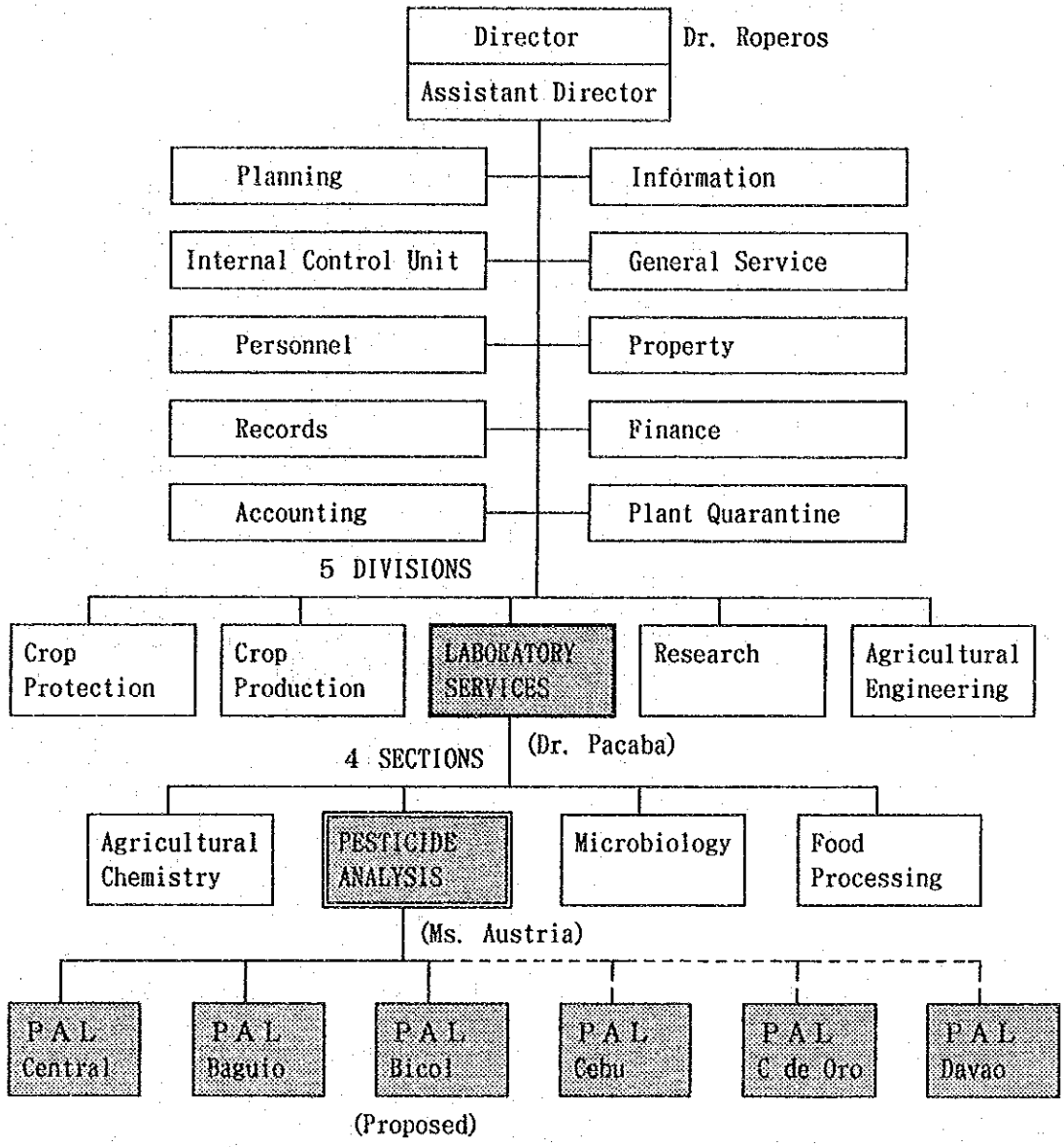


(Source: BPI data)

Figure 3-7 Organization of the Bureau of Plant Industry

For the time being, there are five PALs in the Philippines; PAL-Central in the LSD Headquarters and four satellite PALs. Table 3-6 summarizes current operation done at each existing PAL.

Table 3-6 Outline of Existing PALs

Laboratory	Staff	Main operations	Record (1993)
PAL-Central	14 (incl.1 clerk & 2 temporary staff)	Pesticide residue monitoring (incl. analysis on commission Formulation analysis Research on residues in crops (Pechay)	1,550 545) 46
PAL-Baguio	10	Pesticide residue monitoring	approx. 400 (sample processing)
PAL-Cebu	8	Pesticide residue monitoring Research on residues in crops (Eggplant)	approx. 500 (sample processing)
PAL-CDO	9	Pesticide residue monitoring Research on residues in crops (Tomato, pechay, etc.)	335
PAL-Davao	9	Pesticide residue monitoring	108 (1992)

