Japan International Cooperation Agency
Bureau of Plant Industry
Department of Agriculture
Republic of the Philippines

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF
THE NATIONAL MONITORING PROGRAM ON
PESTICIDE RESIDUE IN AGRICULTURE AND THE ENVIRONMENT AND
PESTICIDE FORMULATION
IN
THE REPUBLIC OF THE PHILIPPINES

September 1994

The Consortium of
Yokogawa Architects & Engineers, Inc. and
Overseas Merchandise Inspection Co., Ltd.

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a basic design study on the project for improvement of the national monitoring program on pesticide residue in agriculture and the environment and pesticide formulation in the Republic of the Philippines and entrusted the study to the Japan International Cooperation Agency (JICA).

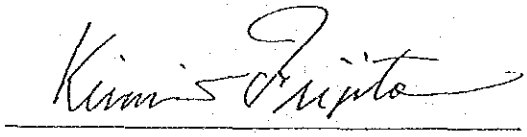
JICA sent to the Philippines a study team (phase 1) headed by Mr. Teizo Igarashi, Deputy Managing Director of Grant Aid Management Department, JICA, and constituted by members of the consortium of Yokogawa Architects & Engineers, Inc. and Overseas Merchandise Inspection Co., Ltd. from January 31 to February 22, 1994. JICA then sent a phase 2 study team headed by Mr. Shigetaka Saburi, Director, Second Inspection Division, Agricultural Chemicals Inspection Station, Ministry of Agriculture, Forestry and Fisheries and constituted by members of the same consortium, from May 11 to June 4, 1994.

The team held discussions with the officials concerned of the Government of the Philippines, and conducted field surveys at the study areas. Then, a mission was sent to the Philippines in order to discuss a draft report, and as a result, the present report was furnished.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the teams.

September 1994



Kimio Fujita
President
Japan International Cooperation Agency

September 1994

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

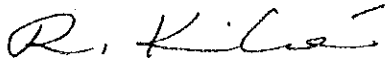
We are pleased to submit to you the basic design study report on the project for improvement of the national monitoring program on pesticide residue in agriculture and the environment and pesticide formulations in the Republic of the Philippines.

This study was conducted by the consortium of Yokogawa Architects & Engineers, Inc. and Overseas Merchandise Inspection Co., Ltd., under a contract to JICA, during the period from January 27 to September 26, 1994. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of the Philippines and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Agriculture, Forestry and Fisheries. We would also like to express our gratitude to the officials concerned of the Bureau of Plant Industry, Department of Agriculture, the JICA Manila Office, and the Embassy of Japan in the Philippines for their cooperation and assistance throughout our field surveys.

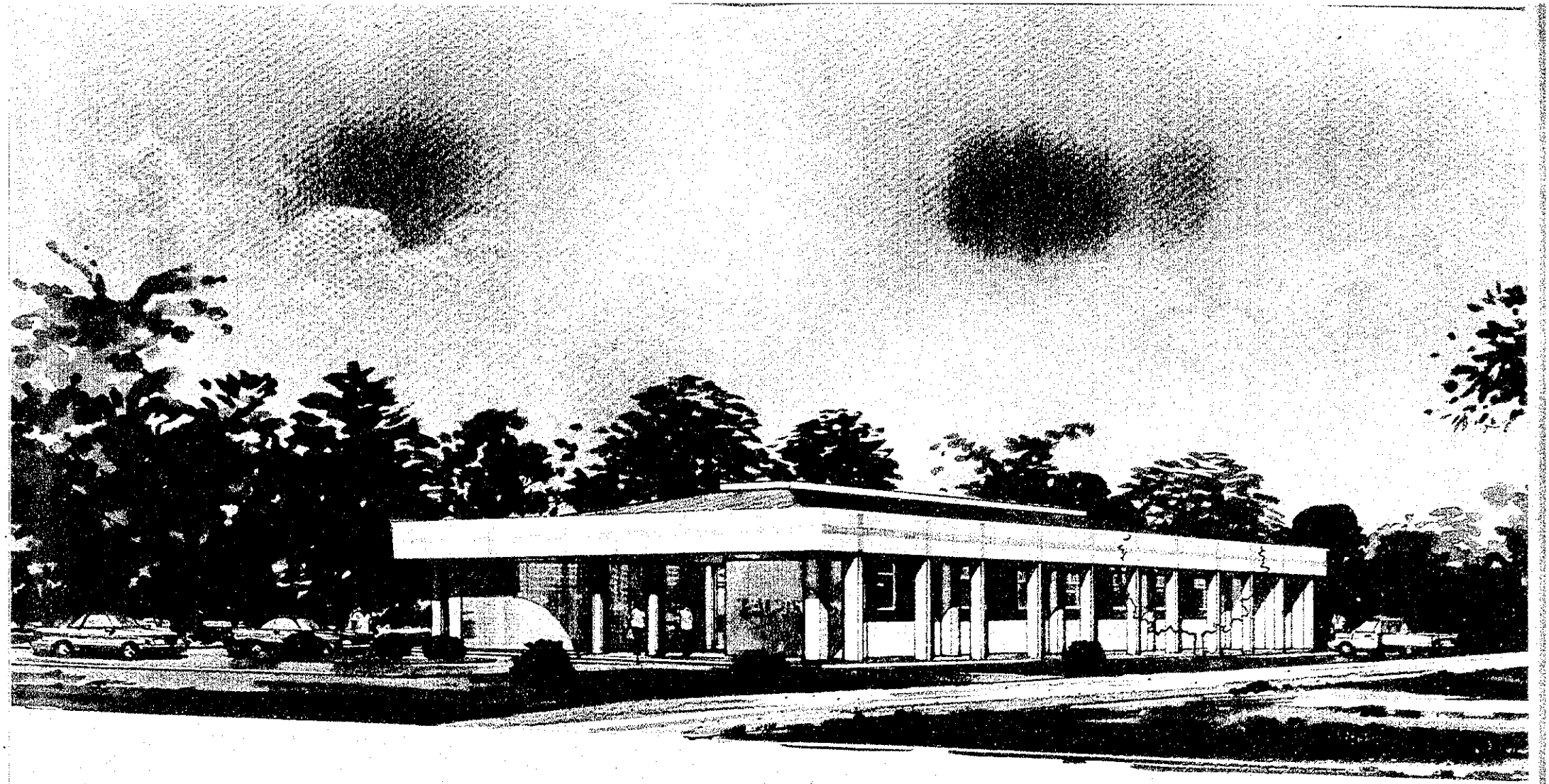
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

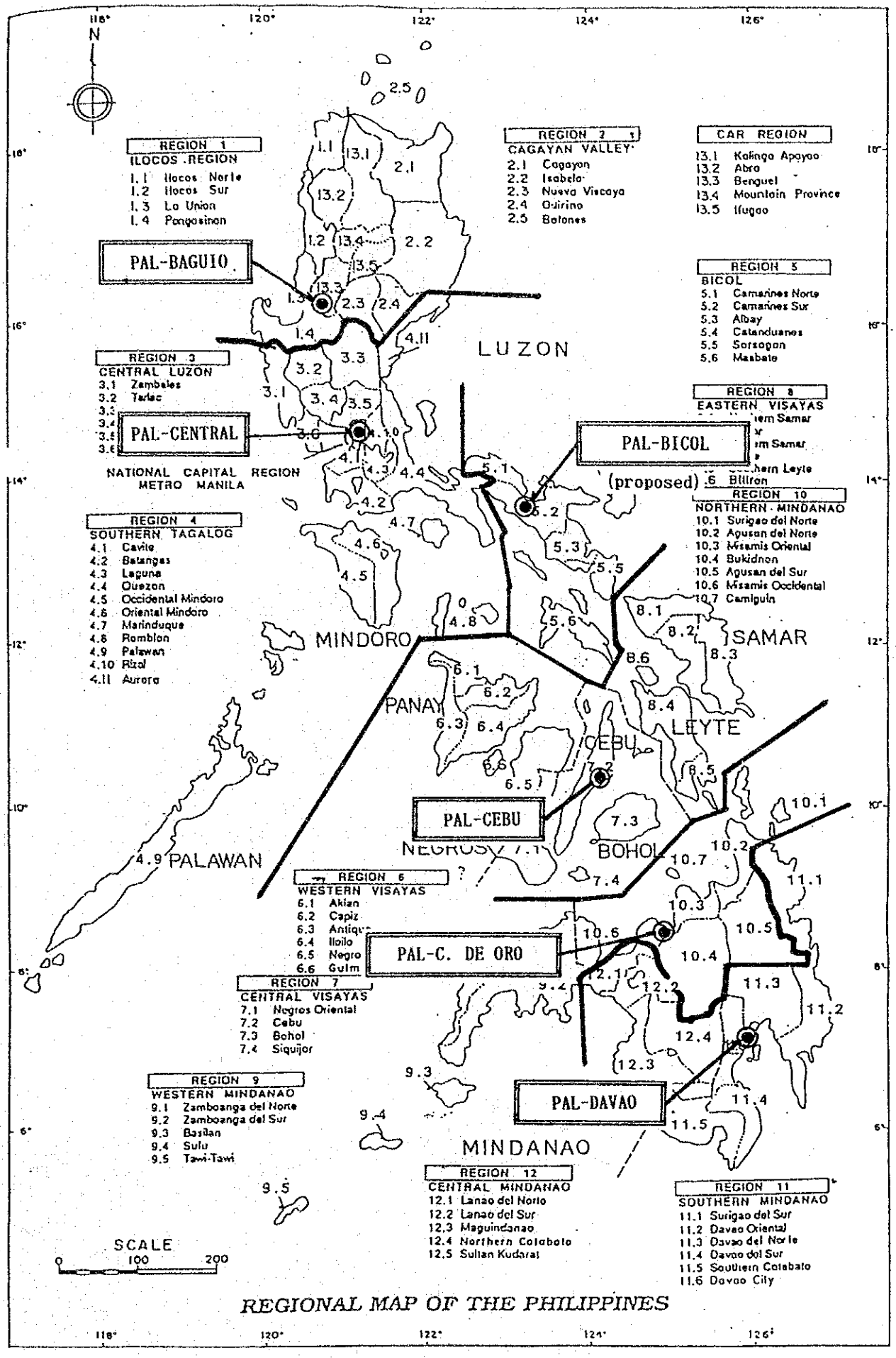


Ryoichi Kibe
Project Manager
Basic design study team on
the project for improvement of the
national monitoring program on pesticide
residue in agriculture and the
environment and pesticide formulation
The Consortium of
Yokogawa Architects & Engineers, Inc. and
Overseas Merchandise Inspection Co., Ltd.

PAL-CENTRAL PERSPECTIVE



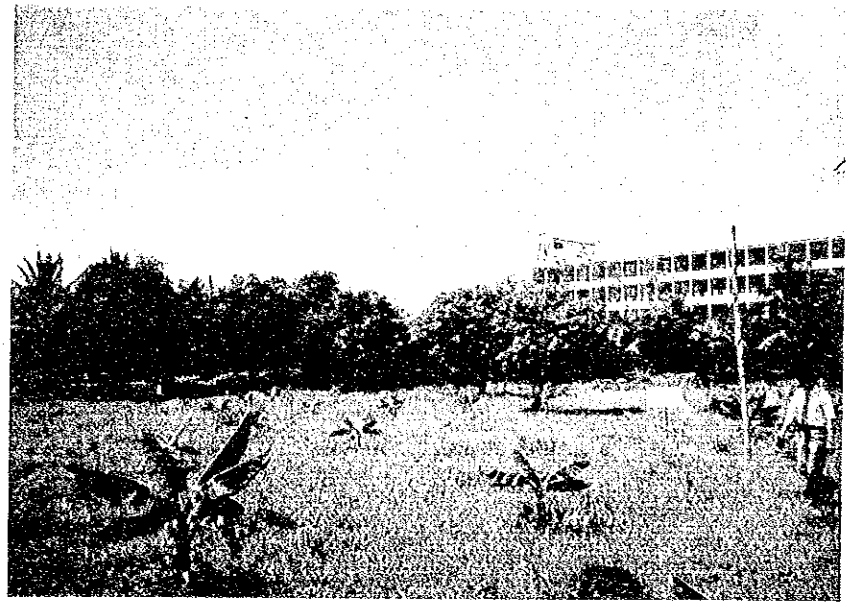
PAL-DAVAO PERSPECTIVE



REGIONAL MAP OF THE PHILIPPINES

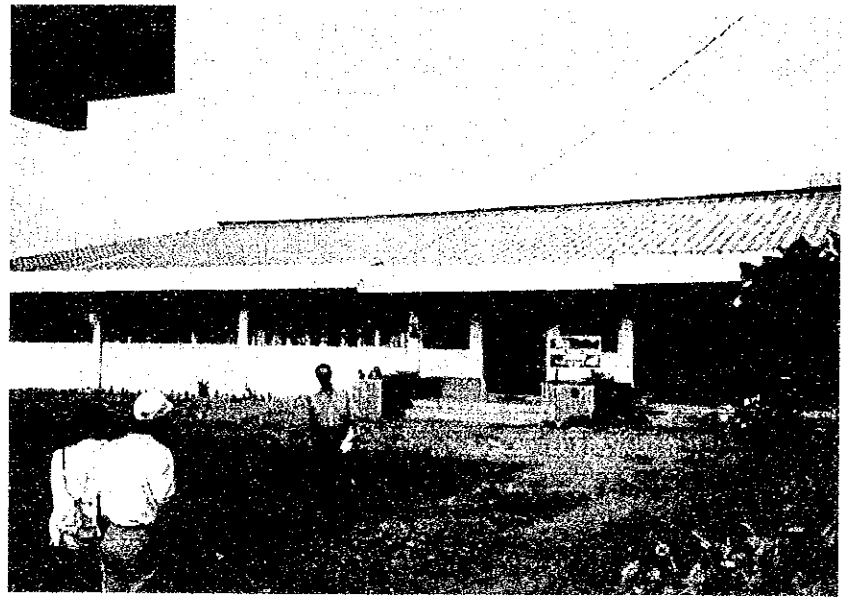
LOCATION OF PALS

REFERENCE PHOTO-1



PAL-CENTRAL SITE
(FROM NORTH TO SOUTH)

