth rate (%)	0.4	6.7	7.1	6.7	7.1	6.9	6.7	6.9
Agriculture, Forestry, Fisheries	26.8	27.9	29.1	30.6	32.2	34.0	35.9	31.6
( ) : Ratio in GDP	(29.5)	(28.8)	(28.0)	(27.6)	(27.1)	(26.7)	(26.5)	(27.4)
Growth rate (%)	3.0	4.0	4.5	5.0	5.5	5.5	5.5	5.0

Source : Statistical Year Book

- alleviation of poverty
- generation of more productive employment
- promotion of equity and social justice
- attainment of sustainable economic growth

To achieve these objectives, the Government of the Philippines is giving development priority to the agriculture, forestry and fisheries sector which accounts for some 30% of the GDP (see Table 2-1-1) and has established the following basic policies to vitalize the Philippine economy through the development of the local agricultural economy and the leadership of the private sector.

(Basic Policies)

(a) To enhance small farmers' income;

(b) To sustain increases in productivity;

(c) To effect an equitable distribution of the factors of and the returns to production;

(d) To attain food self-sufficiency/self-reliance for improved nutritional well-being;

(e) To create/increase agro-based employment opportunities among the rural population, particularly the landless rural workers and subsistence fishermen;

(f) To improve the delivery system for agricultural crops/ commodities, farm inputs, and services; and

(g) To institutionalize the expanded participation of farmers through cooperatives and other farmers' organizations.

Table 2-2-1. Number of Employees in Each Industry

1983 (3rd Qtr.)	Number (in thousands)	% Composition
Agriculture, forestry & fisheries	10,289	50.0
Mining and quarrying	150	0.7
Manufacturing	1,905	9.2
Electricity, gas and waterworks	62	0.3
Construction	629	3.1
Wholesale and retail	2,814	13.7
Transportation & warehousing	841	4.1
Finance, insurance & real estate	390	1.9
Social services	3,516	17.0
Total	20,595	100.0

Source : NEDA ; Statistical Year Book 1987

Table2-2-2. Agricultural Area and Farm Area per person (1983~2000)

Year	Total Area (1,000ha)	Farm Area (ha)		Population (1,000 Persons)	Farm Area per person(ha)	
		Arable land (1,000ha)	Land Under Permanent Crops (1,000ha)		Arable land	Including Land Under permanent Crops
1983	30,000 (100%)	11,612 (38.7%)	3,130 (10.4%)	51,956	0.22	0.28
1985				54,378	0.21	0.27
1990				60,185	0.19	0.24
1995				65,397	0.18	0.23
2000				69,885	0.17	0.21

Source : ALMED, Bureau of Soil and Water Management (1985)

2-2 Agriculture and Soil Surveys and Research in the Philippines

2-2-1 General Conditions of Agriculture

The agriculture, forestry and fisheries sector accounted for 30% of the GDP in 1986 (see Table 2-1-1), coming third after the services sector and the mining/manufacturing sector. As shown in Table 2-2-2, however, the labour force in this sector accounted for 50% of the total labour force, far exceeding that in all other sectors.

While the ratio of food exports in the total export value is some 33%, agricultural products account for as much as 60% of the total foreign currency earnings. The promotion of the agriculture, forestry and fisheries sector should, therefore, prove extremely important in view of the restoration of the Philippine economy.

The Government of the Philippines launched the Comprehensive Agrarian Reform Program on July 22, 1987 in which the compensation for land owners is made over a ten year period in the form of Land Bank bonds, 10% of which can be cashed in annually. Farmers buying land must repay the loan to the Land Bank over 17 years without interest. The improvement of agricultural productivity and profitability is indispensable to foster and settle small-scale farmers and, together with agricultural/village development and the consolidation of the land register, is an important factor for the success of agrarian reform. Consequently, the evaluation of agricultural land use and its dissemination are key factors of the comprehensive agrarian reform and medium/long-term economic plans.

(1) Land Use

Table 2-2-2 shows the conditions of land use in the Philippines which has a total land area of 30 million ha, 49.1% of which is either farmland (11.6 million ha) or arable land (10.4 million ha). Some 70% of the farmland is used for single year crops and the remainder is used for perennials.

(2) Agricultural Labour Force

The Philippines has a total population of 56 million (as of 1985), of which 21.6 million comprise the total labour force. Agriculture has a labour force of 10 million or 46.3% and is made up of tenant farmers (5.5 million or 55%), small-scale independent farmers and land owners (source: NCSO, 1985).

Table2-2-3. Agricultural Out Put at Constant Prices (1972)

Unit : Million Pesos

Kind of Crop / Year	1971	1976	1981	1983
Agricultural products	8,199	12,069	15,418	15,379
Rice	2,774	3,395	4,307	3,953
Corn	844	1,240	1,494	1,403
Coconut	958	1,437	1,396	1,298
Sugar Cane	1,239	1,640	1,337	1,256
Banana	680	1,420	2,356	2,393
Others	1,704	2,955	4,528	4,776
Dairy	1,884	1,740	1,925	2,170
Pig-farming	732	968	1,958	2,481
Fishing (Marine Products)	2,669	3,300	4,132	4,417
Forestry	1,943	1,594	1,175	698
Grand Total	15,457	19,677	24,608	24,845

Source : Statistical Year Book 1984

Table2-2-4 Agricultural Income, Production Volumes, Yields and Yield Areas (1986)

Kind of Crop	Value (in Million Pesos)	(%)	Production (ton)	Mean Yield (ton/ha)	Harvested Area (1,000ha)
Total Agri-cultural Products	17,063	100			
Rice	4,973	29	9,248	2.67	3,465
Corn	1,847	11	4,090	1.14	3,590
Coconut	1,680	10	3,210	0.96	3,335
Sugar Cane	781	5	1,520	4.27	356
Banana	935	5			
Others	6,847	40			

Source : Statistical Hand book in Agriculture, BAE, 1985
Selected Statistics in Agriculture, BAS, 1986

(3) Agricultural Production

As shown in Table 2-2-3, agricultural production has been steadily increasing. The main staple crops are rice and maize and cash crops are coconuts, sugar cane and bananas. The agricultural income, production volumes of the main crops, yields and yield areas in 1986 are shown in Table 2-2-4.