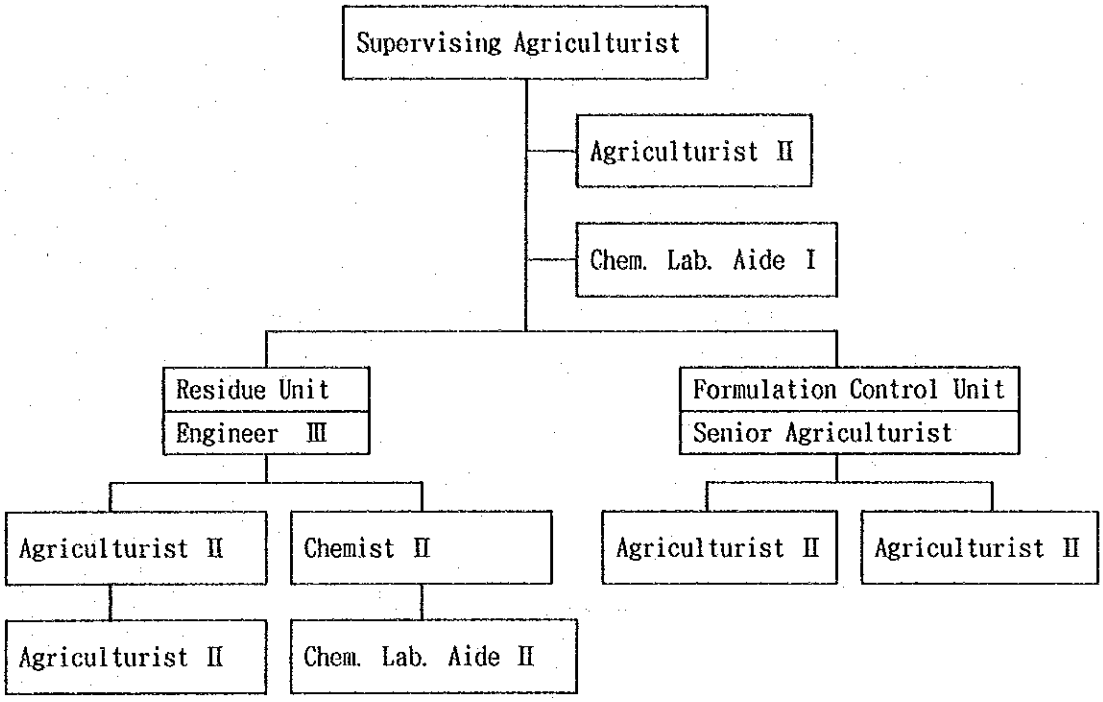
Source: BPI data

(2) PAL-Central

a. History and Organization

PAL-Central was founded in 1976, with all buildings and equipment being donated by the Government of former West Germany, as a part of the RP-German Crop Protection Strengthening Program. Technical assistance was rendered up until March 1987 in terms of analysis of pesticide residues and formulations, testing methods, instructions of research & development, etc. The Government of Japan started technical cooperation in 1991 and has dispatched analysis experts who give assistance on analytical skills, etc.

PAL-Central came under the BPI's jurisdiction in 1980 according to the President's Letter of Instruction No. 986, and now serves as the core center for monitoring of pesticide residues and formulation analysis. Figure 3-8 shows the present organizations of PAL-Central. In addition to the 11 technical staff in the chart, there are one clerk and two visiting analysts; making a total of 14 personnel.



Source: BPI data

Figure 3-8 Organization of PAL-Central (1994)

b. Activities

PAL-Central conducts analysis of pesticidal residues as a monitoring service, together with analysis of residues and formulations on commission. The number of samples analyzed as monitoring was 1,005 in 1993, those analyzed under commission 545. The number of formulations analyzed in 1993 was 46, lower than the 103 for 1992. For analysis of formulations, usually the FPA collects samples from the market and entrusts required analysis to PALs. Research and examinations were completed of residual level examinations of methyl parathion, endosulfan, azinphos ethyl, methamidophos, and lambdacyhalothrin in pechays.

Training of technical staff in the PALs is another duty of PAL-Central. Every year a seminar is held at PAL-Central for the technical staff from the satellites with the view to the updating and standardization of analytical skills. In the past the German donor institution sent instructors and provided any necessary training in analytical skills.

(3) PAL-Baguio

a. History and Organization

PAL-Baguio was established in 1984 along with PAL-Central by the Government of West Germany. It first belonged to the BPI as stated in the President's Letter of Instruction No. 986 of 1980, was moved to the administration of the DA's Regional Office following the government devolution program in 1988, and returned to the LSD in 1989 according to the PAL Unification Order by the Secretary of DA. PAL-Baguio is composed of the following organization with 10 technical staff.

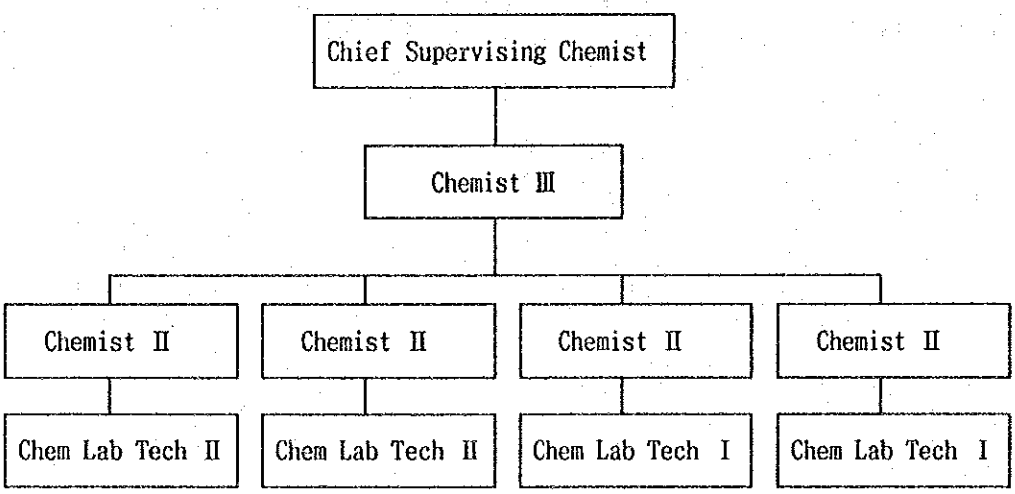


Figure 3-9 Organization of PAL-Baguio (1994)

b. Activities

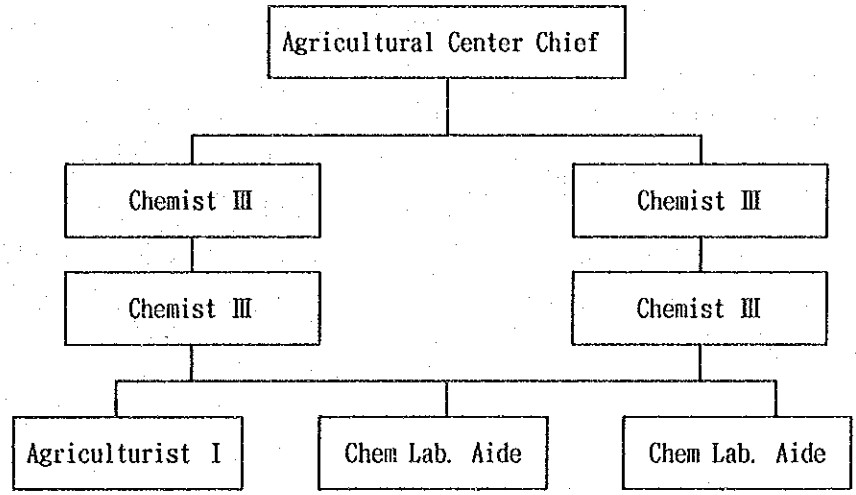
Baguio is located in high land. It is the main vegetable supply source to Manila. The monitoring of residues in vegetables is therefore the main role of PAL-Baguio. However, it is now incapable of analysis work as their four GCs need repairs. Samples collected are processed in PAL-Baguio. The laboratory staff take the samples to PAL-Central and analyze them during night, so as not to disturb the regular operation of PAL-Central. With such an endeavor, 400 commodities were analyzed in 1993.