PAL-DAVAO SITE
(FROM NORTH COMPOUND ROAD)

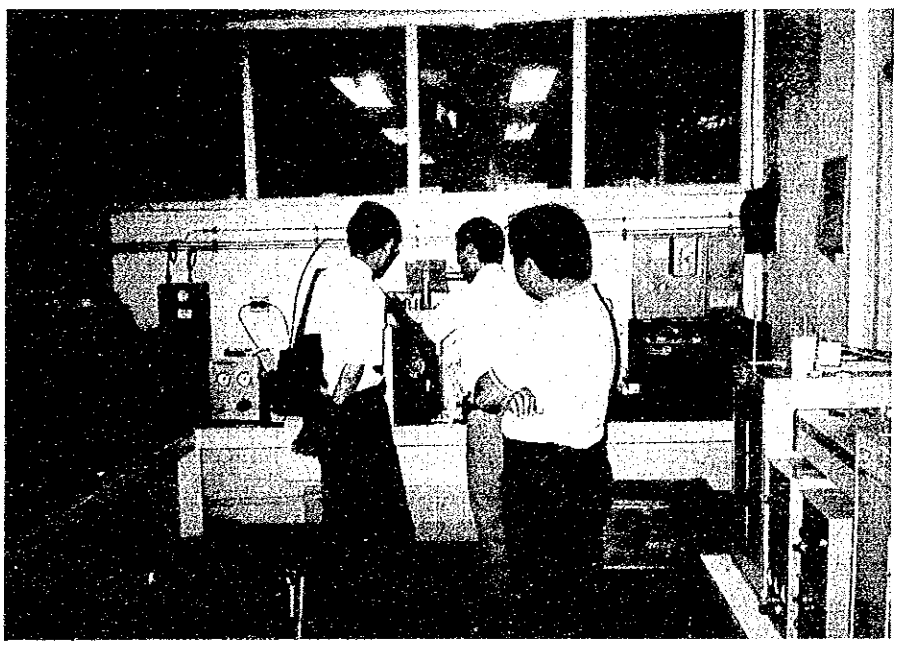


PAL-BICOL
(BUILDING PROPOSED
FOR PAL-BICOL)

REFERENCE PHOTO-2

EXISTING PAL-CENTRAL
(OVERVIEW)

EXISTING PAL-CENTRAL
(EXTRACTION/CLEAN-UP ROOM)



EXISTING PAL-CENTRAL
(INSTRUMENT ROOM)

REFERENCE PHOTO-3

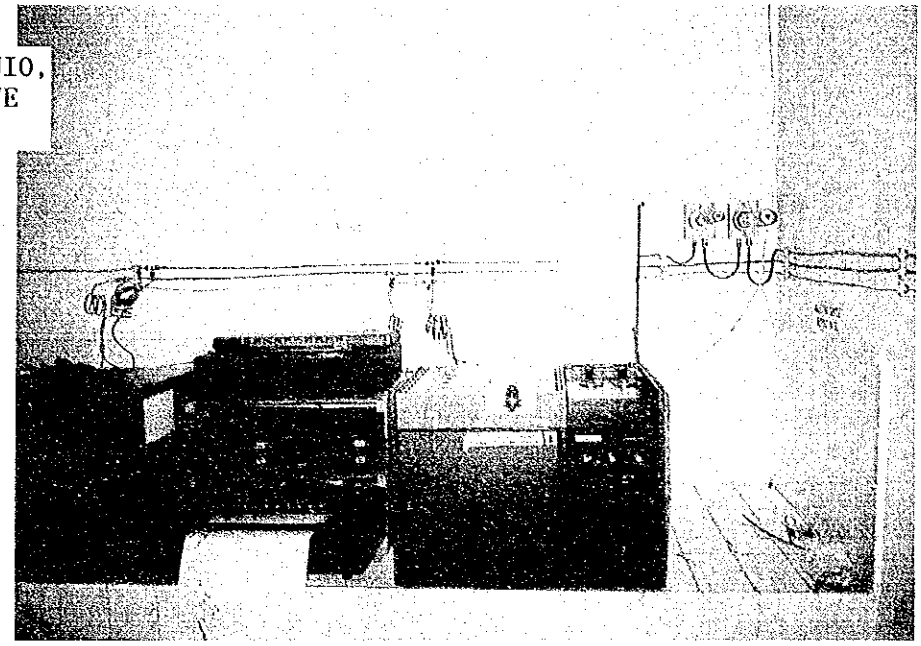
EXISTING PAL-DAVAO
(OVERVIEW)

EXISTING PAL-DAVAO
(EXTRACTION/CLEAN-UP ROOM)

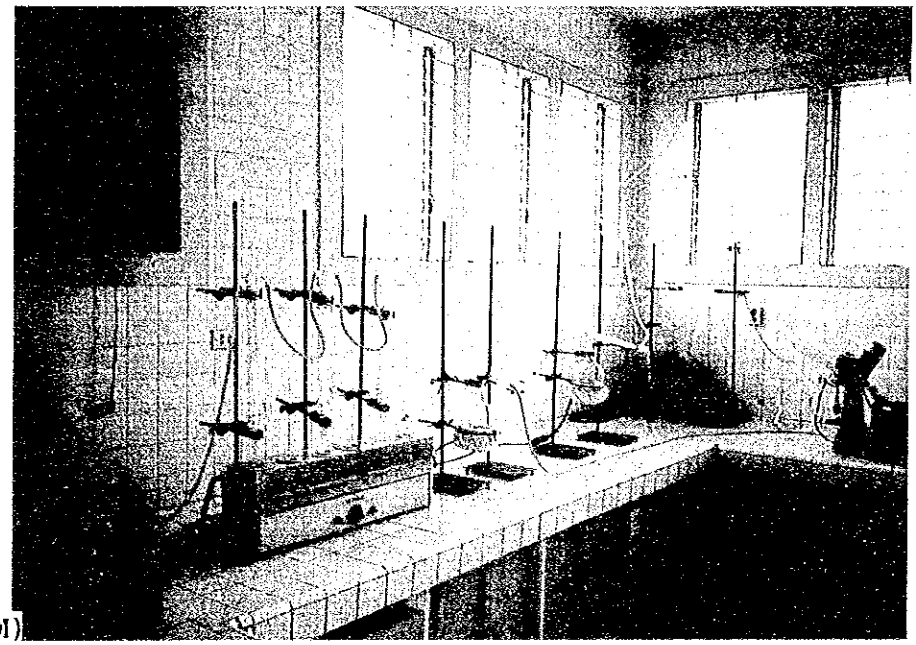
EXISTING PAL-DAVAO
(INSTRUMENT ROOM)

REFERENCE PHOTO-4

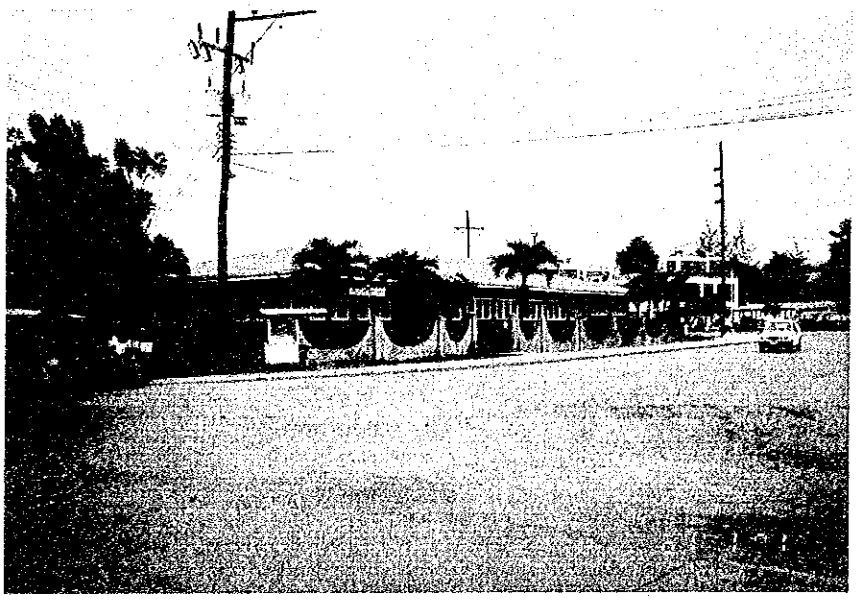
THREE SATELLITES IN BAGUIO, CEBU AND CAG. DE ORO HAVE THE SAME FLOOR PLAN.



PAL-BAGUIO
(INSTRUMENT ROOM)



PAL-CEBU
(EXTRACTION/CLEAN-UP ROOM)



PAL-CDO (OVERVIEW)

SUMMARY

SUMMARY

Looking at the national economy of the Republic of the Philippines, agricultural production has an important role in the industry, sustaining 22.8% of GDP. The agriculture, forestry and fisheries sector accounts for 45.2% of the total employed population of 22.53 million as of 1990. Among the main crops, the Philippines has been continually attempting to raise its self sufficiency rate for rice production, which is the staple diet of the country. A high-yield rice was introduced in the 1970s to improve the productivity of rice per unit area. However, this kind of rice was found to be susceptible to pest infestations, which resulted in indiscriminate usage of pesticides. The usage of pesticides in the Philippines has shown a rapid increase in recent years to protect crops from pests and diseases. Insecticides and fungicides are predominantly used pesticides, and the use of herbicides is also increasing.

With regard to this expansion of pesticide usage, Presidential Decree (PD) No. 1144 was issued in 1977, which abolished the then Fertilizer Industry Authority and formulated a new authority, Fertilizer and Pesticide Authority (FPA). PD 1144 states that all pesticides and chemical fertilizers for import/export, production, formulation/processing, storage, distribution and sales must be approved and registered by the FPA. Further to this, all the dealers must have certificates of FPA authorization. Accordingly, the FPA is authorized to administer the proper distribution and usage of pesticides. The FPA is also responsible for establishing the allowable residue tolerance level, together with its enforcement. The Pesticide Analytical Laboratories (PALs), under the Bureau of Plant Industry (BPI), the Department of Agriculture (DA), have been conducting the monitoring of pesticide residues and formulations, together with supporting the FPA with the scientific data necessary for their administration of pesticide control.

Presently, a central laboratory is located in the compound of the BPI Headquarters, and there are four satellite laboratories in Baguio, Cebu, Cagayan de Oro and Davao. According to the research on pesticide residues in crops completed in PALs, a species of pesticide was detected in 66.9% of the total samples analyzed in 1990, but this figure decreased year by year, and was reading 0.6% in 1993. This is largely due to intensified guidance regarding the correct usage of pesticides. However, the problem remains that the number of commodities analyzed does not increase as much as that of pesticide sales. PALs analyzed about 100 formulations in 1991 and 1992

respectively. They found that more than half of the examined products had different ingredients from that stated on the attached labeling. The quality control of pesticide formulations is another important role of PALs.

The Philippines does not have its own criteria for permissible pesticide residues, and the Maximum Residue Level (MRL) established in the Codex Alimentarius, recommended by FAO/WHO, are currently used as the temporary standards. There is urgent necessity for developing the Philippine's own MRL, suitable to its climate and dietary customs, etc.

Problems concerning the usage and distribution of pesticides in the Philippines, or the guidance and inspections may be summarized into the following categories:

(1) Incomplete observance of the Directions for Safe Usage of Pesticides
(2) Distributions of false and/or adulterated pesticides
(3) Inadequate enforcing power against indiscriminate usage of pesticides
(4) Slow increase in the quantity of analyzed commodities.

In 1988, the DA created an Ad Hoc Committee, in response to recommendations from the Asian Development Bank (ADB), which formulated practical guidelines to establish a monitoring system of pesticide residues. The Committee submitted a report referring to the intensification of PALs through the renewal and upgrading of its facilities and equipment. While there are growing demands for the improvement of the monitoring system of pesticide residues and for the establishment of MRL suitable to the Philippines, the current capability of PALs is inadequate to provide analysis data required to support these activities. In these circumstances, the Government of the Philippines has requested Grant Aid from the Government of Japan for construction of PAL facilities and supply of equipment.