The total agricultural income is 17,063 million pesos. Given the total agricultural labour force of 10 million, the annual income per capita is 1,706 pesos (approximately 12,000 yen). The average land holding per farming household is 1,5 ha and the monthly income per family is 1,335 pesos. However, it is planned to increase the average land holding and family income to 2.0 ha and 2,000 pesos respectively in the future.

With the introduction of high yield varities, rice production increased from 510,000 tons in 1972 to 920,000 tons in 1986 and the unit yield accordingly increased from 1.51 tons/ha to 2.67 tons/ha, almost achieving the self-sufficiency level. In the case of maize which is important as both a staple food and animal feed, the unit yield is as low as 1 ton/ha, necessitating the import of almost 10% equivalent (300,000 tons) of the total annual consumption volume. Coconuts and sugar cane are cultivated by small and large farmers respectively which both face the same problem of stagnant exports due to limited markets and low international prices.

As shown in Table 2-2-2, the farmland area per capita is 0.22 ha as of 1983. However, it is forecast that this per capita area will gradually decline to 0.17 ha in the year 2000 when the total population will reach the 70 million level. Farmers must, therefore, secure farmland by developing new areas together with efforts to achieve the effective utilization of the available land, increased land productivity, increased yields through technical innovations and improved income.

2-2-2 Soil Surveys and Research

Soil surveys, research and analysis on farmland in the Philippines are uniformly conducted by the BSWM and their current state is as described below.

(1) Soil Surveys and Preparation of Soil Maps

With regard to soil surveys, soil maps and land use maps with a scale of 1 : 250,000 have been prepared for almost all of the national land. However,

since these are preliminary survey maps, the preparation of more accurate soil maps with a scale of 1 : 50,000 or 1 : 25,000 is planned for practical purposes. The preparation of topographical maps, which are essential for the preparation of soil maps, with a scale of 1 : 10,000 using aerial photographs is also planned and can be efficiently conducted by analysing aerial photographs and using the remote sensing technology. The soil series is currently used as the cartographic unit for the present preliminary soil survey maps. Although the Soil Taxonomy of the USDA is being introduced to classify soils, its direct application in the Philippines is not without problems as it is not compatible with the soil series. An effective method to utilize them both must, therefore, be found in the future.

(2) Soil Analysis

Soil analysis is currently conducted in accordance with the manual based on the analysis methods employed by the USDA. Most of the methods are similar to those used in Japan but the presentation methods for mechanical analysis for soil particles distdribution, available phosphorus, phosphoric acid absorption coefficience and effective water content slightly differ. For example, the USDA method for mechanical analysis is used in the Philippines to analyse soil properties which are measured by a gravimeter after the dispersion process while the international method using a pipet is employed in Japan to determine soil particles distribution. In the case of available phosphorus, the Olsen method and Truog method are used in the Philippines and Japan respectively. The phosphoric acid absorption coefficience which is a judgement criterion for volcanic soil is not measured in the Philippines. While bar is used in the Philippines for indication of the available water content, pF is used in Japan. As the Japanese level of research on paddy field soil and volcanic soil is one of the highest in the world, its adaptation to a soil analysis method suitable for the Philippines is hoped for through the requested technical cooperation.

(3) Soil Erosion Surveys

A wide area survey on soil erosion commenced in 1982 and 90% of the subject land has so far been covered. Based on the survey results, soil erosion is classified into 4 categories.

In regard to erosion control, the degree of influence on soil loss of the rainfall intensity and running water is studied using grass, leguminous and other surface covering plants. Concrete study themes are as follows.

1) Qualitative analysis of crop yields under different soil erosion conditions

2) Qualitative analysis of soil loss and the effects of running water under cultivation conditions

3) Evaluation of standard soil loss equation in the Philippines

4) Influence of mechanical erosion control methods on the growth and yield of maize and leguminous crops in hill areas

(4) Water Quality (Irrigation Water) Surveys and Water Management

Water pollution caused by industrial waste water presents a problem in those areas near cities while a similar water pollution problem exists in rural areas due to waste water from sugar and other factories. In this context, the BSWM is partially responsible for conducting water quality tests. The analysis items include N, Cl−, SO4, heavy metals and electric conductivity, etc. but excludes BOD.

The basic concept of water management is the achievement of the maximum utilization of the available water in farmland in view of the physical properties of the soil. Since the National Irrigation Agency (NIA) is responsible for the provision of irrigation water, the BSWM does not plan to participate in the construction of large dams but rather intends to assist farmers in constructing their own small reservoirs. As the study of irrigation water quality only commenced in 1987 after the reorganization of the previous organization into the BSWM, there is currently very little data available.

(5) Agroforestry

The study of agroforestry is mainly in the hands of the Department of the Environment and Natural Resources (DENR) and the actual work is carried out by the Forestry Research Institute (FORI) comissioned by the PCARRD.

The BSWM conducts soil surveys and soil classification in cooperation with the Bureau of Forestry Development (BFD) of the DENR. Activities include the preparation of soil maps (1 : 250,000) for possible future farmland or

mountainous/hilly areas which are currently wasted and the issue of warnings against land deterioration due to the use of the slash-and-burn method of agriculture to conserve water resources.

(6) Consolidation of Soil-Related Data

The BSWM publishes technical reports and soil survey reports which provide soil-related data based on its own surveys. Even with a careful examination of these reports, however, it is impossible to determine the basic soil characteristics in a scientific manner due to the scarcity of physical, as well as chemical, soil analysis results although the reports do contain soil profile results. In fact, 259,200 soil samples are taken from farmland annually to provide reference data for fertilizer recommendation but data accumulation and classification are almost non-existent. In the future, this quantitative soil data should be placed under uniform management for its effective analysis and utilization.