(4) PAL-Cebu

a. History and Organization

PAL-Cebu was also established in 1984 along with PAL-Central and PAL-Baguio. It first belonged to the BPI as stated in the President's Letter of Instruction No. 986, and was transferred to the administration of DA's Regional Office 7 as a result of the government devolution program in 1988. Today, the BPI reiterates its request for the direct management of PAL-Cebu to the Secretary of DA based on his PAL Unification Order of 1989.

PAL-Cebu is composed of the following organization with eight technical staff.



Source: BPI data

Figure 3-10 Organization of PAL-Cebu (1994)

b. Activities

PAL-Cebu serves Regions 6, 7 and 8, however, it receives a small amount of samples from Regions 6 and 8. This is probably due to the fact that PAL-Cebu asks the local Regional Office for collection and dispatch of samples, but does not receive favorable cooperation. With regard to Region 7, where PAL-Cebu is located, the laboratory analyzed approximately 500 commodities in 1993. As the GCs in PAL-Cebu are not operating, samples are processed at this PAL and then either sent to PAL-Central or PAL-CDO for analysis. They collect and analyze well water samples for the environment monitoring together with crop samples.

PAL-Cebu also holds surgeries with farmers, discussing their pesticide use to research the relation between the usage and pesticide residue

levels. Where high concentration of residue is detected, the PAL gives notice to the farmer and to the local Regional Office, and recommends the farmer to reduce the amount of pesticide as appropriate.

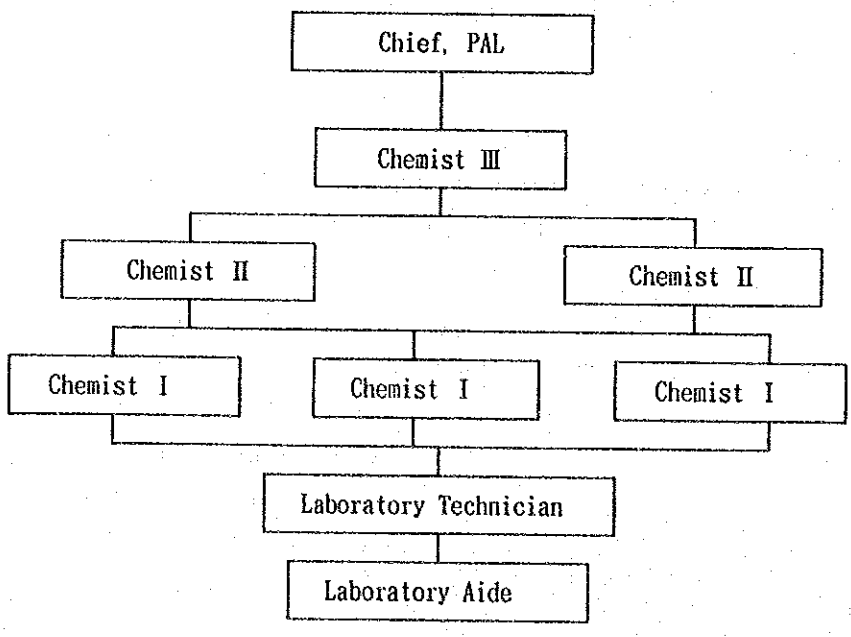
As for research and examinations, residual level examinations of six agricultural chemicals namely tamaron (methamidophos), malathion, folidol (methyl parathion), thiodan (endosulfan), decis (deltamethrin), brodan (chlorpyrifos) are completed using eggplants. The test results are presented in the form of research reports.

They have started hearing of pesticide poisoning in local hospitals.

(5) PAL-Cagayan de Oro

a. History and Organization

PAL-CDO was also established in 1984 by the Government of former West Germany. It first belonged to the BPI as stated in the President's Letter of Instruction No. 986, and was transferred to the administration of the DA's Regional Office 10 as a result of the government devolution program. Today, the BPI reiterates its request for directional management of PAL-CDO to the Secretary of DA based on his PAL Unification Order of 1989. PAL-CDO conducts pesticide residue analysis. It is composed of the following organization with nine technical staff.



Source: BPI data

Figure 3-11 Organization of PAL-Cagayan de Oro (1994)

b. Activities

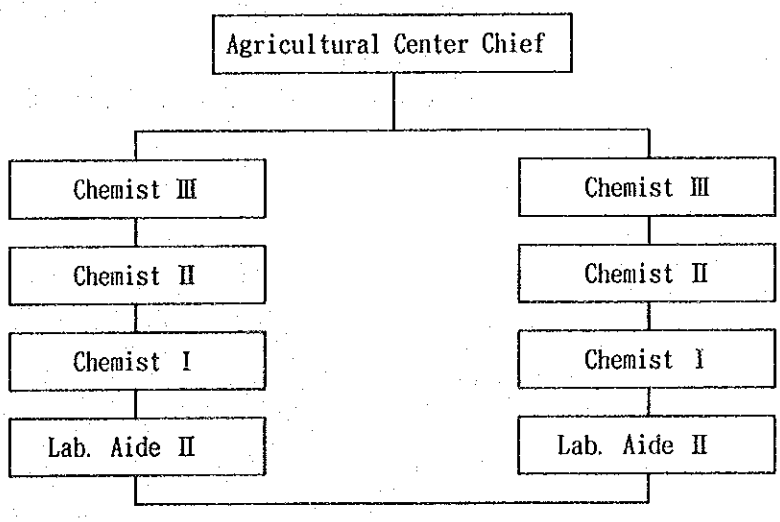
PAL-CDO conducts monitoring of pesticide residues in fruits and vegetables in Regions 9 and 10. During the past five years, PAL-CDO analyzed 141 commodities in 1989, 426 in 1990, 516 in 1991, 381 in 1992 and 335 in 1993.