The request for Grant Aid from the Government of the Philippines has stated immediate objectives and development objectives for the project. The immediate objectives are as follows:

(1) To generate baseline data from research together with the existing CODEX MRL, and to develop the national MRL for the Philippines,
(2) To monitor pesticide residues and formulations in agriculture and the environment to ensure proper implementation.

The development objectives are as follows:

(1) To establish a new Central Laboratory and new satellite laboratories in Bicol and Davao,

(2) To provide new equipment for both the new laboratories and the existing satellite laboratories in Baguio, Cebu and Cagayan de Oro (CDO).

Upon completion of the project, PALs will be concerned with the operation programs, which may be summarized as follows:

(1) Analysis of pesticide residues and quality of formulations

(2) Research and examinations of pesticides

(3) Training, seminars and educational campaigns relevant to pesticide residues and correct usage of pesticides

These operation programs are set in order to achieve the following goals:

(1) Development of an effective national network of pesticide residue monitoring

(2) Education with regard to the proper usage of pesticides, and their hazardous effects to human health and to the environment

(3) Establishment of the Philippines' own MRL

The following shows the major facilities and equipment which are stated in the request proposal. New laboratory buildings will be constructed for PAL-Central, PAL-Davao and PAL-Bicol.

The request for equipment is to supply the following equipment to the above-mentioned new laboratories and the existing three satellites.

(1) Equipment for sample collection

(2) Equipment for sample storage

(3) Equipment for sample extraction

(4) Equipment for sample processing

(5) Equipment for sample analysis

(6) Equipment for electrical power supply

(7) Laboratory furniture and fittings

(8) Others

In response to the request, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team (Phase 1) to the Philippines between the dates of January 31 to February 22, 1994. The study results and replies to the questionnaire were further analyzed in Japan, and compiled into an interim report. JICA then dispatched a Basic Design Study Team (Phase 2), for the period from May 11 to June 4. Following the basic

design study, the appropriateness of the plan, its scope, construction period and other elements of the project were examined; the conclusion is contained in the Basic Design Study Report (Draft Final Report). A team was sent to the Philippines to explain the report from July 31 to August 6. The Draft Final Report was presented to and discussed with the people of the Philippines, who were concerned with this project.

This project will enhance the capability of PALs for an efficient data development, and will contribute to the governmental policies on pesticide control under the initiative of the FPA with the supply of scientific analysis data.

PALs' activities to be enhanced by this project will be as follows:

(1) Analysis of pesticide residues in crops collected through market basket sampling
(2) Pesticide residue analysis upon commission (including analysis of samples for environment monitoring)
(3) Analysis of pesticide formulations
(4) Examination of residual levels in crops to provide basic data for developing pesticide residue tolerance levels
(5) Research and study of concentration and decomposition of pesticides
(6) Training of PALs' staff and outside people
(7) Structuring of the pesticide data bank

The total quantity of analysis to be conducted at all PALs will be expanded from the current 2,400 samples to over 11,300. The first request proposal included biological efficacy testing in PAL's activities. It was agreed upon with the BPI that this testing should come under the responsibilities of the BPI's Crop Protection Division, and will not be included in this project.

Review of the request and PALs' operation programs as well as discussions with the Philippine authorities concerned during the two basic design study missions, have been compiled into the following facility and equipment plan.

The project facilities will be a new PAL-Central with floor area of 2,638.10 m^2 and a new PAL-Davao with 430.25 m^2. Considering that PAL-Bicol will be a new laboratory, and its technical staff will be all new employees, it is difficult to expect this satellite will function with the same capability as the other satellites. Therefore, similar to PAL-Davao, it is regarded to be more appropriate to start PAL-Bicol from a small but

practical laboratory size, accommodated in an existing building, with upgraded equipment, and to expand its function gradually in the future. With regard to the construction sites, the site for PAL-Central is located in the Nursery of the BPI Compound, Diliman, Quezon City. The proposed PAL-Davao site shares part of the Davao National Crop Research and Development Center (DNCRDC). These two sites are fully equipped with infrastructure systems, and have a good environment for laboratories. The following table shows general composition of facilities considered in this project.

Facilities	Rooms	Floor Area
PAL-Central		2,270.38 m^2
1. Main Building	Pesticide residue monitoring unit rooms Formulation analysis unit rooms Administration and training rooms, etc.	
2. Annex	Electric room, Pump room, Garage, Storage room, etc.	286.72 m^2
3. Green house		81.0 m^2
	Sub-total	2,638.10 m^2
PAL-Davao	Pesticide residue monitoring rooms, Electric room, Garage, etc.	430.25 m^2
	Total	3,068.35 m^2

Equipment for pesticide analysis will be considered primarily, and that for training purpose will be selected according to its necessity. Furniture necessary for analysis work will also be provided. Gas chromatographs and high performance liquid chromatographs as the principal instruments are practical and appropriate selection in terms of future maintenance and operation, as PALs are familiar to these instruments. Principal instruments scheduled for each PAL are as follows:

Equipment	PAL Ctrl	Baguio	Cebu	CDO	Davao	Bicol	Total
Sample collection	1	1	1	1	1	1	6
Sample storage	6	2	2	3	4	3	20
Sample extraction	16	7	4	5	7	6	45
Sample processing	52	20	16	13	23	19	143
Sample analysis	18	7	7	7	7	5	51
Electrical power supply	0	1	1	1	0	1	4
Lab. furniture, fittings & others	193	10	14	14	52	37	320
Total	286	48	45	44	94	72	589

At present, PAL-Central, PAL-Baguio and proposed PAL-Bicol directly belong to the BPI, while the satellites in Cebu, Cagayan de Oro and Davao receive technical support from the BPI but belong to DA's Regional Offices in terms of budgets and personnel assignment. The BPI has received approval from the DA regarding the BPI's direct management of all PALs, both in terms of engineering and administration.

After all PALs belong to the BPI in 1996, the budgets will be allocated through PAL-Central to each PAL in proportion with its activities. The budget plan until the year 2000 has been compiled. The budget for personnel costs with additional 28 staff are to be accounted from 1996. An application for a supplementary budget for management and operation expenses is planned for the expected increase of analysis work after the project completion.

In the PALs' personnel plan, a precision equipment engineer is to be assigned at PAL-Central, who will commute among the five satellites in order to maintain and repair the laboratory equipment. PAL-Central will entrust its facility maintenance to the engineering division in the BPI. A civil engineer from the engineering division will visit the satellites regularly. The total operation costs for the year 1996, after the completion of the project, is estimated to be 9,352,000 pesos per year.

All required work will be completed within two years; construction of PAL-Central and PAL-Davao buildings and installation of major analytical equipment in the first year, and installation of equipment at the other satellites and installation of equipment for training and data management at PAL-Central in the second year. The construction period in the first year will be approximately 11 months. The construction work at PAL-Central and PAL-Davao will progress at the same time. The equipment installation period is expected to be six months, in accordance with the progress of construction work. In the second year the equipment installation period is to be about 7.5 months. The project cost to be borne by the Philippines is estimated at approximately 3.94 million pesos.

The enhancement of PALs' activity by facility construction and equipment supply in this project will enable efficient accumulation of more accurate and reliable data of pesticide residues and formulations. A national system will be established to support the following policies for the purpose of effective pesticide management.

(1) Intensive monitoring of crops distribution and pesticide residues through the enhancement of analysis capability
(2) Efficient testing of pesticide residues in crops to create basic data for the development of the Philippines' own MRL
(3) Strict control of false or adulterated pesticide formulations
(4) Promotion in the direction for safe usage, taking the present circumstances in the Philippines into consideration

Accordingly, this project is expected to be beneficial in the following fields:

(1) Safe food supply and health of the Filipino nation as a result of intensive monitoring of pesticide residues in crops
(2) Improvement in standards of living as a result of intensive monitoring of pesticide residues in the environment
(3) Safety of the farmers during pesticide diffusion

Beneficiaries of (1) and (2) will be the entire Filipino nation, and the farmers will be beneficiaries of (3). The DA is extremely concerned with the intensification of the monitoring system for safe food supply and establishment of the national MRL. This project will assist the DA in achieving these objectives. Past records show that the BPI is very experienced in pesticide residue monitoring and formulation analysis, and has no difficulties in implementing the project and in the general management afterwards. This project is therefore well worth considering through Grant

Aid from Japan, with considerable benefit thereby engendered. A request proposal for project-type technical cooperation to PALs has been submitted to the Government of Japan, and it is now under consideration.

The following recommendations are presented for the implementation of the project as well as the smooth and effective operation of PALs to attain their ultimate goals.

(1) Adequate budget and personnel planning
(2) Collaboration and coordination among governmental authorities and other institutions concerned with the establishment of the Philippines' own MRL
(3) Cooperation with the DA's Regional Integrated Agricultural Research Centers in each region
(4) Establishment of a project construction committee in the BPI for smooth progress during the implementation of the project.
(5) Prompt completion of the works under the responsibility of the Government of the Philippines during the implementation of the project.

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[ANNEX]

[BASIC DESIGN DRAWINGS]

ABBREVIATIONS

ADB	Asian Development Bank
ADI	Acceptable Daily Intake
AOAC	Official Methods of Analysis of the Association of Official Analytical Chemists, 13th ed. 1980
ATI	Agricultural Training Institute of the Philippines
AVR	Automatic Voltage Regulator
BFAD	Bureau of Food and Drug
BPI	Bureau of Plant Industry
BNCRDC	Baguio National Crop Research & Development Center
CA	College of Agriculture
CPAP	Crop Protection Association of the Philippines
CPH	College of Public Health
DA	Department of Agriculture
DEOH	Department of Environment and Occupational Health
DOH	Department of Health
DOST	Department of Science and Technology
DNCRDC	Davao National Crop Research & Development Center
ECD	Electron Capture Detector
EMB	Environmental Management Bureau
FAO	Food and Agriculture Organization
FDC	Food Development Center
FNRI	Food and Nutrition Research Institute
FPA	Fertilizer and Pesticide Authority
FPD	Flame Photometric Detector
GC	Gas Chromatography
GC/MS	Gas Chromatography-Mass Spectrometry
GDP	Gross Domestic Products
HPLC	High-Performance Liquid Chromatography
IADCCO	International Agricultural Development Cooperation Coordinating Office
IPM	Integrated Pest Management
LSD	Laboratory Service Division
MRL	Maximum Residue Limit
NCRDC	National Crop Research & Development Center
NCPC	National Crop Protection Center
NEDA	National Economic and Development Authority

NFA	National Food Authority
NOE	Non-Observed Effect Level
NPD	Nitrogen Phosphorus Detector
PAC	Program Advisory Council
PAL	Pesticide Analytical Laboratory
PD	Presidential Decree
PMC	Program Management Council
PTAC	Pesticide Technical Advisory Committee
PTC	Program Technical Committee
RIARC	Regional Integrated Agricultural Research Center
SOP	Standard Operation Procedure
UP	University of the Philippines
UPS	Uninterruptible Power Supply
WHO	World Health Organization

CHAPTER 1

BACKGROUND OF THE REQUEST

CHAPTER 1 BACKGROUND OF THE REQUEST

1. Background of the Request

In recent years, the Government of the Philippines has been continually attempting to raise the yield of agricultural products in order to supply the increasing population. High yielding rice and new agricultural technology has been introduced to augment the productivity, however, this has resulted in the rapid increase of pesticide usage, which has sometimes caused indiscriminate or improper usage. A large portion of pesticides in the Philippines are imported products. The pesticide importation has increased substantially in the 1980s, in accordance with the expansion of pesticide usage, which accounted for 16,000 tons in 1987. In particular, import of fungicides for fruits and vegetables has quintupled during the seven years from 1980.

The Pesticide Analytical Laboratories (PALs), which were established by the Bureau of Plant Industry (BPI) under the Department of Agriculture (DA), conduct monitoring of pesticide residues and formulations, together with supporting the Fertilizer and Pesticide Authority (FPA) with scientific data necessary for the FPA's administration of pesticide control. Today there is a central laboratory in the compound of the BPI Headquarters in Manila, and there are four satellite laboratories in Baguio, Cebu, Cagayan de Oro and Davao. PAL-Central was founded in 1976, and the three satellites, with the exception of PAL-Davao, in 1984. All the facilities were financed by a donation program of the Government of the former West Germany, namely the RP-German Crop Protection Strengthening Program. PAL-Davao was situated by the DA in its Davao National Crop Research and Development Center (DNCRDC) compound in 1988, with major laboratory equipment being transferred from PAL-Central. The RP-German Crop Protection Strengthening Program was completed in March 1987. The equipment installed during that project has been situated in PAL-Central for over 18 years, and 10 years in the satellites without adequate maintenance or renewal. Most of the equipment needs improvement for efficient analysis. The satellites whose gas chromatographs are not in operation conduct sample preparation, and dispatch the samples to either PAL-Central or PAL-Cagayan de Oro for analysis. The analysis capabilities of these satellites have reached capacity.

The DA created an Ad Hoc Committee in 1988, in response to recommendations from the Asian Development Bank (ADB), which formulated practical

guidelines to establish the monitoring system of pesticide residues, and investigated PALs' functions. The Committee submitted a report referring to the intensification of PALs through the renewal and updating of their facilities and equipment.