2-3 Bureau of Soils and Water Management

The history of the Bureau of Soils goes back as far as 1921 although the present BSWM was only established on January 30, 1987 as a result of the reorganization of the Department of Agriculture when the Water Management Section was integrated with the original Bureau of Soils. There are seven Assistant Secretaries responsible for specific fields under the Secretary of Agriculture and the BSWM is controlled by the Assistant Secretary for Regional Operations (see Figure 2-3-1).

Unlike those administrative organizations which are responsible for the preparation and promotion of national policies, the BSWM is regarded as a technical organization promoting soil research on all farmland throughout the Philippines.

2-3-1 Operations

(1) Operation System

As shown in Fig. 2-3-2, the BSWM is composed of seven technical divisions under the Office of the Director (i.e. Agricultural Land Management and Evaluation, Soil Survey, Soil Conservation and Management, Water Resources and Management, Laboratory Service, Soil and Water Research and Cartographic Operations), the Administration Department and the Rain Stimulation Coordinating and Monitoring Center, etc. and each division and department is further divided into specialized sections.

The BSWM is operated by members of the Operation Committee under the leadership of the Director. Suggestions for new projects and research come through either the administrative channel from such higher organizations as the Department of Agriculture (DA) and the National Economic Development Agency (NEDA) for the promotion of national policies or from lower administrative levels, including farmers' cooperatives, development stations and local governments. The preparation of soil maps (1 : 250,000) is an example of the former and guidance on fertilizers is an example of the latter.

(2) Employees

The BSWM currently has 474 full-time and 197 part-time employees. As shown in Fig. 2-3-2, the Office of the Director has 38 full-time employees