A surveillance had been made from 1982 to 1990 on pesticide application onto vegetables in Region 10, and the result report was issued in 1991. Examinations on pesticide residue levels in such vegetables as tomatoes, eggplants, cabbages and pechays found indiscriminate use of pesticides including banned or restricted brands. High concentrations of dieldrin and mevinphos over the Codex MRL were also detected in the above vegetables.

(6) PAL-Davao

a. History and Organization

PAL-Davao was established in 1988 at the Davao National Crop Research and Development Center (DNCRDC) Compound, to be a key center of pesticide residue monitoring for this district, as Davao is one of the largest fruit yielding areas in the Philippines. A building (10 m x 10 m), once used as DNCRDC's canteen was remodelled, and two GCs and other laboratory equipment were then transferred from PAL-Central. These GCs need repairs, and samples collected are sent to PAL-Central in Manila for analysis. PAL-Davao is composed of the following organization with nine technical staff.



Source: BPI data

Figure 3-12 Organization of PAL-Davao (1994)

b. Activities

PAL-Davao carries out only sample processing and then sends them to PAL-Central for analysis. In 1992, 108 samples were processed. PAL-Davao researches what types of pesticides are applied in what manner through interviews with farmers.

Other research laboratories for entomology or plant pathology in the DNCRDC Compound do not appear to operate in an active manner either, due to shortage of budget and equipment.

2. Projects and/or Programs of Other Donors

PALs were originally constructed with the aid of a donation program of the Government of former West Germany. This aid, namely the RP-German Crop Protection Strenghthening Program, finished in March 1987. PAL-Central provided seminars on pesticide residue analysis technique for PAL's engineers, with the aid of experts also from the former West Germany. This seminar ceased in October 1991. Cooperation projects from other countries relevant to pesticide residues are not planned now.

International organizations like FAO and ADB provide or finance various projects in the Philippines. These projects are not directly related to pesticide residue monitoring, but rather related to integrated pest management projects in terms of crop protection. IPM is expected to become mainstream for the future improvement of agricultural productivity, and Japan's technical cooperation will consider IPM as necessary. Paragraphs below refer to past cooperation projects relevant to pesticide residues and present IPM projects provided by the FAO and the ADB.

(1) FAO

The BPI conducted various pesticide residue analyses in crops, with a financial support from the FAO in 1990. The results were compiled into "A Technical Report on Contamination of Foods Found in the Philippines in 1990." This analysis support project was a temporal one, and is not continuous till present.

The FAO has been continuously conducting an IPM introduction project in rice cultivation in the Philippines, following the one in Indonesia. One of the aims of that project is to reduce agricultural chemicals, however, principal objectives are to achieve safety of farming personnel,

who are the users of the chemicals, and to improve cost performance in agriculture.

Thus, their project does not have close, direct relationship with this project, which aims for safe food supply and good human health through the monitoring of pesticide residues.

(2) ADB

The FPA issued in 1989 a guideline toward pesticide dealers, which specified application procedures for pesticide registration and required documents. The ADB provided financial support and sent consultants of agricultural chemicals in preparation of this guideline.

At present, the ADB assists an IPM program that aims for protection of cabbages against larvaes of Diamondback Moth. It is a peculiarly oriented program for crop protection, and is not strongly related to this project, which intends for overall management of pesticides.

3. Current Conditions of the Construction Sites

3-1 PAL-Central Site

(1) Natural Conditions

The PAL-Central site in Quezon City is located in the tropical monsoon climate zone. The annual average temperature is about 27.5°C. This zone has two seasons: the dry season from November to May and the rainy season from June to October, which includes the typhoon season in August and September. Rainfall is scarce in the dry season, concentrating in the rain season, reaching about 2,300 mm rainfall in a year. Heavy rain storms during the typhoon season often inundate roads and grounds. Earth work such as excavation, soil filling and grading is quite difficult during this season.

The site has the square-like shape with 80-meter-long side each. The ground is flat, with the maximum level difference of approximate 1.2 meter. The subsoil investigations (attached to this report in ANNEX 11) indicate that there is an adobe layer at approximately 1.5 meters below the existing ground surface, which can be taken as the bedrock.

Seismic force must be taken into consideration in structural design, because the Philippines is a part of the Circum-Pan-Pacific Earthquake Belt.

(2) Infrastructure

The Nursery of the BPI Compound faces Visayas Avenue, about 50 meters from the Quezon Memorial Circle. The district around the Memorial Circle is the Philippine's government office quarter, and the DA's main office and many institutions under the DA spreads near Visayas Avenue. The National Seed Quality Control Center and the Seed Storage, another Japanese Grant Aid project, commenced construction in March 1994, in a part of the BPI Compound. The BPI's other institutions are to be gathered in this compound in the future, including the main office.

Basic infrastructures like electric power, water supply, telephone piping, etc. are provided already; thus it will be easy for connection and intake piping to the site.

3-2 PAL-Davao Site

(1) Natural Conditions

Davao City also belongs to the tropical monsoon climate zone, with the average annual temperature at around 27.5°C. The rainy season comes one month earlier than in Quezon City, from May to October, and the dry season from November to April. This area has considerable rains also in the dry season. It is seldom attacked by typhoons, however, heavy rain storms often cause flood inundations.

The site has a irregular triangular shape, about 2,000 m^2 large. The ground is flat, with the maximum level difference less than 1.0 m within the building area.

The subsoil investigations (attached in ANNEX 11) indicate that a silty clay stratum having 0.7 kg/cm^2 bearing capacity lies between 0.7 and 1.0 m below the ground. For a single story PAL-Davao building, footings may rest on this layer, tied to each other with stiff footing beams.

Seismic force should also be taken into consideration, as Davao City belongs to the same earthquake belt.

(2) Infrastructure

The construction site is in the DNCRDC Compound, surrounded by the DNCRDC main office and laboratories of plant pathology, seed testing, etc. The site faces an 8-meter-wide unpaved road (gravel), allowing easy access. An aerial electric wiring runs from east to westward over the site. The DNCRDC is requesting the local electric corporation to relocate this wiring. Basic infrastructures are provided already, and connection and

intake of electric power, water supply telephone piping, etc. is assumed to be available.