In 1990, the BPI completed examinations of pesticide residual levels in crops with the FAO's assistance, which were compiled and presented as "A Terminal Report on Contaminations of Foods Found in the Philippines in 1990." The purpose of FAO's support is the monitoring of pesticide residues, comparison with the Maximum Residue Limits (MRL) of the Codex Alimentarius, and the accumulation of data for the prompt development of the Philippines' own MRL.

While there are growing demands for the improvement of the monitoring system of pesticide residues and for the establishment of MRL suitable to the country, the current capability of PALs is inadequate to provide analysis data required to support these activities. In these circumstances, the Government of the Philippines has requested Grant Aid from the Government of Japan for construction of PAL facilities and supply of equipment.

Following the request for Grant Aid, the Government of the Philippines has requested project-type technical cooperation in the names of BPI and FPA through the National Economic and Development Authority (NEDA). This request situates Grant Aid as the first stage and the technical cooperation as the second stage of this project; that is, the technical cooperation is to enhance the capability of PALs after their facilities and equipment are upgraded through Grant Aid. It aims to support PALs to accumulate analysis data and the FPA to utilize the data for its administration of pesticide control. In other words, it is the objective of the technical cooperation to take the maximum advantage of Grant Aid.

The request for technical cooperation referred to a cooperation period for five years from October 1993 (extendable). Considering that this request was compiled in September 1990, the technical cooperation period should be reread as five years from April 1996, in correspondence with the Grand Aid schedule.

Six experts are requested; three for pesticide residue monitoring, one for formulation analysis and two for pesticide registration/legal regulations. With regard to staff training, it is requested that each year two persons will take training in pesticide residue monitoring or formulations analysis, which will make 10 persons in total during the technical cooperation period.

2. Outline of the Request

The first request for Grant Aid was prepared in 1991, and it was slightly modified three times later. This section summarizes the latest version of the request made in December 1993.

2-1 Objectives of the Request

The request from the Government of the Philippines stated immediate objectives and development objectives of the project. The immediate objectives, concerning agricultural administration, are as follows:

(1) To generate baseline data from research together with the existing CODEX MRL, and to develop the national MRL for the Philippines
(2) To monitor pesticide residues and formulations in agriculture and the environment to ensure proper implementation.

The development objective, referring to more specific contents of the project, are as follows:

a. To establish a new Central Laboratory and new satellites in Bicol and Davao.
b. To provide new equipment for both the new laboratories and the existing satellite laboratories in Baguio, Cebu and Cagayan de Oro.

2-2 Implementing Agency

The Department of Agriculture (DA) in the Government of the Philippines has presented the project request, and the Bureau of Plant Industry (BPI) is the project implementation agency. When the building construction and equipment supply is completed, PAL-Central together with the satellites will be concerned with operation programs for the project.

2-3 PALs' Activities

PALs will provide the following services when their facilities and equipment are improved.

(1) Analysis of pesticide residues and quality of formulations
(2) Research and examinations of pesticides
(3) Training, seminars and educational campaigns relevant to pesticide residues and proper usage of pesticides

These activities are set to achieve the following political thrusts as confirmed during the Basic Design Study (Phase 1).

a. Development of an effective national network of pesticide residue monitoring
b. Education with regard to the proper usage of pesticides and their hazardous effects to human health and in the environment
c. Establishment of the Philippines' own MRL

2-4 Requested Facilities and Equipment

The following facilities and equipment were requested in this project. The reason a new satellite has been requested for Bicol is there is no satellite in Region 5, and PAL-Central currently serves this region. Region 5 is at a considerable distance from Manila. Due to unfavorable road conditions, it is difficult to transport samples promptly.

According to the BPI, six laboratories are necessary for the proposed national monitoring network. Should they give the priority order among them, however, PAL-Bicol might have lower importance than the other five.

The following shows major facilities and equipment stated in the request from the Government of the Philippines.

(1) Buildings

The new PAL-Central and PAL-Davao will be constructed and all the present functions of the existing laboratories will be transferred there. PAL-Bicol will be newly established. The requested floor areas of the three laboratories are as follows:

1) PAL-Central 2,675 m^2
2) PAL-Bicol 420 m^2
3) PAL-Davao 420 m^2

Requested floor plans for each PAL are shown in figure 1-1.

(2) Equipment

The request is to supply the equipment to the above-mentioned new laboratories and to the existing three satellites. Major items are as follows. A list of equipment attached to the request proposal from the Government of the Philippines is shown in table 1-1.

1) Equipment for sample collection (vehicles with refrigerator, etc.)
2) Equipment for sample storage (refrigerators, freezers, etc.)
3) Equipment for sample extraction (blenders, homogenizers, etc.)
4) Equipment for sample processing (balances, distilling apparatus, rotary vacuum evaporators, etc.)
5) Equipment for sample analysis (gas chromatograph, high performance liquid chromatograph)
6) Equipment for electrical power supply (UPS, generator)
7) Laboratory furniture and fittings (laboratory tables, exhaust fans, etc.)
8) Others (AV equipment, computer sets, photocopiers, etc.)

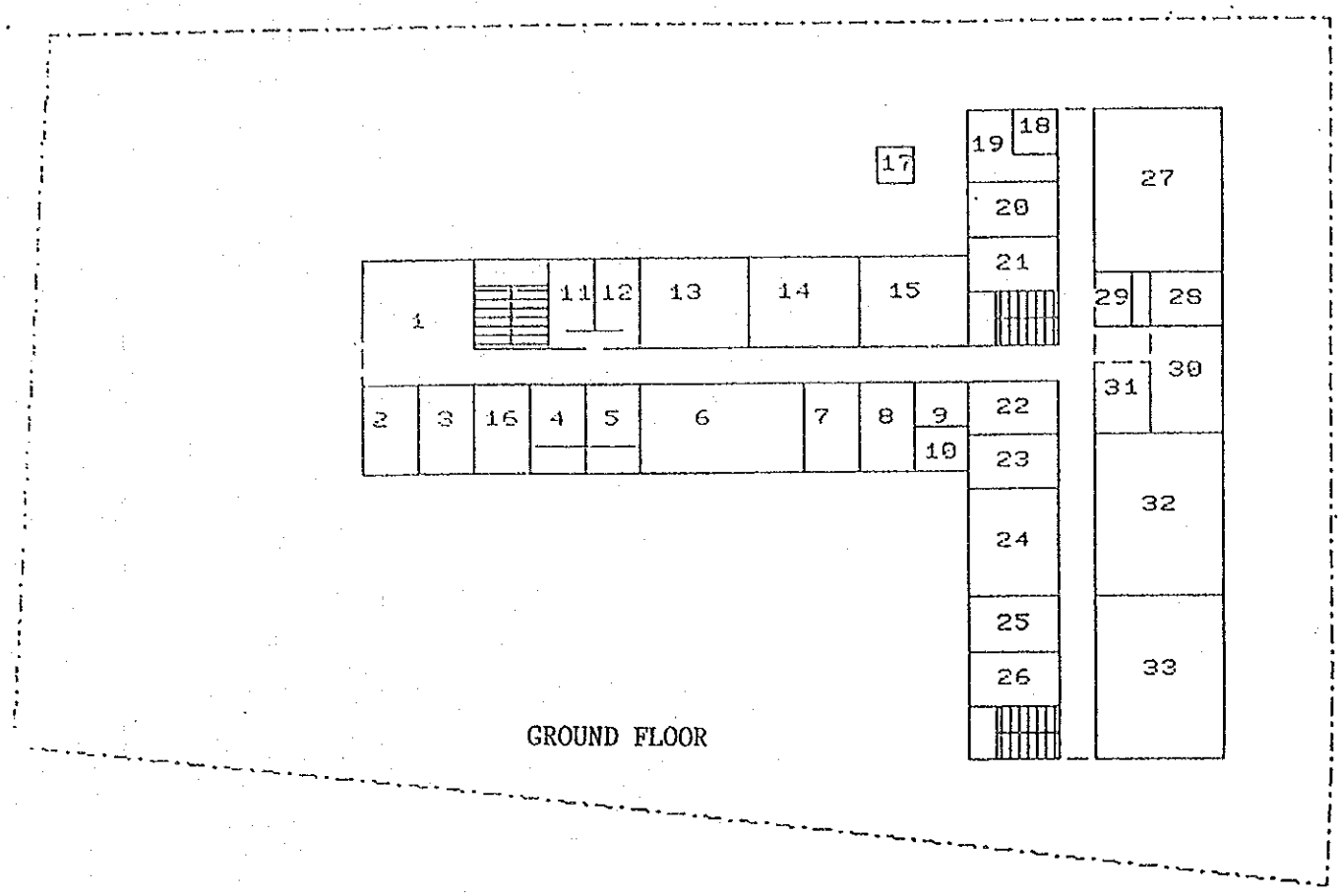
An additional request was made during discussions on the details of equipment in Phase 2 study, to include an atomic absorption spectrometer. Also, more equipment was requested as necessary for sample extraction and processing work.

<MANILA CENTRAL LABORATORY>

1. Entrance Hall	23. Instrument Rm	44. Lab Chief Office
2. Guard Office	24. Instrument Rm	45. Adviser's Office
3. Information Rm	25. Instrument Rm	46. Toilet (M)
4. Locker Rm (M)	26. Gas Cylinder	47. Toilet (F)
4. Shower Rm (M)	27. Experiment Rm	48. Storage Rm
5. Locker Rm (F)	28. Incubation Rm	49. Storage Rm
5. Shower Rm (F)	29. Sterilization Rm	50. Wash Rm
6. Staff Office	30. Distilling Rm	51. Instrument Rm
7. Sr. Staff Office	31. Balance Rm	52. Instrument Rm
8. Sr. Staff Office	32. Experiment Rm	53. Instrument Rm
9. Sample Receiving	33. Experiment Rm	54. Experiment Rm
10. Storage Rm	34. Library	55. Distilling Rm
11. Toilet (M)	35. Locker Rm (M)	56. Balance Rm
12. Toilet (F)	35. Shower Rm (M)	57. Experiment Rm
13. Electricity Receiving	36. Locker Rm (F)	58. Experiment Rm
14. Generator Rm	36. Shower Rm (F)	59. Toilet (M)
15. Water Distilling Rm	37. Staff Office	60. Toilet (F)
16. Pump Rm	38. Senior Staff Office	61. Storage Rm
17. Incinerator	39. Sample Receiving	62. Hall
18. Toilet (M)	40. Cold Rm	63. Preparation Rm
19. Toilet (F)	40. Freezing Rm	64. AV Lecture Rm
20. Storage Rm	41. Toilet (M)	65. Green House
21. Storage Rm	42. Toilet (F)	66. Workshop
22. Wash Rm	43. Meeting Rm	

BUILDING FLOOR	= 2,590 m^2
(GROUND FLOOR)	= 1,095 m^2
(2ND FLOOR)	= 1,095 m^2
(3RD FLOOR)	= 400 m^2
GREEN HOUSE & WORKSHOP	= 85 m^2
TOTAL FLOOR	= 2,675 m^2

Figure 1-1 Requested Floor Plans (1)



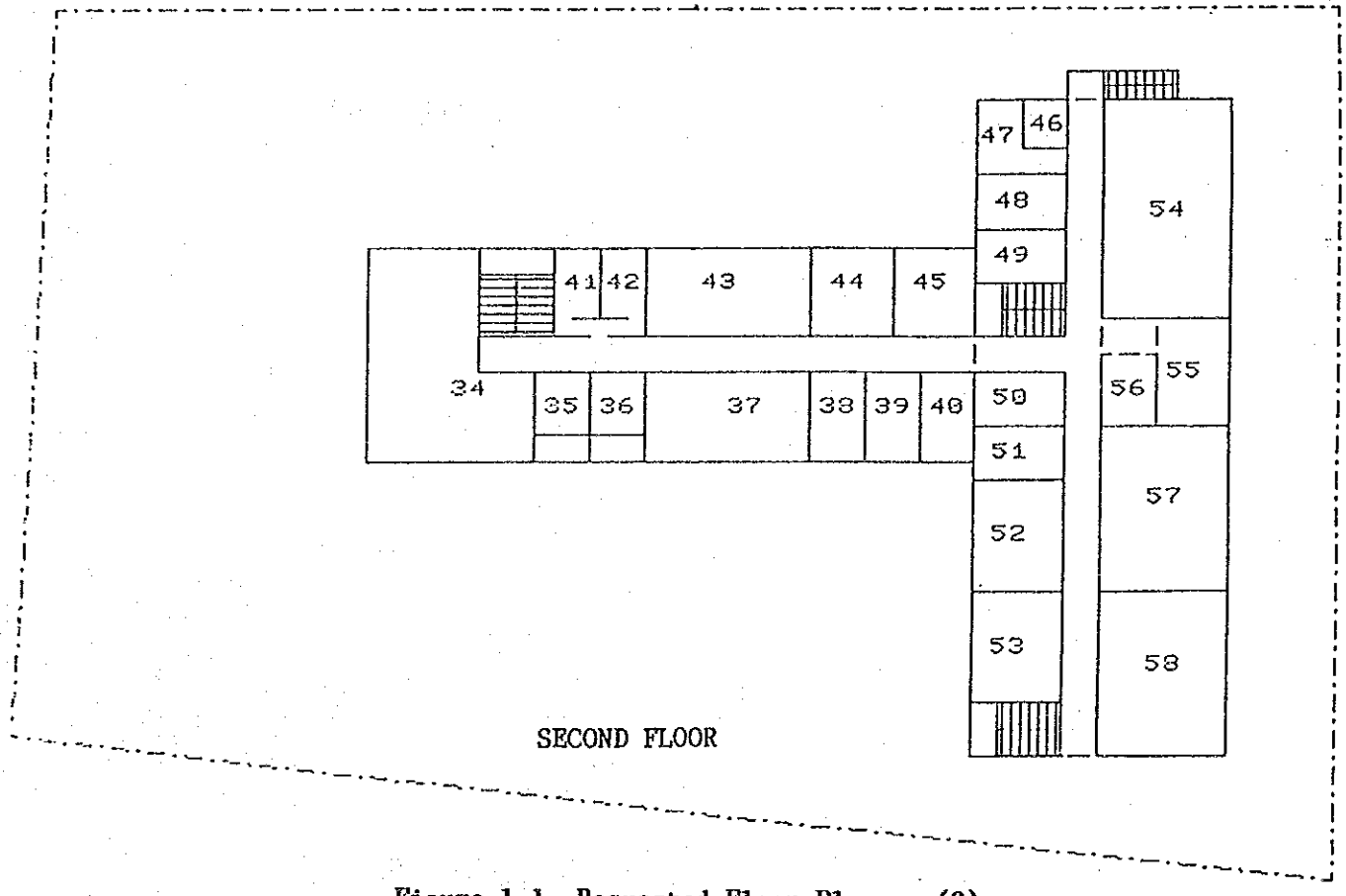


Figure 1-1 Requested Floor Plans (2)