Fig. 2-3-1. Organization of Department of Agriculture

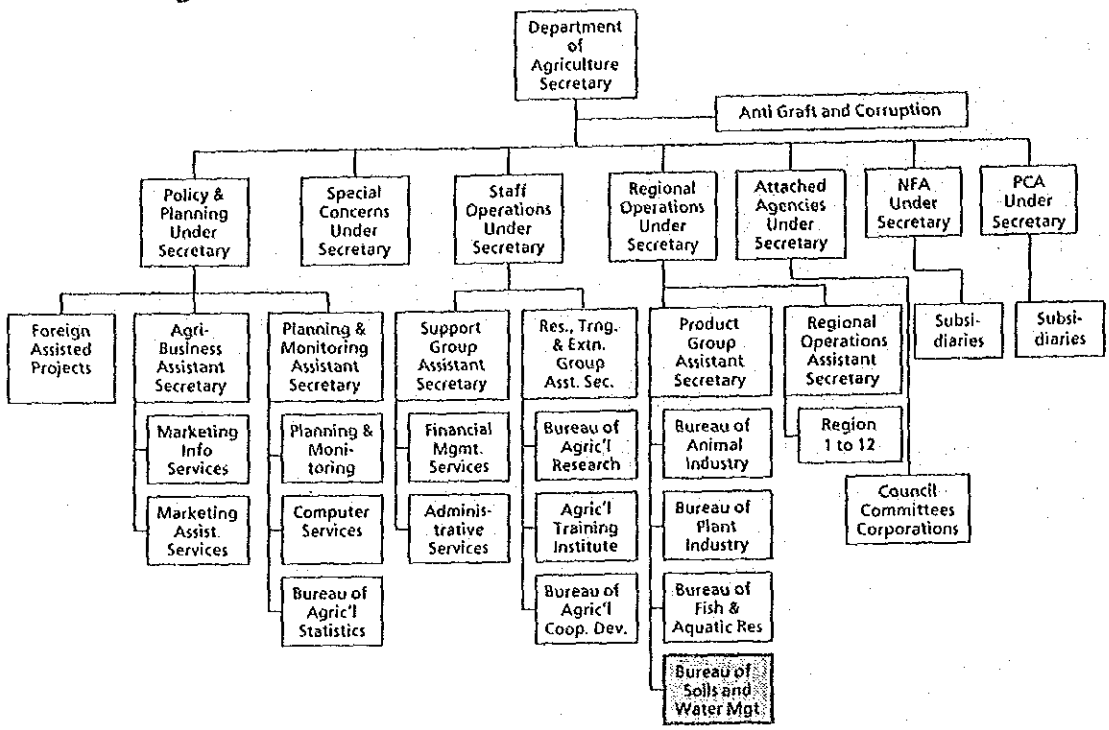

Fig. 2-3-2. Organizational chart of Bureau of Soils and Water Management

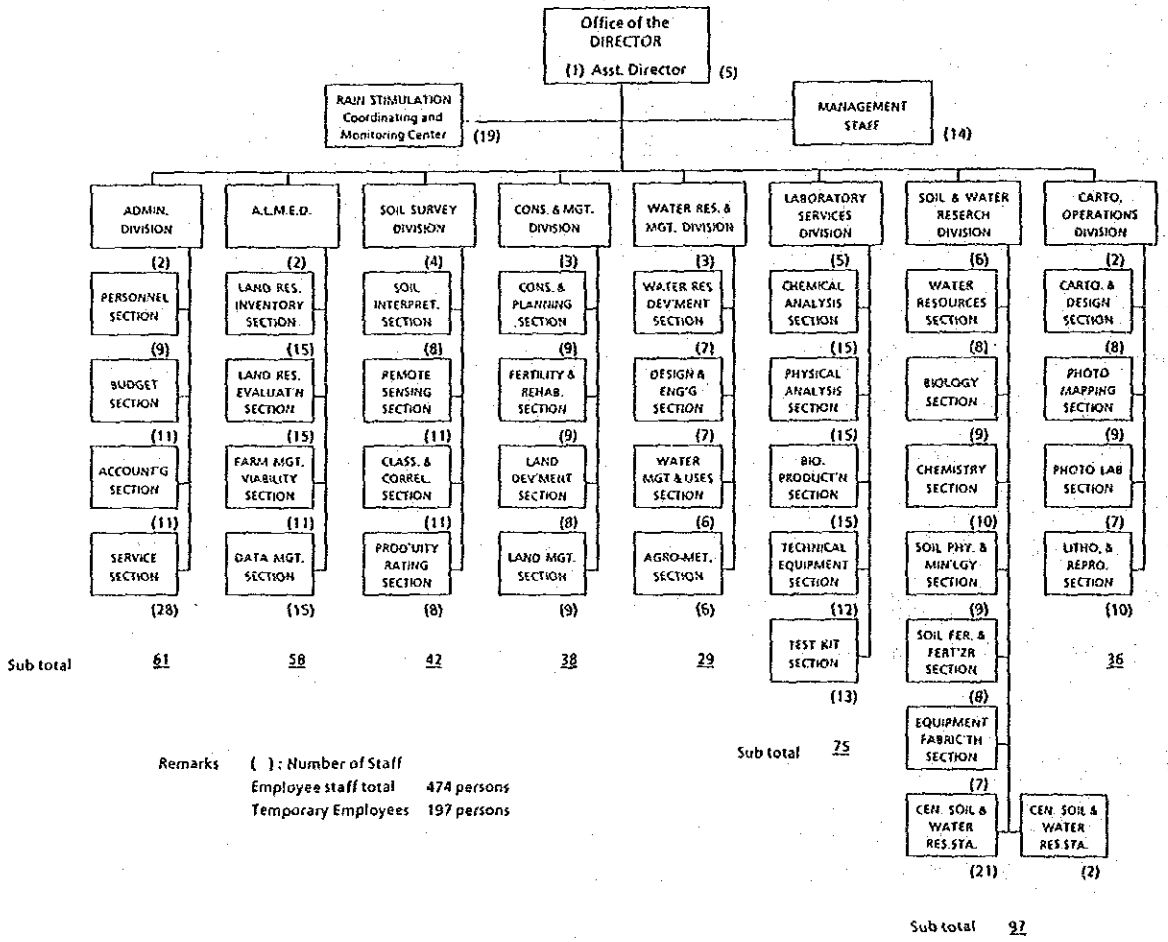

Table 2-3-1. Breakdown of Researchers

Specialization	Ph. D.	MS	BS	Post Grad.	Total
1. Soil Survey & Classification	2	4	32	3	41
2. Soil Chemistry	-	1	52	-	53
3. Soil Physics	-	1	7	-	8
4. Soil Microbiology	-	1	8	-	9
5. Plant Nutrition	-	-	4	-	4
6. Fertilizers	-	-	11	-	11
7. Applied Geomorphology	-	1	2	-	3
8. Soil & Water Conservation	-	1	5	-	6
9. Radioisotope	-	1	1	-	2
10. Agricultural Engineering	-	1	10	-	11
11. Agriculture	-	-	3	-	3
12. Land Use Planning & Landscape Architecture	1	-	-	-	1
13. Rural Land Ecology Survey	-	-	2	-	2
14. Integrated Survey	-	-	2	-	2
15. Land & Water Management	-	-	1	-	1
16. Urban Regional Planning	-	1	-	-	1
17. Geology	-	-	1	-	1
18. Civil Engineering	-	-	3	-	3
19. Agricultural Economics	-	-	5	-	5
20. Economics	-	-	5	-	5
21. Agronomy	-	-	4	-	4
22. Animal Husbandry	-	-	2	-	2
23. Agricultural Extension	-	-	1	-	1
24. Cartography	-	-	15	-	15
25. Entomology	-	-	1	-	1
26. Laboratory Instrument, Repair & Maintenance	-	-	6	-	6
27. Remote Sensing	-	-	-	10	10
Grand Total	3	12	186	13	214

Source : Bureau of Soils and Water Management

while the technical divisions and the Administration Department have 375 and 61 respectively. 214 of these full-time employees are researchers engaged in the fields of work given in Table 2-3-1. There are three Ph.D, 12 MSc and 168 BSc graduates in various fields in addition to thirteen employees who are sitting for the BSc. As there are also employees sitting for either their Ph.D or MSc, the academic standard is improving every year, particularly in the remote sensing field where ten employees are undergoing training. Therefore, the general level of basic scientific knowledge among BSWM employees is judged to be fairly high.

(3) Budget

The BSWM's budget is decided through a series of approvals by the DA, Department of Finance, Office of the President and the Congress in that order while the budget appropriation is made through the same process in the reverse order. As shown in Table 2-3-2, the BSWM's budget steadily increased between 1985 and 1987.

Table 2-3-2. Budget of Bureau of Soils and Water Management

Item		Budget (1,000 pesos)		
		1985	1986	1987
Personnel	Soil Cons. & MGT.	7,160	8,282	9,910
	Administration	1,623	1,873	2,311
	Sub Total	8,783	10,155	12,221
Operation and Maintenance	Soil Cons. & Mgt.	13,076	25,100	25,583
	Administration	2,499	2,749	5,319
	Training&Information	75	83	116
	Sub total	15,650	27,932	31,018
Grand total		24,433	38,087	43,239

Source : Bureau of Soils and Water Management

2-3-2 Current Activities

The BSWM is currently conducting the land evaluation of all farmland throughout the Philippines, soil surveys and research, soil management and technical services, including the provision of soil data and guidance on fertilizer use for farmers.

(1) National Land Resources Evaluation

A five year plan is currently in progress to survey the national land resources in view of their reclassification and evaluation. The preliminary survey of 28 million ha or 93% of the national land was completed by 1987 and the survey results were used to determine a national land policy and suitable land for agricultural development.

(2) Preparation of Soil and Land-Use Maps

Soil maps with a scale of 1 : 1,000,000 and 1 : 500,000 have already been prepared. At present, the preparation of soil maps with a scale of 1 : 250,000 is in progress using serial photographs with U.S. aid. However, as these are preliminary survey maps, they cannot be used to provide farmers with agricultural guidance. The preparation of detailed soil maps (1 : 50,000) is also in progress for direct application to agricultural guidance and 6 out of 75 provinces (4% in terms of the land area) have so far been provided with these detailed soil maps. Soil profile surveys are conducted annually at 350 sites.