4. Environmental Concerns

In addition to the pesticide residue monitoring in crops, this project will serve for the environmental control through the monitoring of water and soil samples taken from rivers, lakes, farm lands, etc. Furthermore, records of pesticide application and residue analysis data will be utilized for the establishment of the Direction for Safe Usage of Pesticides and its enforcement by the FPA. This project will, therefore, contribute to the creation of better environment in the Philippines in terms of safe food supply, environmental control and safe pesticide usage in agriculture.

The project will also be concerned with its influence in the environment, especially of water contamination by laboratory waste water containing used solvents, and of air pollution by exhaust from the instrument rooms.

The plan is to store used solvents and liquid pesticides in the PAL buildings until designated outside experts retrieve them for incineration. Water used for washing laboratory glassware can be discharged into the ordinary sewage system, because the solvents in such water are assumed to be diluted far below the required standard.

The ventilation system in the instrument room with draft chambers for exhaust with high concentration of solvents shall be equipped with active carbon filters. Room air to be exhausted via room exhaust fans will not need special concerns, as it is assumed with low concentration of solvents and can be attenuated into outside air at once.

CHAPTER 4

CONTENTS OF THE PROJECT

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1. Project Description

1-1 Review of the Request

(1) Necessity for the Intensification of PALs

As was stated in the Letter of Instruction No. 986 regarding the establishment of PALs, which was issued by the President to the Secretary of DA in 1980, PALs have been expected, in collaboration with the FPA, to monitor and evaluate pesticide residues, and to develop the Directions for Safe Usage, together with the establishment of MRL. As figure 4-1 shows, PALs have been conducting pesticide monitoring and formulation analysis to supply scientific data to and support FPA's administration of pesticide control. The FPA is the leading agency in control of pesticide usage, while PALs supply scientific data to be utilized as DA's official data, which support the baseline of governmental policies on pesticide control.

Other governmental authorities such as the Department of Environment and Natural Resources request analyses of lake waters, river waters and soil samples for environmental monitoring. Since the Philippine's local governments are not concerned with administration of environmental conservation or food sanitation, there are not a sufficient number of hygienic laboratories in the local government. Therefore, one of the tasks of PALs as the public analytical laboratories of pesticide residues in crops and in the environment will become more important.

The DA intends to adjust its administrative systems and to regulate laws so that they may enforce orders such as to restrain shipping of crops in which high concentration of pesticide residues are detected. An efficient network for monitoring pesticide residues will be necessary to fulfill this intention. In an expectation of more frequent migration of vegetables and fruits in the country, the satellite PALs will play a more significant role in the prompt analysis of collected crop samples and to incorporate data into agricultural policies.

It is also important to collect samples and conduct analysis in accordance with special agricultural products in the neighboring regions. Table 4-1 shows regions covered by each PAL and their special products. Table 4-2 shows production of major crops in each region.

Table 4-1 Pesticide Analytical Laboratories, Regions Covered and Specialties

PAL	Target Regions	Specialties
PAL-Baguio	Regions 1, 2, CAR	cabbage, eggplant, tomato, tobacco
PAL-Central	Regions 3, 4, NCR	calamansi, eggplant, onion
[PAL-Bicol (proposed)	Region 5	abaca, camote, cassava]
PAL-Cebu	Regions 6, 7, 8	mango, sugarcane
PAL-Cagayan de Oro	Regions 9, 10	pineapple
Pal-Davao	Regions 11, 12	banana, coconut

The Philippines is one of the most famous banana exporting countries in the world, and its exportation of this fruit and other crops is expected to increase. In accordance with international movements toward free trade of crops through GATT and others, the Philippines requires more strict quality control of exporting crops in compliance with international standards. For this purpose, too, the DA shall establish an effective governmental monitoring network throughout the country.

Some pesticides, recently banned, still remain in water or soils. This together with chemicals for household or sanitation use, shall also be more strictly monitored with regard to their effects within the environment.

The BPI sets up roles of PALs as follows:

1) Pesticide residue monitoring,
2) Analysis of pesticide formulations,
3) Research and study of pesticides,
4) Training and seminar for agricultural technicians, farmers, etc.,
5) Structuring of the pesticide data bank.

Viz; 1) pesticide residue monitoring includes following services, sharing the most important portion of the PAL's operation.

1)-a Pesticide residue analysis in crops collected through market basket sampling,

1)-b Pesticide residue analysis in crops to formulate basic data for the Philippine's MRL,

1)-c Examination upon commission.

Data collected by 1)-b residue examinations in crops will be accumulated in the data bank at PAL-Central, and will be utilized as basic data