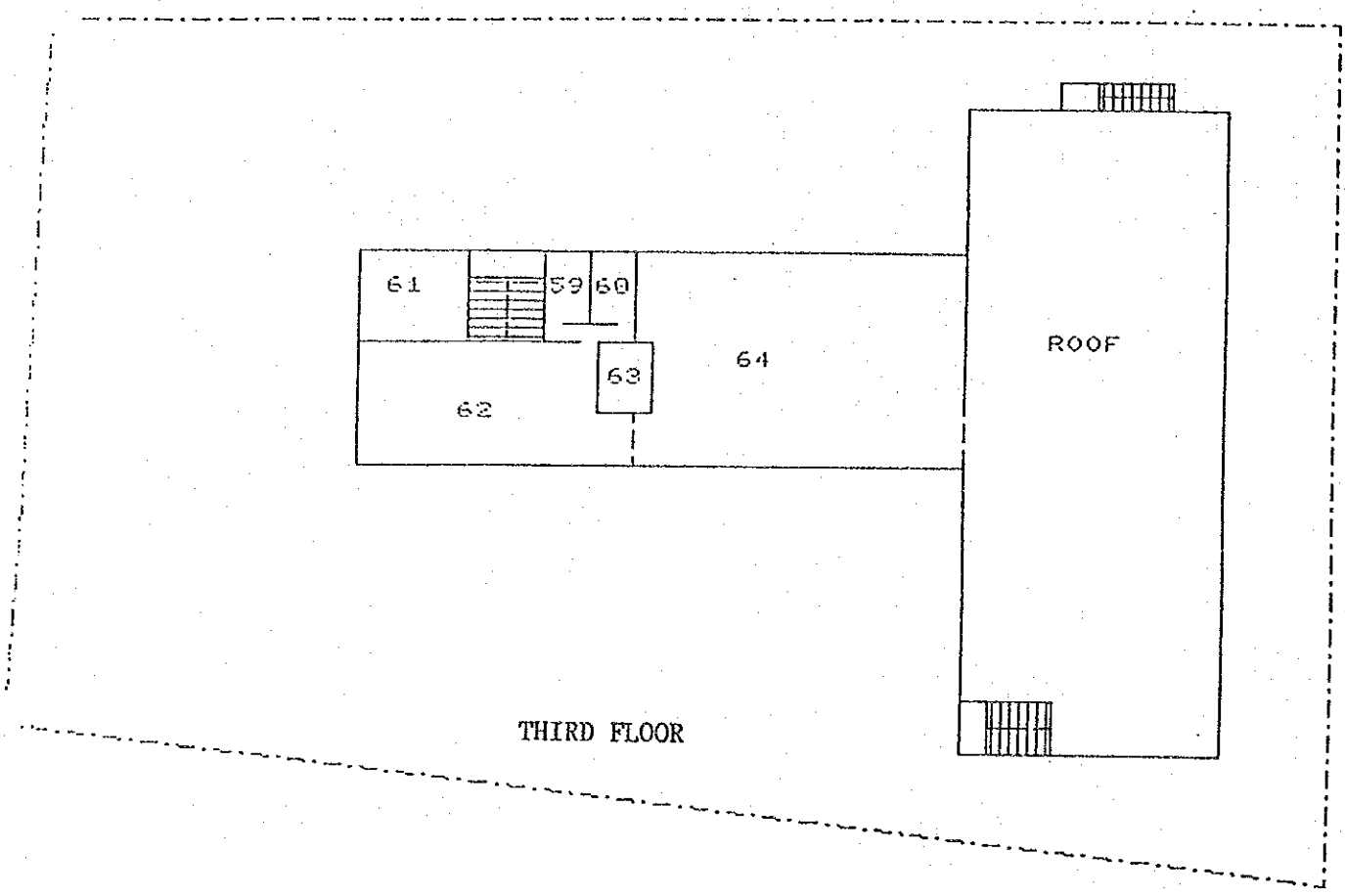
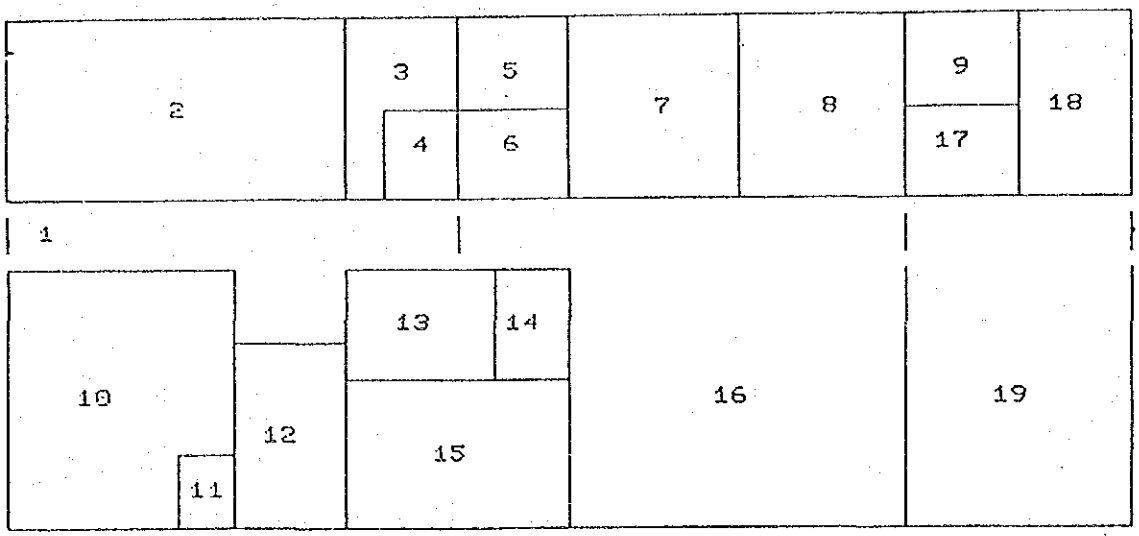


Figure 1-1 Requested Floor Plans (3)



PAL-DAVAO, BICOL

1 : ENTRANCE HALL	7 : INSTRUMENT RM	13 : STORAGE RM
2 : LIBRARY·CONFERENCE RM	8 : INSTRUMENT RM	14 : BALANCE RM
3 : TOILET (M)	9 : GAS CYLINDER RM	15 : DISTILLING RM
4 : TOILET (F)	10 : STAFF OFFICE	16 : EXPERIMENT RM
5 : SHOWER RM	11 : TEAKETTLE RM	17 : FREEZER RM
6 : FREEZER RM	12 : LAB. CHIEF OFFICE	18 : STORAGE RM
		19 : EXPERIMENT RM

BUILDING FLOOR	=	420 m²
RESIDUE SECTION	=	265 m²
STAFF ROOM	=	57 m²
LIBRARY·CONFERENCE RM	=	45 m²

Figure 1-1 Requested Floor Plans (4)

Table 1-1 Requested Equipment and Apparatus (1)

ITEM	Central-PAL	PAL-Baguio	PAL-Cebu	PAL- Cag de Oro	PAL- Bicol	PAL-Davao	Additional request	Total
a. Sample Collection								
Vehicle (4WD) with refrigerator	1	1	1	1	1	1		6
Motorcycle	2	2	2	2	2	2		12
b. Sample storage								
Refrigerator (for std. soln.)	2	1	1	1	1	1		7
Refrigerator (for sample ext.)	2	1	1	1	1	1		7
Freezer			1	1	2	2		6
Freezer (for std. soln.)	1						2	3
Freezer (for sample homogenized)	2							2
Cold Room (-20C) (for samples)	1							1
Cold Room (+5C) (for samples)	1							1
c. Sample Extraction								
Blender	8	3	3	3	3	3		23
Homogenizer	6	2	2	2	3	3		18
Grinder	1			1	1	1		4
Shaker (horizontal/vertical)	3	1	1	1	1	1		8
Shaker (rotary)	1						1	2
Shaker (with water bath)	2	1	1	1	1	1		7
Soxhlet extraction apparatus (6 ports)	2	1	1	1	1	1		7
Ultrasonic bath (large)	1							1
Ultrasonic bath (small)	3	1	1	1	1	1		8
d. Sample Processing								
Analytical balance	2	1	1	1	1	1		7
Top loading balance	6	1	1	1	1	1		11
Distilling apparatus	3	1	1	1	1	1		8
Cooling water circulator	1	1	1	1	1	1		6
Water bath	3	1	1	1	1	1		8
Mantle heater	6	3	3	3	3	3		21
Rotary vacuum evaporator w/accessories	8	4	4	4	4	4		28
Cooling aspirator	4	2	2	2	2	2		14
Magnetic stirrer w/hot plate	8	4	4	4	4	4		28
Automated gel permeation chromatograph	1							1
Vacuum pump	3	1	1	1	1	1		8
Vacuum manifold	2	1	1	1	1	1		7
GPC column system (column, pump, fraction collector, UV monitor)	1	1	1	1	1	1		6
Laboratory oven (Activation column adsorbent)	2	1	1	1	1	1		7
Dehumidifier (desiccator)	2	1	1	1	1	1		7
Muffle furnace	1						2	3
Water purifier with demineralizer	3	1	1	1	1	1		8
Drying oven (for glassware)	2	1	1		1	1		6
Ultrasonic pipette washer	2	1	1	1	1	1		7
Centrifuge (bench-top)	3	1	1	1	1	1		8
Centrifuge (large, 250ml)	2	1	1	1	1	1		7
Ice making machine	1	1	1	1	1	1		6
pH meter	3	1	1	1	1	1		8
Laboratory cart	10				3	3		16
Glassware assorted	2	1	1	1	1	1		7
e. Sample Analyzing								
Gas chromatograph								
with ECD	2	2	2	2	2	2		12
with NPD	3	2	2	2	2	2		13
with FPD	2	1	1	1	1	1		7
with FID	2							2
High performance liquid chromatograph								
with UV, Fluorescence	3	1	1	1	1	1		8
with UV, Multi spectrum	1							1
Data processor	13	6	6	6	6	6		43
UV-VIS spectrophotometer	2	1	1	1	1	1		7
Gas chromatograph-Mass spectrometer system	1							1
Infrared spectrophotometer	1							1
HPLC-MS	1							1
Atomic absorption spectrophotometer							1	1
f. Electric supplies								
Uninterruptible power supply	2	1	1	1	1	1		7
Generator	2	1	1	1	1	1		7
Voltage regulator	2	1	1	1	1	1		7
g. Laboratory Furniture and Fittings								
Laboratory center table	8				3	3		14
Laboratory side table	12				3	3		18
Work table	6				1	1		8
Laboratory sink	6	2	2	2	3	3		18

Table 1-1 Requested Equipment and Apparatus (2)

ITEM	Central-PAL	PAL-Baguio	PAL-Cebu	PAL- Cag de Oro	PAL- Bicol	PAL-Davao	Additional request	Total
Reagent shelf	4	1	1	1	1	1		9
Stool	40				10	10		60
Air conditioner			5	5			7	17
Fire extinguisher (CO2 gas type)	6	2	2	2	2	2		16
Fire extinguisher (power type)	6	3	3	3	3	3		21
Exhaust fan	10				7	7		24
Fume cupboard (draft chamber)	4	1	1	1	1	1		9
Clean bench	1							1
Movable rack (for glassware storage)	8							8
Solar energy heater	1							1
Emergency shower	3	1	1	1	1	1		8
Incinerator	1							1
h. Extension Equipment								
Library table	4			1		1		6
Library chair	16			4		4		24
Folding table	10					3		13
Folding chair	20					6		26
Locker	20							20
Television (Projection type)	1							1
Television (34 inch)	1	1	1	1	1	1		6
Video	2	1	1	1	1	1		7
Video movie camera	1							1
Video editor system	1							1
Slide projector	1	1	1	1	1	1		6
OHP set (w/screen)	1	1	1	1	1	1		6
Computer set	3	1	1	1	1	1		8
Modem system (w/software)	1	1	1	1	1	1		6
Photocopier w/sorter	1							1
Photocopier		1	1	1	1	1		5
Car for administration	1							1
Typewriter (manual)	2	1	1	1	1	1		7
Fax machine	1	1	1	1	1	1		6
Coaster	1							1
Total	361	80	86	91	112	126	13	869

CHAPTER 2

OUTLINE OF THE STUDY

CHAPTER 2 OUTLINE OF THE STUDY

In response to the request for Grant Aid from the Government of the Philippines, as referred to in Chapter 1, the Government of Japan decided to examine the viability of the project. The Japan International Cooperation Agency (JICA) dispatched to the Philippines a Basic Design Study Team (Phase 1), headed by Mr. Teizo Igarashi, Deputy Managing Director of Grant Aid Management Department, JICA, from January 31 to February 22, 1994.