(3) Soil Analysis

Physical, chemical, mineral and biological analyses of soils are conducted in view of soil potential productivity classification and for the identification of soil limiting factors in soils vis-a-vis crop production.

(4) Evaluation of Soil Fertility and Fertilizer Trials

Fertilizer trials are conducted on paddy rice and upland field crops and fertilizer recommendation have been established. Surveys on zinc deficient soils for paddy rice production and on possible remedial measures are also conducted.

(5) Development of Superior Strain of Rhizobia

As nitrogeneous fertilizers are expensive, the selection of cheap and readily available superior rhizobia is stressed as a substitute for chemical fertilizers.

Particular attention is paid to the selection of those rhizobia with strong nitrogen fixation capacity and their practical tests. The selected rhizobia are cultured and are packed for sale at 5 pesos a bag (annual sales: 5,000 bags).

(6) Rainfall Simulation and Artificial Rain Experiments

These are conducted in cooperation with the Meteorological Agency but no noticeable results have so far been achieved. Rainfall observation and simulation using satellite data are under planning.

(7) Training of Technical Staff of Attached Organizations

At present, there are no training facilities although several training courses are held annually using meeting rooms, etc.

(8) Soil, Water and Crop Analysis Services

Soil, water and crop analysis services are provided by the BSWM and regional and provincial laboratories for local municipalities. Some 260,000 samples are analized a year but a capacity to handle 680,000 samples a year is required to meet the total demand of 3.42 million farming households (9.73 million ha). Advanced analyses, including analysis of micronutrients, are only conducted at the main office of the BSWM.

(9) Provision and Sale of Simplified Soil Test Kits

The BSWM provides soil test kits to assist farmers on fertilizer use, sells them to local municipalities via regional and provincial soil laboratories and provides training courses on their proper use, which contributes to soil analysis by farmers.

(10) Publication of Technical Information and Reports

The latest publications of the BSWM include 21 technical bulletins, 11 booklets and 40 soil survey reports, showing the BSWM's rather vigorous publication activities.

The results of the BSWM's activities described above not only serve as technical information for the preparation of administrative policies, projects and development plans of both central and local governments, but also contribute to the improvement of the technical knowledge of DA staff,

agricultural supervisors and leading farmers and to the fostering of small-scale farmers.

2-3-3 Facilities and Equipment

(1) Facilities

The current facilities of the BSWM are divided into the Main Office located on Taft Avenue in Ermita in the Metropolitan Manila area and the Laboratory Building on Maria Orosa Avenue. As shown in Table 2-3-4, the Main Office has a floor area of 5,570m2 while the Laboratory Building has a floor area of 787m2, totalling 6,375m2. The BSWM rents both buildings at an annual cost of 2.4 million pesos (approximately 16.8 million yen). The Main Office uses the 3rd, 4th and 5th floors of a five-story building. Administration is located on the 3rd floor while the research rooms relating to soil surveys, library and meeting rooms are housed on the 4th and 5th floors. In general, the available space is inadequate, as illustrated by the use of the lecture rooms, originally for training purposes, for meetings.

The Laboratory Building on Maria Orosa Avenue is a distance of 2 to 3 km from the Main Office. This separation of the two facilities was unavoidable as the owner of the building housing the Main Office refused to permit laboratories on the premises due to his fear of accidents involving chemicals. The Laboratory Building, in fact, consists of both a two-story building and a single-story building. The 1st and 2nd floors of the two-story building house the physical and chemical laboratories while the single-story building houses the micro-bacterial laboratory and the general analysis laboratories. Both buildings are in a fairly deteriorated state. As the research rooms for soil survey, classification and cartographic sevices are located in the Main Office and the related laboratories are located in the Laboratory building, the research work is consequently inefficient.

(2) Equipment

The list of the equipment currently owned by the BSWM is included in the Appendices. In general, the equipment is old fashioned and tends to be inaccurate.

In the soil survey-related field, the preparation of soil maps with a scale of 1 : 50,000 should not prove very difficult as topographical maps (1 : 50,000) and

aerial photographs (1 : 10,000) covering most of the national land are available. Although some soil profile data used for the preparation of the preliminary survey maps is available, there is virtually no systematic arrangement of the soil analysis data. The soil profile data and soil analysis data should, therefore, be both rearranged and integrated.

Most laboratory equipment were originally donated by the FAO in 1963 and most of them are now out of order (balances, colorimeter and atomic absorption spectro photometer, etc.). That equipment still in use requires constant repair.

The main analysis equipment includes an atomic absorption analyser (old type), two flame photometers (old type), colorimeter (UV100-01), centrifugal separator (100mℓ), electric conductivity meter, pH meter, two steel distilled water stills (3 gallons/hr), several balances (Sauter), several thermometer and an autoclave. Apart from the colorimeter and the balances, the equipment is so old that the dates of their manufacture and the manufacturers' names cannot be confirmed except that they were made in Australia. The condition of the draft chamber is particularly poor due to the breakdown of the exhaust motor, while the environment of the Plant and Fertilizer Laboratory is in a critical state as sulfuric gas enters to the laboratory. The provision of glass apparatus is inadequate and the quality is inferior.

(3) Books and Reference Materials

Although a library is located on the 4th floor of the building housing the Main Office, its collection of books and reference materials is not extensive. For example, the regular subscription to Advance Agronomy was cancelled in 1974 and the latest issues have not been purchased. No academic journals in the soil science field are on the regular subscription list although the annual reports of the USDA are available. The library has a total of 717 books, including annual reports, independent volumes and an encyclopedia. The collection of journals and books on soils must be given serious consideration to facilitate research in the future.

2-4 Soil Survey and Research Organizations

In addition to the BSWM, the following organizations in the Philippines also conduct tests/research on soil and water utilization. Close cooperation with these organizations should be maintained to consolidate the activities of the SoilsResearch and Development Center.