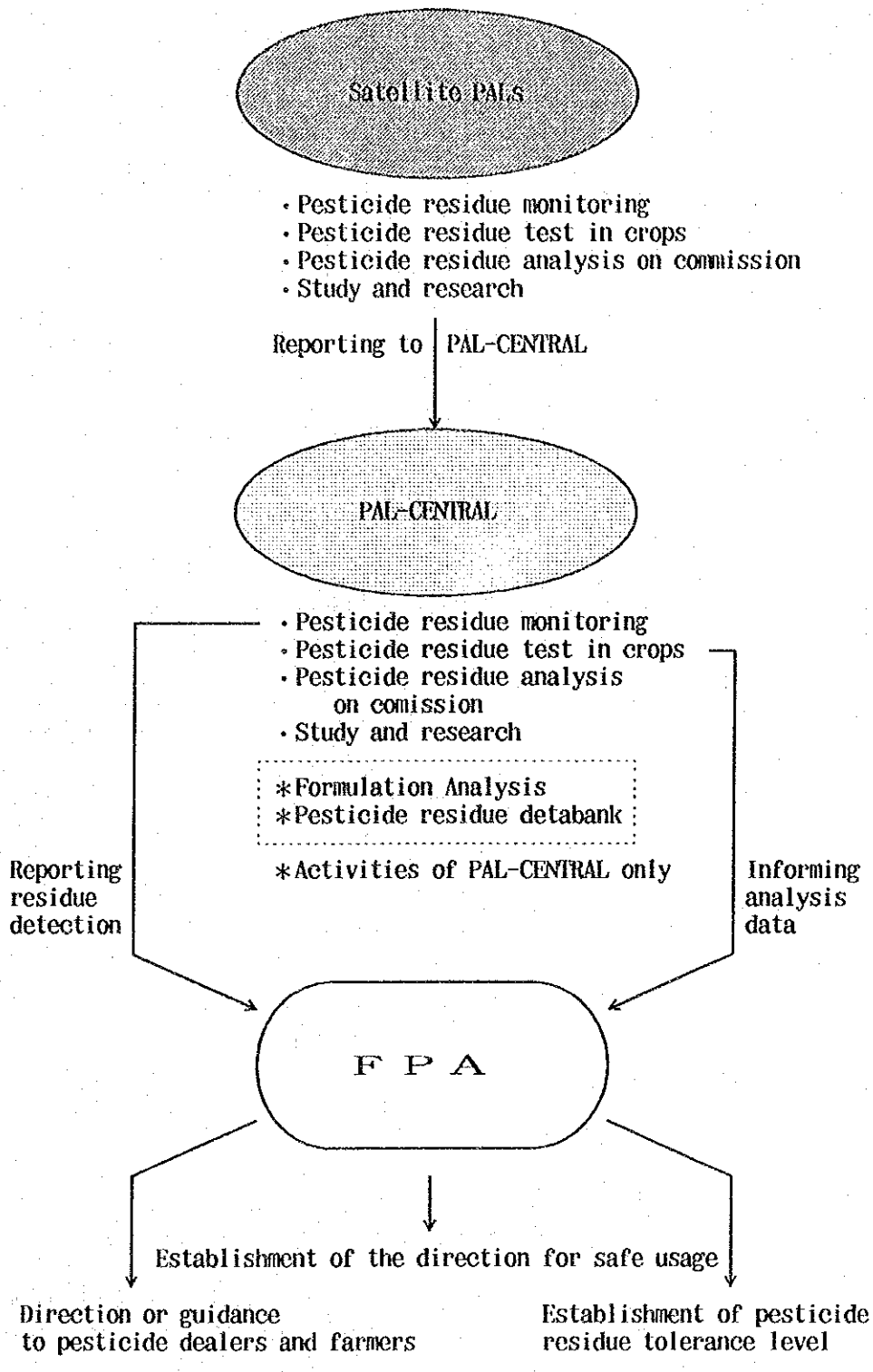


Figure 4-1 Functions of PAL-Central and the Satellites

Table 4-2 Regional Crop Production (1992)

	Abaca		Banana		Cabbage		Calamansi		Camote		Cassava		Coconut		Eggplant	
Country	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%
Total Amt.	84314		3005209		83209		47133		677152		1797848		11404900		100451	
PAL-Baguio	0	0.0	129629	4.3	68759	82.6	4303	9.1	133319	19.7	14540	0.8	114909	1.0	40222	40.0
PAL-Ctrl.	73	0.1	178945	6.0	2253	2.7	23135	49.1	56970	8.4	72038	4.0	1935403	17.0	33944	33.8
PAL-Bicol	32402	38.4	48734	1.6	2137	2.6	5648	12.0	176193	26.0	254930	14.2	759122	6.7	4877	4.9
PAL-Cebu	23584	28.0	441520	14.7	3251	3.9	6765	14.4	178253	26.3	289453	16.1	1396226	12.2	10302	10.3
PAL-CDO	10486	12.4	498100	16.6	2697	3.2	3052	6.5	53840	8.0	367980	20.5	2062812	18.1	4152	4.1
PAL-Davao	6260	7.4	1560180	51.9	3383	4.1	3469	7.4	75648	11.2	45021	2.5	4417623	38.7	6554	6.5
ARMM	11509	13.7	148103	4.9	730	0.9	760	1.6	2929	0.4	753886	41.9	728805	6.4	398	0.4

	Mango		Onion		Pineapple		Sugarcane		Tobacco		Tomato		Rice (Ref.)		Corn (Ref.)	
Country	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%	Yield(t)	%
Total Amt.	330131		55508		1135199		21801961		116667		165423		3505500		3614130	
PAL-Baguio	64661	19.6	21570	38.9	2548	0.2	83950	0.4	106526	91.3	74269	44.9	734380	20.9	411240	11.4
PAL-Ctrl.	95635	29.0	33517	60.4	61508	5.4	4305424	19.7	6544	5.6	36558	22.1	878720	25.1	261150	7.2
PAL-Bicol	376	0.1	40	0.1	41739	3.7	171124	0.8	16	0.0	4795	2.9	330910	9.4	176500	4.9
PAL-Cebu	113752	34.5	158	0.3	11489	1.0	15895318	72.9	866	0.7	23669	14.3	788750	22.5	820870	22.7
PAL-CDO	21902	6.6	84	0.2	625797	55.1	1185259	5.4	858	0.7	20538	12.4	282090	8.0	489990	13.6
PAL-Davao	24318	7.4	139	0.3	391985	34.5	160886	0.7	57	0.0	5212	3.2	400890	11.4	1146400	31.7
ARMM	9488	2.9	0	0.0	134	0.0	0	0.0	1799	1.5	384	0.2	89760	2.6	307980	8.5

Source: D/A data (1992)

for developing the Direction for Safe Usage. These data will enable the FPA to evaluate more precisely the safe application criteria of pesticides submitted by pesticide dealers at the time of registration. Furthermore, they will supply information to promote IPM programs in terms of selection of proper pesticides, safe application method, etc.

Therefore, the pesticide data bank will contribute not only to governmental policies on pesticide control, but also to the entire agricultural sector.

(2) Operation Programs

PALs have been conducting the following services:

a. Analysis of pesticide residues in crops collected through market basket sampling
b. Pesticide residue analysis upon commission (including analysis of samples for the environment monitoring)
c. Analysis of pesticide formulations
d. Research and study of concentration and decomposition of pesticides
e. Training at PALs in analysis technology

The Philippine government has proposed, along with their request for the project, the following programs as the future operations of PALs. Programs from 4) to 7) are newly added activities. Figure 4-2 shows PALs' present activities and future ones which have been enhanced by this project.

1) Analysis of pesticide residues in crops collected through market basket sampling
2) Pesticide residue analysis carried out on commission (including analysis of samples for the environment monitoring)
3) Analysis of pesticide formulations
4) Examination of residual levels in crops to provide basic data for developing the 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 first request proposal included biological efficacy testing in PALs' activities. It was agreed upon with the BPI that this testing should come under the responsibilities of the BPI's Crop Protection Division, and not to be included in this project.