The study team discussed the issues with the DA, BPI and FPA from February 1, conducting field surveys in Quezon, Davao and Cebu at the same time, and exchanged the minutes of discussions on February 9 with Mr. Lantin, undersecretary of DA. After the three government staff of the study team returned to Japan on February 10, the consultant staff continued field surveys in Cagayan de Oro, Baguio and Bicol, and discussions with the BPI and the FPA. The team exchanged technical notes with Mr. Roperos, Director of BPI on February 21.

The study started with an explanation of the Japanese Grant Aid system and a presentation of the inception report, and discussions with the authorities concerned in the Philippine Government. In particular, the study team clarified that the purpose of the Basic Design Study Phase 1 was to confirm the background of the request and the project implementation system in the Philippine Government (i.e. collaboration among PAL-BPI, FPA and ATI), and that specifications of facilities and equipment would be detailed in Phase 2 of the study. The study team submitted a questionnaire, and continued discussions and surveys regarding the purpose of the project, latest request proposal, operation program, project sites, organization and personnel plan, budget plan, etc.

The study results and replies to the questionnaire were further analyzed in Japan, and were compiled into the Interim Report.

Then JICA dispatched a Basic Design Study Team (Phase 2), headed by Mr. Shigetaka Saburi, Director, Second Inspection Division, Agricultural Chemicals Inspection Station, Ministry of Agriculture, Forestry and Fisheries, between May 11 and June 14, 1994. The study team started discussions with the DA, BPI and FPA from May 12, conducted field surveys in Davao and held a meeting with the laboratory chiefs from each PAL satellite together at PAL-Central. Minutes of discussions was exchanged on May 19 with Director Roperos. After the three government staff members in the

study team returned to Japan on May 20, the four staff members of consultant continued field surveys in Cebu and Bicol, and discussions with the BPI. The team exchanged technical notes with Mr. Roperos on May 27.

The Phase 2 study was started with a presentation of the inception report and the questionnaire, and entered discussions according to the Interim Report. Specifications of facilities and equipment to be supplied by Grant Aid were examined in particular, and the priority order was marked. Estimation of PALs' maintenance and operation costs were also discussed.

The study team visited all the existing satellite PALs and investigated their conditions in terms of facilities and equipment. At the construction sites for new PALs, the team carried out site investigations as well as market research on the recent construction situation and equipment dealers in the Philippines.

Based on the basic design study (phases 1 and 2), the plan was examined and the results were compiled into a draft report. A draft mission was sent to the Philippines from July 31 to August 6, 1994. The team presented the report and entered discussions with the BPI and FPA from August 2. Minutes of discussions were signed and exchanged on August 4 with Undersecretary Lantin. On August 5 the team visited the NEDA with the BPI authorities and confirmed major concerns of the Investment Coordination Committee (ICC) for evaluation of this project.

The member lists of the study teams, study schedules, member lists of the Philippine authorities concerned, minutes of discussions and technical notes are attached in Annex of this report.

CHAPTER 3

CIRCUMSTANCES AROUND THE PROJECT

CHAPTER 3 CIRCUMSTANCES AROUND THE PROJECT

1. Circumstances of Pesticide Usage and Control in the Philippines

1-1 Philippine Administrative System on Pesticides

(1) Administrative System on Pesticides

The administrative authorities on pesticides in the Philippines are the FPA and the BPI, both of which belong to the DA. Another relevant authority is the Agricultural Training Institute (ATI), which supports seminars and extension campaigns to the farmers. Figure 3-1 shows the organization of DA. The FPA administers registration and distribution of pesticides and takes a leading role in controlling pesticide usage. The FPA's duties are, among others, as follows:

- Evaluation of pesticides for registration
- Seminars, state examinations and qualification on pesticide handling with the dealers
- Instructions to the traders and dealers

The establishment of residue tolerance, as referred to in the following pages, is another responsibility of the FPA, as stated in PD 1144.

The BPI consists of five divisions; crop protection, crop production, research, agricultural engineering and laboratory services (LSD). With regard to technical matters such as analyses of pesticides, PALs under the LSD have control. PAL-Central is now located in the BPI Headquarters in Manila, and four satellite PALs are in Baguio, Cebu, Cagayan de Oro and Davao. The satellite PALs conduct monitoring of pesticide residues in crops, while PAL-Central also conducts monitoring of pesticide formulations for quality control of products. These analyses are completed not only as a part of a pesticide residue monitoring program, but also upon commission from other governmental organizations and the private sector as well. The BPI files and retains all the analysis files as the DA's official data. A copied set of the same referenced data is also provided for the FPA.

The Crop Protection Division is concerned with the watching and forecasting of any pest infestation occurrence, selection of plant varieties, and guidance to farmers regarding how to best protect their crops based on the Integrated Pest Management (IPM) program. This program takes advantage of the natural enemies of selective wild life in addition to pesticide application. This division is also responsible for plant quarantine.

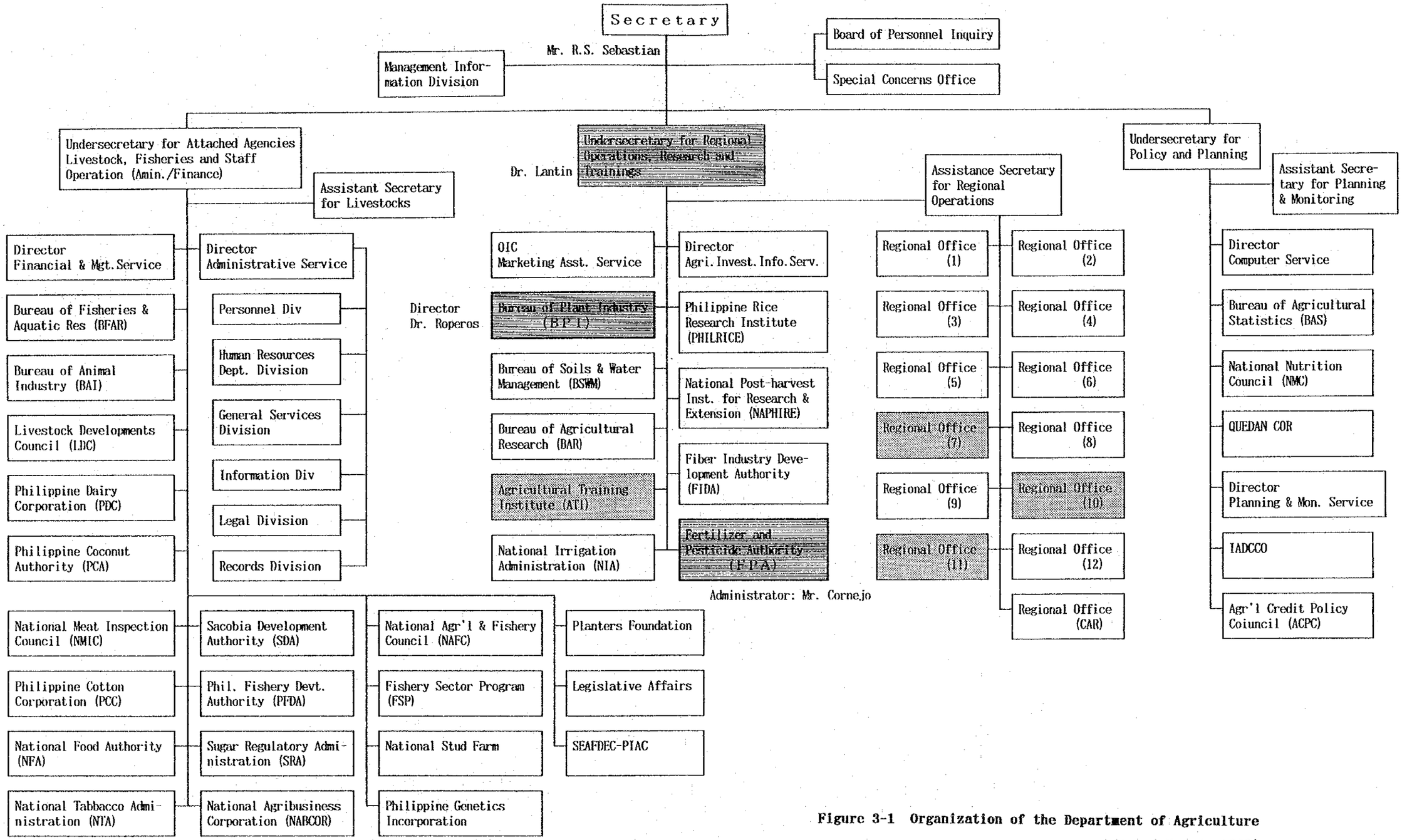


Figure 3-1 Organization of the Department of Agriculture

(As of May 4, 1993)

The ATI has its own budgets for seminars and extension campaign to the farmers. The ATI supports promotional activities conducted by the FPA and the Crop Protection Division of the BPI, in terms of human resources, seminar places and teaching materials.

The following figure shows functions and services of each institution and their relationship.

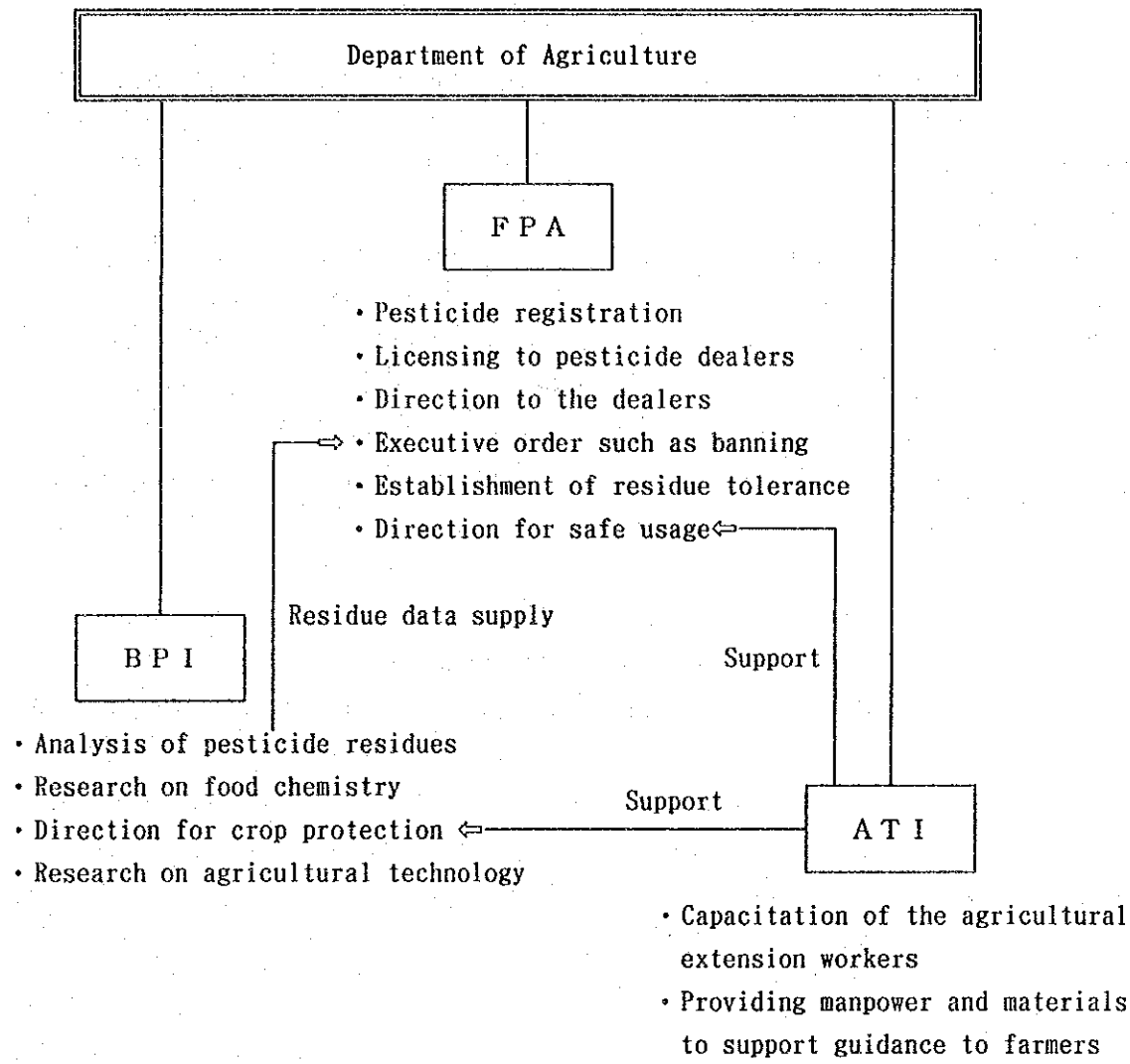


Figure 3-2 Activity Relationship between the Organizations Involved in the Pesticide Control Administration

There is currently no practical calendar indicating what types of pesticides are to be used and appropriate timing for application, which is called a Pest Management Calendar in Japan, but instructions are given to the farmers according to the IPM program that the DA promotes. The IPM program aims at extension of proper and safe usage of pesticides among its other objectives, and incorporates inspections of used pesticide containers along with promoting boycott campaigns against banned or restricted pesticides.