(1) Regional and Provincial Soil Laboratories

The regional and provincial soil laboratories were originally part of the Bureau of Soils but were placed under the authority of the regional and provincial agricultural offices of the Department of Agriculture following the Department's reorganization. These agricultural offices are staffed by extension officers who are responsible for 1,100 to 1,500 farming households each.

The regional and provincial soil laboratories are responsible for soil and water management in their respective administrative areas. The BSWM assists in solving any problems which cannot be independently dealt with by these soil laboratories due to a lack of the necessary facilities or equipment. In turn, the soil laboratories assist in any national surveys initiated by the BSWM. For example, while the soil laboratory in Tarlac Province can analyse N and P, it cannot analyse K and, therefore, must request the soil laboratory for the Pampanga Region to conduct this analysis. While the latter can analyse both N, P and K, it cannot conduct analysis for micronutrients and must request the BSWM for this analysis. However, all the soil laboratories assist in national surveys and fertilizer tests.

The facilities and equipment of the soil laboratories in the Pampanga Region (Region III) and Tarlac Province are described below as examples of the soil laboratories.

The soil laboratory in San Fernando in the Pampanga Region has an old colorimeter, balance, pH meter and draft chamber. Despite its lack of testing equipment, it gives the impression of being a competent laboratory. Although it is responsible for six provinces, i.e. Zanbares, Bataan, Pampanga, Tarlac, Bulacan and Nueva Ecija, its facilities and equipment are extremely inadequate. The laboratory has 550 soil test kits (STKs).

The soil laboratory in Tarlac City in Tarlac Province has an old colorimeter, old chemical balance and pH meter. Compared to a regional laboratory, the

building is old and the equipment is inadequate. Although the laboratory has a draft chamber made of wood, it is currently out of order. The laboratory displays several soil monolith specimens collected from a representative paddy field in Tarlac Province, which shows its strong interest in soils. The laboratory provides farmers with guidance on mushroom growing.

(2) UPLB

The UPLB's Department of Soils of the Faculty of Agriculture has a soil analysis laboratory with eight staff members who conduct joint research with the BSWM. Commissioned by the BSWM, the Department of Biology is conducting an experiment on azolla. Many of the BSWM's employees have, in fact, diplomas from the UPLB or are currently sitting for their diplomas and this close relationship is helping to improve the standard of the BSWM's technical staff. Following the completion of the Soil Research and Development Center, this relationship is expected to continue in terms of the dispatch of lecturers for training courses and the promotion of joint research.

(3) NIA

The BSWM provides the NIA with soil survey/research results (such as recommended fertilizing methods and soil maps, etc.) while the NIA in turn provides guidelines on the infrastructure development for farmland expansion. Both organizations are involved in the development and utilization of irrigation water resources and require a close exchange of information.

(4) BPI

The BPI belongs to the DA and is responsible for crop production and seed development. The BSWM maintains a close relationship with the BPI through crop experiments and information exchange.

(5) IRRI

The IRRI has its own soil laboratory and soil microbiology laboratory and the objective of its soil surveys is the investigation of soils related to rice production all over the world, particularly in developing countries. Accordingly, the IRRI does not conduct research directly relating to land-use, soil surveys and farming guidance in the Philippines. However, it frequently

exchanges information with the BSWM on problematic soils (zinc deficient, acid soils, etc.), azolla, etc.

(6) PCARRD

The PCARRD is equivalent to the Agriculture, Forestry and Fisheries Technical Committee in Japan and has neither an independent facility nor full-time researchers but coordinates the various agricultural research in the Philippines. Although it is not directly engaged in soil research, it plays an important part in administrative decisions on research themes.

2-5 International Cooperation for Agricultural Development

International cooperation for agricultural development in the Philippines is currently being provided by such international banks as the World Bank and the Asia Development Bank and also through bilateral agreements with Japan, the U.S., the Netherlands and Australia. Table 2-5-1 shows the ongoing projects which are under the jurisdiction of the DA. None of these projects have a similar subject or objectives to the Soil Research and Development Center Project.

Table 2-5-1. Department of Agriculture On-Going Foreign-Assisted Projects

(In Thousand Pesos)

Project Title	Starting Date - Ending Date	Funding Agency	Total Amount (1988)
1. Agricultural Support Services Project (ASSP)	Nov. 1981 ~ June 1989	World Bank	130,222
2. Rainfed Resources Dev. Project	Jan. 1987 ~ Dec. 1990	USAID	125,880
3. Highland Agricultural Development Project	Jul. 1987 ~ Dec. 1991	ADB	219,514
4. Smallholder Livestock Development Project		ADB	—
5. Palawan Integrated Dev. Project-Agricultural Component	Sep. 1982 ~ Dec. 1988		15,967
6. Accelerated Agricultural Production Project		USAID	409,898
7. Bohoi Agricultural Production Center	Feb. 1983 ~ Feb. 1988	JICA	—
8. International Training Center on Pig Husbandry Project	June 1985 ~ Sep. 1988	Netherlands Grant	11,348
9. Northern Samar Integrated Rural Development Project	Feb. 1984 ~ Dec. 1988	ADB	60,944
10. Diversified Crops Irrigation Engineering Project	May. 1987 ~ Apr. 1992	JICA	—

Source : Bureau of Soil & Water Management

2-6 Rationale and Contents of the Request

2-6-1 Rationale

The Philippines economy is largely dependent on agriculture and approximately 50% (14.7 million ha) of the total national land (30 million ha) is suitable for agricultural use. However, agricultural productivity and profitability are rather low as shown by the fact that the total production value of agriculture, forestry and fisheries accounts for a mere 30% of the GDP despite 50% of the total labour force being employed in this sector.

In its Medium-Term Economic Development Plan (1987 – 1992) announced in February, 1986, the Government of the Philippines stresses on short-term economic recovery and long-term stable economic growth with the main objective of developing agriculture, as well as rural areas. In addition, the Government also stresses on the promotion of agrarian reform and the fostering of small-scale farmers. Under this policy initiative of the Government, the structure of the Department of Agriculture was reorganized in January, 1987, and the comprehensive restructuring of the BSWM was planned as part of this reoganization to improve both qualitatively and quantitatively its technical and administrative functions in terms of policy/project planning and technical services for farmers.