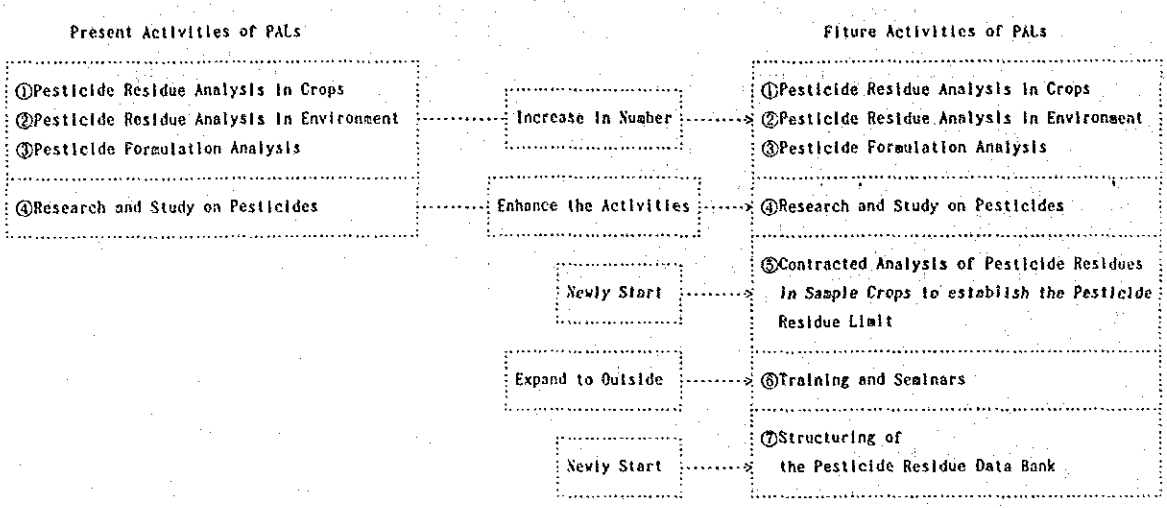


Figure 4-2 PALs' Activities Enhanced by the Implementation of the Project

Future operation programs are reviewed in the following pages, based on results from past activities and the request proposal. Figure 4-3 shows the application of monitoring and formulation analysis data at PALs to pesticide control administration.

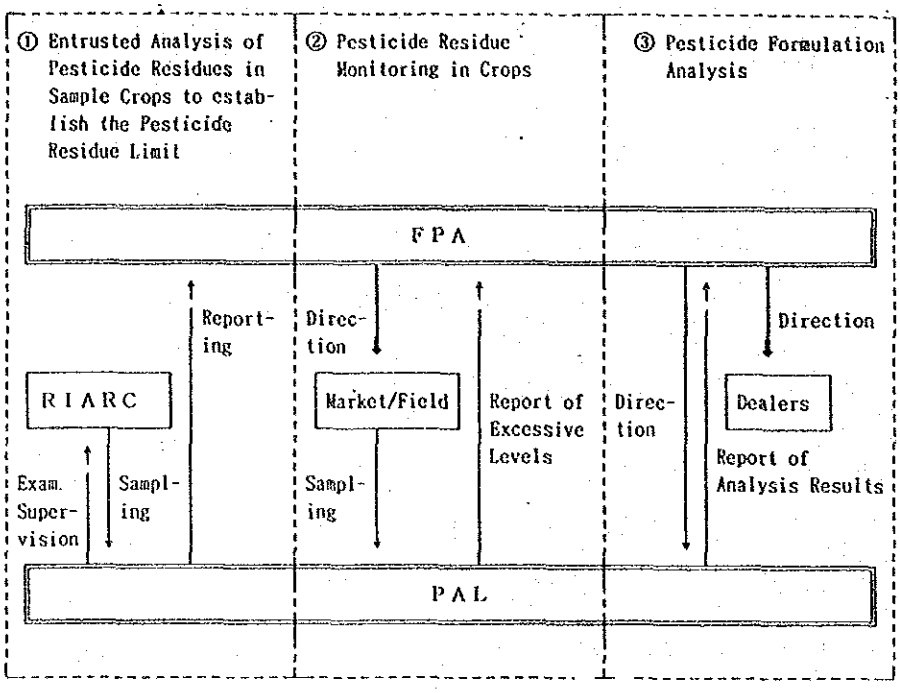


Figure 4-3 Application of Data to Pesticide Control Administration

a. Analysis of Pesticide Residues in Crops Collected through Market Basket Sampling

At present, PALs conduct research and analysis of pesticide residues in crops in accordance with MRL recommended by the Codex Alimentarius Committee of FAO/WHO. Table 4-3 shows PALs' records of analysis in the past five years. PAL-Central conducted 800 to 1,000 analyses annually, while each satellite conducted 350 to 650 analyses. The future operation programs assume 1,000 analyses at PAL-Central and 500 at each satellite. The satellites will select crop samples mainly from among special crops in the regions they serve. Assumed target crops and pesticides are as follows:

Target crops: Ampalaya, Tomato, Cabbage, String bean, Eggplant, Pechay, Baguio bean, Carrot, Squash, Banana, Calamansi

Target pesticides:

Insecticides: Chlorpyrifos, Carbofuran, Cyhalothrin, Malathion
Fungicides : Benomyl, Bitertanol, Maneb, Thiofanate Methyl
Herbicides : Butachlor, Fluazifop, Glufosinate, 2,4-D

b. Pesticide Residue Analysis Carried out on Commission

PALs have conducted pesticide residue analyses of soils and waters from lakes, rivers and wells for environmental monitoring, together with analyses of fruits, fish, meat or their products, as entrusted by other governmental authorities or private companies. Past analysis records are also shown in figure 4-4. In future operation, approximately 500 commodities are assumed annually at PAL-Central. PALs plan to start analysis upon commission also at the satellites, and assumes approximately 100 commodities at each satellite in a year.

PALs have charged dealers on analysis service for pesticide registration. In the past, such income was submitted to the National Treasury, and then a portion of the income could be availed by the earning body as a revolving fund, on the condition that it should be applied to the maintenance of buildings and equipment. This revolving fund is, in principle, unable to be obtained now, since the Circular (No. 1-93, dated July 14, 1993) abolished the revolving fund. However, it is still possible, if an application is made for an exemption of the Circular with the agreement of the budget committee. Then a maximum 20% of the income may be appropriated to the budget for maintenance and operation of the earning body.