The FPA extends guidance to the farmers with the assistance of the ATI and pesticide dealers. All the extension workers are qualified with bachelor's degrees in agriculture, are trained at the ATI, and are then assigned to various regions, provinces or municipalities throughout the country.

Pesticides are usually applied by farm owners or farm employees. Some pesticides are diffused by specialists who must have approval and the qualification of the FPA. The farm owners and diffusers should receive instructions from the extension workers, FPA officers or DA's agriculturists as to appropriate pesticide kinds and the proper time for application. Pesticide dealers and traders sometimes give supports on guidance if so requested. Pesticides for use under specified limitations can only be applied by certified specialists.

As to instructions on practical application methods of pesticides in the field, the extension workers and pesticide dealers who were trained by the FPA provide instructions, and occasionally the Crop Protection Association of the Philippines (CPAP) provides assistance.

The circumstances regarding instructions on safer pesticide application method in the Philippines have their peculiarities retaining to the private sectors such as pesticide manufacturers, dealers or traders who are involved in instruction as well as the extension workers or the DA's agriculturists. The FPA is in the position to control and supervise all activities.

In 1993 the FPA held 133 seminars for pesticide dealers at 57 locations. Among 5,632 total participants, 4,799 persons passed the examination at the end of the seminars. In addition, the FPA opened 7 lectures (282 participants in total) on pesticide poisoning precautions and 27 lectures (2,230 participants) for mango farmers. The FPA held seminars and lectures with considerable eagerness in 1993, compared with 13 seminars having been held in 1992.

The ATI holds seminars on the IPM program for the farmers in rice cultivation districts; in total, 3,672 persons participated at 101 seminars during the past three years.

Table 3-1 Seminars by the FPA (1993)

Target Clientele & Subjects	Frequency	No.of Participants
Pesticide dealers	133	5,632
Pesticide poisoning precautions	7	282
Mango farmers	27	2,230

Source: FPA data (1994)

Table 3-2 Seminars on the IPM Program by the ATI
(1991 to 1993)

Year	Target Clientele	Frequency	No.of Participants
1991	Farmers	92	3,339
	Extension workers	2	88
1992	Farmers	2	59
1993	Farmers	7	274
	Extension workers	4	149

Source: ATI data (1994)

(2) Legal Regulations on Pesticides

With regard to legal regulations which are relevant to pesticides, the Presidential Decree No. 1144 was issued in 1977. It abolished the then Fertilizer Industry Authority and formulated a new authority, the FPA.
PD 1144 states that all pesticides and chemical fertilizers for import/export, production, formulation/processing, storage, distribution and sales must be approved and registered by the FPA. Further to this, all the dealers must have certificates of FPA authorization. The FPA is authorized to administer proper distribution and usage of pesticides. The FPA is also responsible for establishing the residue tolerance level, and its enforcement as well. Referring to PD 1144, the FPA issued the Implementing Rules and Regulations No. 1, Series 1977, regarding the codes of practice concerned with import, production, formulation/processing, distribution, sales and usage of pesticides. This regulation includes articles on application

for pesticide registration; qualification of traders, dealers or diffusers; requirements for containers and labeling on packages; restrictions and relevant penalties.

In addition to these regulations, there is a bill, currently at the Senate as of 1994, vesting the FPA with the necessary power to cease and desist orders and thus prohibiting the courts from intruding any exercise of such powers. This is because when the FPA issued a restriction order for endosulfan in 1992, the lower court approved a claim from a pesticide dealer to restrain the order due to improper processing, that is, the FPA failed to give an interview to the dealer, a mandatory procedure stated in the Rules and Regulations No.1. It caused considerable delay in its enforcement of import restriction of that chemical.

All of these laws and regulations are, however, concerned with the rights and responsibilities of the FPA, the roles of PALs not being stated therein. PALs' roles are stated in the President's Letter of Instructions No. 986 to the Secretary of DA in 1980, the letter mandating the BPI to establish satellite PALs, specifying their roles and which districts are to be covered by each PAL.

As mentioned above, PD 1144 clarifies the development of the residual tolerance as the FPA's duty, but up to date, the Philippines does not have its own criteria for pesticide residues. The Maximum Residue Limits (MRL) established in Codex Alimentarius, recommended by FAO/WHO, are currently utilized as the temporary standards, which are not lined with legal basis for their enforcement and penalties. As a consequence, the government is unable to enforce withdrawal or improvement in the case that a high concentration of residual pesticide is detected. In such cases, various countermeasures are rendered such as the BPI issues a notice of the fact to the farm owner, or the FPA gives warning to the local pesticide dealers who diffuse the detected pesticide, though they are temporary actions, not leading to a long-term fundamental solution.

1-2 Pesticide Usage in the Philippines and Its Problems

(1) Current Pesticide Usage

Looking at the national economy as a whole, agricultural production has 22.8% of GDP, and the agriculture, forestry and fisheries sector accounts for 45.2% of the total employed population of 22.53 million as of 1990. Among the main crops, which are rice, corn, sugar cane and coconut, the Government of the Philippines has been continually attempting to raise its self-sufficiency rate of rice production, the staple diet of the

country. A high-yield rice was introduced in the 1970s to improve the productivity of rice per unit area, but this kind of rice is susceptible to pests and diseases such as rice tungro virus and bacterial leaf blight. Areas affected by Golden Kuhol, which destroys rice stalks, show serious concern, and account for 63.5% of the total areas affected by pests and diseases in 1991. (Refer to table 3-3.)

Table 3-3 National Pest and Disease Profile (1991)

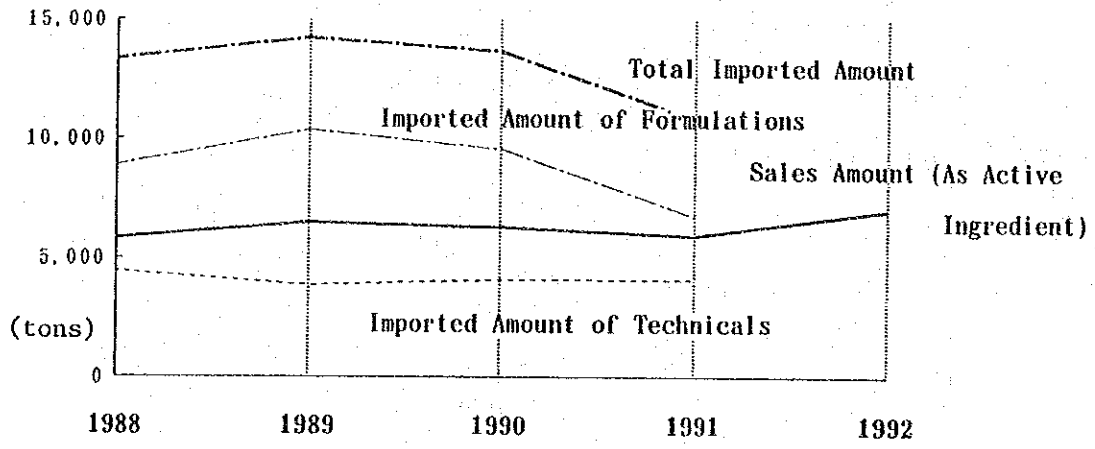
Pest/Disease	Area Affected	Percentage
Golden Kuhol	184,768	63.5
Rats	49,776	17.1
Brown Planthopper	8,405	2.9
Locust	25,615	8.7
Ricebug	2,856	1.0
Stemborer	1,923	0.7
Rice Whorl Maggot	1,807	0.6
Armyworm	663	0.2
Caseworm	683	0.2
Leaffolder	1,134	0.4
Green Leafhopper	399	0.1
Corn Borer	11,233	3.9
Sub-total	289,262	99.5
Rice Tungro Virus	522	0.2
Bacterial Leaf Blight	413	0.1
Rice Blast	550	0.2
Sub-total	1,485	0.5
Grant Total	290,747	100.0

Source: BPI Annual Report 1991

The usage of pesticides in the Philippines has shown rapid increase since early 1980s in order to protect crops from insect and disease infestation. Insecticides and fungicides are the predominantly used pesticides, and the use of herbicides is increasing in rice production so that the labor investment may be saved.

Most of pesticides distributed in the Philippines are imported products. Some are imported in the form of finished, ready for usage products, and others in the form of raw materials which are formulated in the Philippines. The number of companies currently approved by the FPA is 19 formulators and 46 dealers of pesticides for agricultural use, together with 26 dealers of pesticides for household use. Together, they sell 370

commercial brands with 175 active ingredients for agricultural use, and 95 brands with 37 active ingredients for household use. The number of imported products has shown some gradual decrease in recent years, while the total amount of sales shows an increase. (Refer to figure 3-3.)



Source: FPA and BPI data (1994)

Figure 3-3 Sales and Importation of Pesticides

There are currently 27 banned pesticides including three which have just been added in November 1993, and 20 restricted pesticides (Refer to tables 3-4 and 3-5). Organotin, one of the newly banned pesticides, and endosulfan, newly restricted for limited locations, were widely used in paddy rice fields to control Golden Kuhol. It was frequently found that these pesticides killed fish and various shells indiscriminately. As a consequence they were banned or restricted from use, and less toxic pesticides with more selective effects have been introduced.

Table 3-4 Banned Pesticides

1. Parathion-ethyl	14. Gophacide
2. Copper Aceto-arsenite (Paris Green)	15. Sodium Flouroacetate
3. DDT	16. Sodium Flouroacetamide
4. DBCP	17. Strychnine
5. Nitrofen	18. 2,4,5-T
6. Leptophos	19. Aldrin
7. EPN	20. Dieldrin
8. Endrin	21. Heptachlor
9. Mercuric fungicides	22. Chlordimeform
10. Toxaphene	23. EDB
11. Elemental phosphorous	24. BHC
12. Thalium sulfate	25. Organotin
13. 1-Naphthylthiourea (ANTU)	26. Azinphos ethyl
	27. Methyl parathion

Source: FPA data

Table 3-5 Restricted Pesticides

A. Importation not allowed except in cases of emergency as determined by the Authority
   1. Aldicarb
   2. Chlorobenzilate

B. Too hazardous for general use
   1. Paraquat
   2. Phenamiphos
   3. Entroprop
   4. Methidathion
   5. Inorganic arsenicals (arsenic trioxide)
   6. Lindane
   7. Pentachlorophenol

C. For use under specified limitations
   1. DDT - All uses cancelled except for malaria control purposes by the Department of Health.
   2. Not for use near aquatic ecosystem
      a. Chlordane
      b. Endosulfan
   3. For termite control only
      a. Chlordane

D. Fumigants and other chemicals for use only by certified Fumigators
   1. Methyl bromide
   2. Carbon disulfide
   3. Phosphine generating compounds
   4. HCN-generating materials
   5. Carbon tetrachloride
   6. Chloroform
   7. Ehtylformate

Source: FPA data

According to the research analyses of pesticide residues in crops completed in PALs, (refer to figure 3-4), a species of pesticide was detected in 66.9% of the total samples analyzed in 1990, but this figure decreased year by year, and was reading 0.6% in 1993. This is largely on account of intensified guidance regarding the proper usage of pesticides. However, the problem remains that the number of commodities analyzed does not increase as much as that of pesticide sales, that is, the analyzed amount is not sufficient when compared to the whole pesticide usage in the country. The varieties of pesticides detected in 1992 accounted for 21. Among them was found DDT, which can only be used for malaria control purposes. Thus, the monitoring of residual pesticides for non-agricultural use has also become necessary.