The BSWM currently has 505 employees who are engaged in surveys and research and is located at two separate sites (total floor area: 6,000m2) in a densely built-up area. The buildings are rented at a total annual cost of 2.4 million pesos and are fairly old. The deterioration of the laboratories is particularly noticeable and the equipment is inadequate. The situation is said to be the same at the 12 regional laboratories and consequently, these laboratories are incapable of performing the work assigned by the Government, necessitating the urgent provision of new facilities and an appropriate research system.

The Government of the Philippines has, therefore, prepared the Soil Research and Development Center Project of which the main contents include the preparation, accumulation and consolidation of basic soil data, provision of research facilities to develop practical farming techniques based on local soil conditions, establishment of a soil information system by the centralization of related data and the provision of training facilities for the teaching and dissemination of farming techniques suitable for local conditions. The Government of the

Philippines has subsequently made a request to the Government of Japan for the provision of grant aid and technical cooperation.

2-6-2 Contents

The Soil Research and Development Center Project planned by the Government of the Philippines aims at the expansion of the BSWM by newly incorporating information processing and training functions, which are outlined below.

Project Objective

The establishment of the Soil Research and Development Center is intended to consolidate research and development activities concerning soils, which are the basis of agriculture, and to provide farmers with the results to improve agricultural productivity and profitability.

Project Implementation Body

BSWM, Department of Agriculture

Project Site

Diliman District, Quezon City, Metropolitan Manila

Main Activities

Soil Research and Development
Consolidation of Soil-Related Data
Development of Farming Techniques
Training and Dissemination of Farming Techniques
Training of Agricultural Engineers

Number of Employees -- 900

Facilities

Main Building (seven stories including basement: 10,703m^2)

- Research and Survey Department: Rooms for the ALMED, Soil Survey, Soil Conservation and Management, Water Resources and Management, Laboratory Services, Soil and Water Research and Cartographic Operations Divisions
- Special Projects and Services Department

- ISRIS Department
- Administration Department: Office and Meeting Rooms
- Other: Basement Carpark

Training and Information Building (3 stories: 3,121m2)

- Training Facilities: Lecture Rooms, Convention Room, Dormitories and Printing Room
- Information Services Facilities: Soil Museum and Audio-Visual Room
- Others: Training and Information Services Office, Staff Room and Canteen, etc.

Equipment

- Survey and Research Equipment: Survey, Testing and Analysis Equipment and Soil Map Production Equipment, etc.
- Information-Related Equipment: Host Computer, Personal Computers and Radio Communication Equipment
- Training Equipment: Video Set, Slide Projector and Editing Equipment
- Others: Vehicle for Mobile Laboratory and Others

The Government of the Philippines has made a request to the Government of Japan for the Construction of the facilities and the provision of equipment for this Project in addition to technical cooperation to consolidate the activities of the Center.

CHAPTER 3. CONTENTS OF THE PROJECT

CHAPTER 3 CONTENTS OF THE PROJECT

3-1 Objectives of the Project

The final objective of the Project is to contribute to the agricultural promotion and village development policies which are the main pillars of the economic development activities of the Government of the Philippines, thereby assisting the implementation of the Comprehensive Agrarian Reform Program.

To achieve this objective, the Project intends to establish the Soil Research and Development Center, which will act as a central organization for research and information services concerning soils, i.e, the basis of agricultural production, and other related subjects in addition to the dissemination and training of farming techniques. The establishment of the Center also aims at the promotion of soil surveys and research based on the collection, accumulation and consolidation of basic soil resources data, establishment of a rational land use system, provision of soil-related technologies and information to improve agricultural productivity and profitability and the establishment of a soil information system, which is capable of meeting the various demands of both the public and private sectors. The Center will play the role of a national center for soil-related fields in the Philippines and is expected to conduct the following activities.

1) Surveys and research on soil and water resources
2) Development of farming techniques involving soil and water resources
3) Consolidation of soil and water resources-related data
4) Teaching and dissemination of farming techniques
5) Training of agricultural engineers

The Project aims at the provision of the facilities and equipment required for the activities described above.

3-2 Examination of Requested Contents

The Preliminary Study Team was sent to the Philippines to confirm and examine the contents of the original request described earlier (2-6-2). Based on the Preliminary Study Team's examination results, the present Study Team again confirmed the requested contents and examined in detail the functions, roles and necessity of the requested facilities, research equipment and survey and research subjects in view of the objectives of the proposed Center.

On the present Study Team's arrival in the Philippines for the field study, the requested contents of the Project were given in more detail than those at the preliminary stage and the quantitative aspect of the request was enlarged in terms of the functions, number of staff and size of the facilities. The main items of the revised request are as follows.

(1) Organization of the Center and Personnel Plan

In addition to the Research and Survey Department (consisting of seven divisions, i.e. Agricultural Land Management and Evaluation, Soil Survey, Soil Conservation and Management, Water Resources and Management, Laboratory Services, Soil and Water Research and Cartographic Operations) and the Administration Department of the BSWM, the Center will also consist of the Special Projects and Services Department (consisting of three groups, i.e. Satellite Center, RASCOMO and Remote Sensing), Integrated Soil Resources Information System Department (ISRIS, consisting of three divisions, i.e. System and Programming, Operation and Data Entry and Geographic Information System) and the Training and Information Department (consisting of three divisions, i.e. Training, Information and Dissemination and Mass-Communication).

The Office of the Directors consisting of legal and management staff will be responsible for the overalll management of the Center. Compared to the planned organization at the time of the Preliminary Survey, the Special Projects and Services Department and the ISRIS Department have been promoted to independent department status and the Training and Information Dissemination Department has been newly introduced, giving a clear picture of the Center's planned future activities. In terms of the number of employees, 900 employees is suggested instead of the initial 723.