PALs also conduct analyses of pesticide formulations which are sold in the market. PALs analyzed about 100 formulations in 1991 and 1992 respectively. They found that more than half of the examined products had different ingredients from those which were stated on the attached labeling. The quality control of pesticide formulations is another important role of PALs. The rate of those products examined having different ingredients detected remained at 15% in 1993, but this might be due to the fact that the total number of formulation analysis was only 20. The future development of formulation analysis by PALs is anticipated.

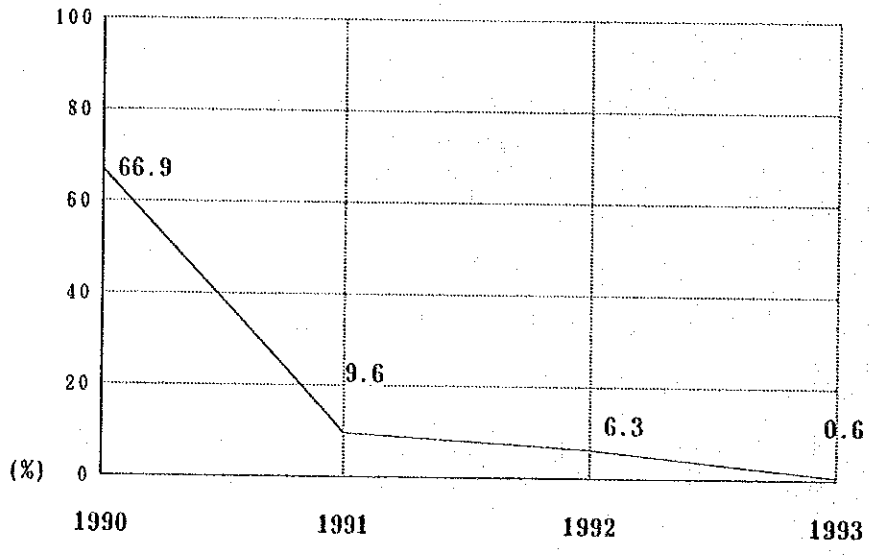


Figure 3-4 Pesticide Residue Levels Detected in Crops
Source: BPI Annual Report 1990, 1991, 1992, 1993

(2) Problems

Problems concerning the usage and distribution of pesticides in the Philippines, or the guidance and inspection may be summarized into the following points:

a. Incomplete observance of the Directions for Safe Usage of Pesticides:

In the past years, kinds of pesticides and appropriate timing for their application were recommended by pesticide dealers to expand sales of their own brands to the farmers. This situation inclined to suggest excessive quantity and frequency, which resulted in high concentration of pesticide residues in crops. Repetitive usage of the same kind of pesticide may generate pests with a high resistance.

Today, proper selection of quantity and frequency of application is being enhanced among the farmers, owing to DA's extension workers and agricultural technicians who are assigned to instruct proper usage of pesticides as a part of the IPM program. The Direction for Safe Usage of Pesticides needs be reconsidered in order to serve for the further promotion of proper pesticide usage.

b. Distribution of false and adulterated pesticides:

Pesticides whose ingredients do not match the attached labeling are often seen in the product markets. These false or adulterated products may lead to ineffective crop protection, or extensive damages by pest infestations.

c. Inadequate enforcing power against indiscriminate use of pesticides:

When excessive concentration over the MRL of FAO/WHO, or banned pesticide residues are detected, the government cannot enforce withdrawal or restrain its use, in compliance with legal jurisdiction. Effective legal structures for the development of the pesticide tolerance of the Philippines, as well as their codes of practice should be formed as a priority.

d. Slow increase in the quantity of analyzed commodities:

Though the rate of pesticide residues detected in crops has been decreasing in recent years, the total amount of pesticide sales is increasing, with the variety of pesticides diversifying. The capacity for pesticide analysis needs be improved, including the extension of

target pesticides. The slow increase in the quantity of analysis is mainly attributable to incapability of PALs utilizing obsolete or damaged equipment. The upgrading of PALs' equipment is anticipated for the improvement of analysis capacity as well as reliability. Inefficient collection and transport of samples may be a further cause of slow expansion of analysis.

1-3 Pesticide Residue Monitoring in Japan

Pesticides decompose gradually into the atmosphere after their application onto crops. However, some crops may be harvested before all the pesticides disappear, due to such reasons as the period between the application and the shipment being short, the applied pesticide being slow to decompose and remaining on the surface or inside the crops. The residual levels in crops depend on the period, postharvest treatment or other factors. If crops with high concentration of pesticide residues reach points of sale, they may cause harmful effects to human health. To avoid such circumstances, in Japan, the residue tolerance has been established, and agricultural products detected with excessive residues must be restrained from shipment, or withdrawn from the markets. The following paragraphs refer to principles of establishing the residue tolerance and outline of pesticide decomposition/residue procedures.

(1) Pesticide Residue Tolerance

The intake amount of agricultural chemicals per day per weight of a human being, which will not cause any effects if one takes it every day throughout one's life, is defined as the acceptable daily intake (ADI). The ADI is calculated by the non-observed effect level (NOEL), which is determined from animal testing of chronicle intoxication, multiplied by the safety factor for human beings (dependent on the character of the pesticide; 1/100 for example). The maximum residue tolerance is established so that the amount of pesticide in question to be taken by a person per day through food may not exceed the ADI. This can be expressed in the following formula.

$$\text{Residue tolerance} \times \text{Daily intake of food containing the pesticide in question} < \text{ADI} \times \text{Standard weight of a person}$$

or

$$\text{Residue tolerance} < \frac{\text{ADI x Standard weight of a person}}{\text{Daily intake of food containing the pesticide in question}}$$

With the use of this formula, the residue tolerance in Japan is specified as the maximum allowable residue for each agricultural chemical or in each crop in the Standards of Food and Additives of the Food Sanitation Law. At present, the residue tolerances are set for 87 agricultural chemicals and for 132 agricultural products as of September 14, 1993. For pesticides to which the residue tolerances are not established, the Environment Agency regulates the Registration and Reservation Standards of Agricultural Chemicals. The Agency withholds pesticide registration, in case pesticide may be left in crops and is regarded dangerous to human beings or wild life if it is used according to the usage method referred to along with its application for registration. The Registration and Reservation Standards are established for 241 AIs as of July 1993.

Meanwhile, the Codex Alimentarius Committee of FAO/WHO has established MRL, in terms of crop protection against pest infestation. MRL is the amount of pesticide residues detected in crops at the time of their natural harvest, after the least amount of pesticide necessary for pest control is applied. FAO/WHO does not regard MRL as an international regulation, but recommends that each member country should establish its own residue tolerances considering its climate, dietary customs, etc., but without exceeding MRL.

(2) Movement of Pesticides after Diffusion

Pesticides, after being diffused with sprays, adhere to the surface of crops. Some pesticides evaporate and vanish into the atmosphere or are washed away by the rains. But others remain on the surface, or penetrate inside. Most pesticides decompose gradually after their diffusion through oxidization, hydrolysis or aqueous hydrolysis by oxygen, humidity or UV rays in the air. The decomposition speed differs from chemical to chemical; one with high permeability or low resolvability tends to remain in the crops or soils. Figure 3-5 shows general movement of pesticides after diffusion.

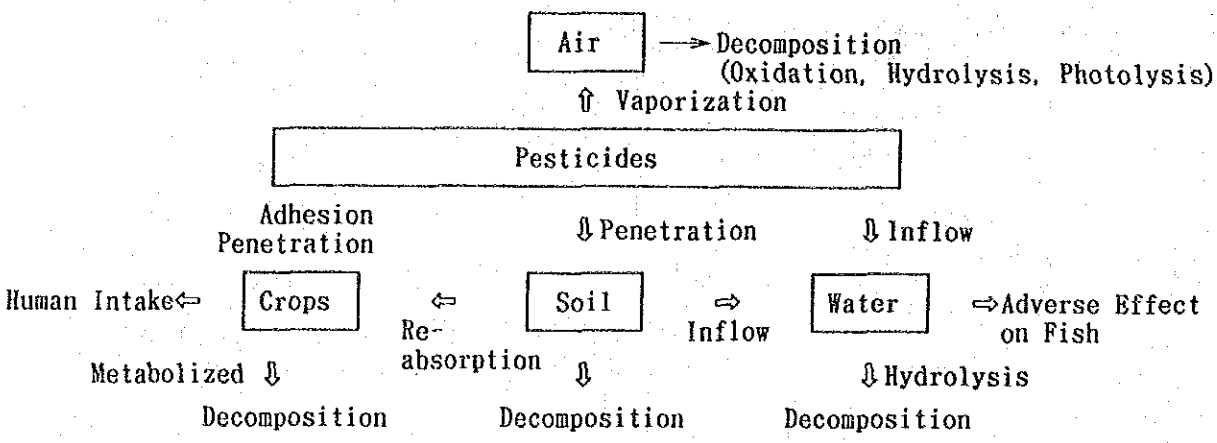


Figure 3-5 Movement of Pesticides after Diffusion

(3) Examination of Residual Levels in Crops

Pesticide behavior from its application to crops to decomposition, as shown in the above figure, needs be understood for the development of pesticide residue tolerances. For this purpose, crop samples, once applied with pesticides, are taken at regular intervals, and pesticide residuals traced in each sample are measured and analyzed. This is referred to as the Examinations of Residual Levels in Crops. By altering test factors like the pesticide density or the application frequency, such data as the relations between the application quantities and residual levels of a pesticide in question may also be collected.

(4) Direction for Safe Usage

In accordance with the data of relations between the application quantities and residual levels, proper pesticide usage criteria that protect crops effectively from pest infestation, and satisfy the residue tolerance at the time of harvest may be developed. This is referred to as the Direction for Safe Usage of agricultural chemicals. Labels on the pesticide containers have to specify proper application methods in compliance with the Direction for Safe Usage, such as how many times the pesticide should be diffused, until how many days prior to harvesting. The pesticide, if applied accordingly, is supposed to decompose into the air

and reduces below the allowed residue tolerance level by the time of harvest or shipment. The Direction for Safe Usage of Pesticides is indispensable for the proper obligation of Residue Tolerance.

(5) Pesticide Analysis Procedure

A standard method of pesticide analysis in crops is to grind crop samples, to extract AI in the pesticide into solvent (usually organic solvent), and then to separate and identify the AI with GC or HPLC.

The chromatography is to identify the ingredient in question by comparison to a standard (or pure) substance whose character is already known. Therefore, it needs pure pesticide samples for the pesticide analysis.

As food ingredient in the crop sample may well be diluted in the organic solvent during the extraction process, they have to be excluded with the use of other solvents or absorbents, so that they may not obstruct analysis of AIs. The pesticide residue analysis works on a minimum amount of substance, and it is vital to identify AIs of pesticide from food ingredients of crops. Today, the analyzed ingredient is confirmed at the last process with the GC/MS that it is definitely not a food ingredient.

Procedure	Operation	Equipment
1. Sample Processing	Grinding of samples to be analyzed	Mixer, Blender
↓		
2. Extraction	Extracting AIs into solvents	Evaporator
↓		
3. Purification	Excluding obstructive food ingredients	GC
↓		
4. Separation, Identification	Comparison with the standard pesticide	GC, HPLC
↓		
5. Confirmation	Confirming as the pesticide in question	GC/MS

Figure 3-6 Pesticide Residue Analysis Procedure

1-4 Pesticide Analysis in the Philippines

(1) General

PALs are concerned with pesticide residue analyses and provide analysis data to support governmental policies on pesticide control. Figure 3-7 shows the organization of the BPI and the status of PALs. The roles of PALs are monitoring of pesticide residues in crops collected by market basket sampling; analysis of formulations collected by random choice sampling; analysis of pesticide residues in water or soils, upon commission from other governmental organizations.

Other than PALs, the Food Development Center (FDC) under the National Food Authority (NFA), DA and the National Crop Protection Center (NCPC) are also concerned with pesticide residue analysis in crops and foods.

The NCPC, situated in the University of the Philippines Los Banos, aims at research and technological transfer or collitional programs in close relationship with DA's crop protection centers in each region, BPI's Crop Protection Division, Philippine Rice Research Institute, ATI, DA's regional offices, CPAP, etc. Other than the residual level examinations, the NCPC conducts research and development from the integrated pest management approach; research such as assessment of pesticides in the environment, biological efficacy testing of pesticides, research of introduction of biological pesticides, etc. Though it cannot be said that their instruments are maintained under the optimum conditions, they conduct analyses strenuously taking the maximum advantage of limited equipment. The NCPC has a GC and a GC/MS, with an intention to more efficient, advanced experiments.

The FDC is mainly concerned with research of food sanitation technology and inspections in conformity with the food standards. It is devoted to technology transfer and assistance to private enterprises. The FDC renewed its facilities and equipment through JICA's grant aid in 1988.

In summary, though the NCPC is a public institution similar to PALs, its principal goal is scientific study and research. The FDC conducts analysis in terms of food sanitation, and pesticide analysis shares only a part of its analysis work. It is not directly relevant to the monitoring of pesticide residues in crops. Large pesticide dealers, plantation owners and food companies conduct analysis in their laboratories, which are mainly interested in the quality control of their products. The amount of analyzed commodities is not very large, either.