(2) Strengthening of Information Function

The ideas presented to the Study Team in regard to the possible activities of the ISRIS Department are very grandiose in that they intend to assist the Government's policy making function in terms of national land use plans and economic development plans.

(3) Facility Size

The original size of approximately 11,400m^2 (a 6-story building) suggested at the time of the Preliminary Survey has been revised to some 14,000m^2 with a basement.

The results of the examination of the requested contents are given below.

(1) Survey and Research Plan

The survey and research plan given in the request aims at the active promotion of soil condition surveys, soil-section surveys and soil analysis surveys with the objective of the land-use evaluation of all farmland in the Philippines. Based on the survey results, land use maps, soil calssification maps and land productivity classification maps, etc. will be prepared and soil improvement tests and fertilizer trials will be conducted to prepare soil management guidelines, fertilizer recommendation and soil fertility conservation guidelines. Furthermore, the dissemination of these guidelines and criteria will be promoted together with the fostering of small-scale farmers, thereby assisting the Government's efforts in terms of agrarian reform and agricultural development projects.

These intended activities of the survey and research plan constitute an upgrading of the BSWM's present activities and can be efficiently achieved with the expansion of the facilities and equipment given the present quality and technical level of the technical staff. In regard to the preparation of new soil maps (1 : 50,000), Japan took more than 20 years to cover the entire country. In consideration of the natural and social conditions in the Philippines, the conventional survey method where soil surveys are conducted every 25 ha, will not be able to achieve the early completion of the preparation work hoped for by the Government of the Philippines. In particular, taking the geographical condition of the Philippines which consists of numerous islands and the difficulty of conducting ground surveys caused by the inferior road network into consideration, the introduction of

the remote sensing technology will be required to assist the conventional soil cross section survey method in view of improving the efficiency of soil surveys.

(2) Establishment of ISRIS Department

The systematization of soil-related information is very important for the effective utilization of national land resources. At present, however, the BSWM does not have a sufficient amount of reliable data which can be input as numerical or graphic information.

The creation of a database containing data relating to soil maps, land evaluation, soil conservation and soil management should prove very significant for future use and the ALMED and other divisions are actively dealing with this requirement. A realistic step for the immediate future is the introduction of a soil information system as a database through the collection and arrangement of soil-related numerical and graphic data.

Since a software development plan to support this database has not yet been prepared, however, it will be more practical firstly to introduce a system to help research and development with the application of image processing technology to the soil research field by means of data processing using a small general-purpose computer, a group of personal computers and graphic display units rather than introducing a main frame right from the beginning.

The Rain Stimulation Coordinating and Monitoring Center of the Special Projects and Services Department has requested the provision of weather satellite data reception and analysis equipment to assist the research on artificial rain. However, since the Center will be able to receive this data from the Philippine Atmospheric Geophysical and Astronomical Service Administration which is currently conducting a large project to improve the equipment in question, the provision of this equipment under the Project will not be considered.

(3) Improvement of Regional Laboratories and Mobile Laboratory

The equipment of the 12 regional soil laboratories is inadequate in view of providing the services, particularly such direct technical services as soil analysis and guidance on fertilizer application for farmers, stipulated in the Project and, therefore, the provision and consolidation of analysis equipment

for local soil laboratories is considered necessary and is in line with the main objectives of the Project.

In addition, in order to upgrade the functions of the Center as the central soil research and development center, close coordination with the local soil laboratories will be necessary. The Center should be capable of providing immediate and appropriate support to solve those technical problems faced by the agricultural offices (and soil laboratories for which they are responsible) in their daily operation. Appropriate communication with and instructions to field researchers will also be necessary to conduct efficiently surveys covering the entire country. However, the communication network in the Philippines is rather poor and even Metropolitan Manila and the surrounding areas do not have an adequate telephone network. In this context, the requested provision of radio communication equipment for the 12 regional soil laboratories appears reasonable in view of improving the direct technical services for farmers and issuing warnings in those areas where strong rain and floods are predicted during the typhoon season.

The requested mobile laboratory using a car and equipped with an atomic absorption photometer, colorimeter, balance, pH meter, electric conductivity meter and a hot plate to decompose soils and crops, etc. and the capability of making on-line transmission of the analysis results to the host computer assumes the application of the most advanced modern science. The design of such a mobile laboratory has no precedence anywhere in the world and, therefore, has been judged unrealistic in view of the relevant conditions in the Philippines (weather, roads, etc.) Instead, the Center will be provided with an atomic absorption photometer for local services. However, the provision of a vehicle has been judged necessary to improve the mobility of field surveys in view of improving their efficiency.

(4) Training Plan

The training plan mainly deals with the teaching and dissemination of those farming techniques developed in accordance with the advancement of soil surveys and research and also with the training of farming techniques, new soil analysis techniques and other advanced technologies with training provided for employees of the Center in the first year and subsequently extended to technicians and supervisors of the local agricultural offices and soil laboratories, researchers of agricultural research organizations and leading farmers. The planned contents of the training courses are diverse,

ranging from basic soil science to those equivalent to basic college courses and those on highly advanced technologies. In view of the present Study Team's belief that the suggested courses should be restructured for more practical purposes taking the objectives and actual functions of the Center into consideration, a series of consultations were held and it has been concluded that the new training courses should consist of the theories and practical applications of new soil analysis techniques, farming techniques and advanced technologies.

(5) Contents and Size of Facilities

Based on examination of the personnel plan and facility utilization plan, which were in turn decided on following the review of the organization and functions of the Center, it has been decided that the Center will have 713 employees. In view of the Center's proposed functions, the introduction of two separate buildings, i.e. Main Building and Training and Information Building, has been judged appropriate. The Main Building will house the Research and Survey, ISRIS, Special Projects and Services and the Administration Departments while the Training and Information Building will house the service facilities, including lecture rooms, dormitories and canteen, etc. With regard to the total size of the Center, examination of the basic building plan, in view of personnel allocation, equipment distribution and the equipment utilization plan finds that some 11,500m^2 should be sufficient for both the Main Building (four stories and semi-basement in part) and the Training and Information Building (three stories).