Table 4-3 Records of Analysis and Future Assumption

Year	1989	1990	1991	1992	1993	Assum.
Pesticide residue monitoring	646	2486	1220	3172	1806	3500
Analysis on commission	96	352	351	431	545	1000
Formulation analysis	170	82	92	103	46	300
Residue analysis for developing MRL	--	--	--	--	--	6528
T o t a l	912	2920	1663	3706	2397	11328

Source: BPI data

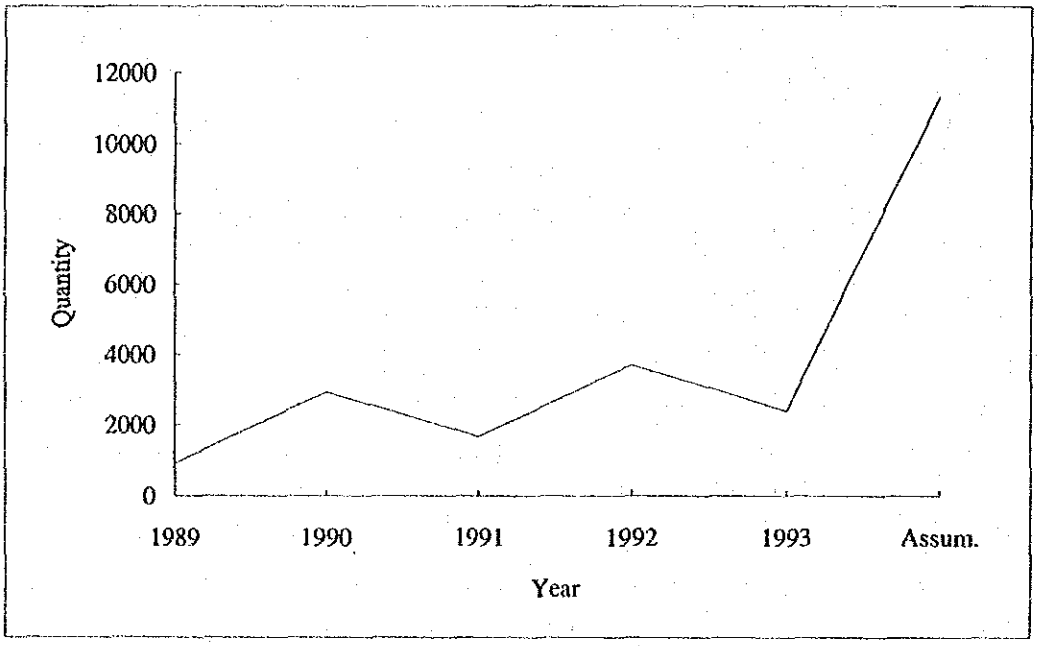


Figure 4-4 Records of Analysis and Future Assumption

c. Formulation Analysis

This service is to control quality of formulation products in the market, whether their ingredients are the same as those shown on the labels, etc. In response to the instructions from the FPA, PALs collect formulation samples and analyze types, quality and quantity of AIs. Pesticide dealers have to present the FPA quality data of their products for registration, of which chemical character (types and quantity of AIs) and physical performance (stability of the formulation) are examined. PALs charge analysis commission fees to the dealers, and it is also possible to

apply exemption of the Circular so that this income can be returned as the revolving fund.

Records of formulation analysis in the past five years are also shown in table 4-3. Today, 175 AIs and 400 formulations are registered. As the registration of pesticides is renewed every third year, it is assumed that PALs will conduct annually about 100 samples upon commission, making a total of 300 analysis including analysis of formulations in the market.

d. Examination of residual levels in crops to provide basis data for developing the pesticide residue tolerance levels

This service is to provide basic data for establishing the Philippines' own MRL, in collaboration with the Regional Integrated Agricultural Research Centers (RIARC). RIARCs are to prepare experimental forms, grow and cultivate sample crops under PALs' instructions, while PALs are responsible for diffusion of pesticides, analysis of crop samples and evaluation of data. This service will compose the PALs' main subject of research for the time being.

Pesticide residue tolerances are to be established from those with high priority in accordance with the toxicity of pesticides and frequency of their use. As shown in the following calculation, the number of samples to be analyzed at PAL-Central is estimated at 1,728 annually and 960 at one satellite. If a satellite having equivalent capability to the other ones is founded in Bicol, the total number of samples will be 6,528 annually. Table 4-3 shows the assumed number of various pesticide residue analyses at PAL-Central and the satellites.

Table 4-4 Assumed Number of Analysis at PAL-Central and the Satellites

	PAL-Central	Satellites x 5	Total
1. Monitoring of pesticide residues in crops	1,000	500 x 5 = 2,500	3,500
2. Examination for developing the MRL	1,728	960 x 5 = 4,800	6,528
3. Analysis upon commission	500	100 x 5 = 500	1,000
4. Formulation analysis	300	N/A	300
Total	3,528	7,800	11,328

[cf. Calculation of samples to be analyzed annually]

There are five factors to determine the annual quantity of samples to be analyzed.

a) Number of crop samples: PAL-Central 6 typical crops
Satellite 4

b) Kinds of pesticides to be diffused in an experiment:
PAL-Central 6 kinds
Satellite 5

c) Samples taken from one experiment area: 4

d) Number of samplings after diffusion: 6 times
(e.g. next day, after 3 days)

e) Frequency of experiments:
once in the rainy and dry seasons respectively

Therefore;

at PAL-Central 6 x 6 x 4 x 6 x 2 = 1,728

at the Satellite 4 x 5 x 4 x 6 x 2 = 1,440

e. Research and Study of Concentration and Decomposition of Pesticides

As stated in paragraph d. above, examinations and analysis of pesticide residues in crops for the establishment of MRL is PALs' main subject of research and study. Other subjects include research of pesticide residues in the environment, examination of multi-residue analysis methods as R&D of analysis technology, etc.

Table 4-5 PALs' Research Program

Subjects	Place	Contents
Examination/ analysis of residual level in crops	PAL-Central Satellites	Examination and analysis of pesticide residues in crop samples in collaboration of the RIARCs, for the establishment of the Philippine's MRL
Analysis of pesticide residues in the environment	PAL-Central Satellites	Analysis of pesticides (including banned and restricted ones) in the environment, using lake and river water and soil samples
Development of multi-residue analysis methods	PAL-Central	Seminars and model experiments to introduce new analysis technology to PAL staff, aiming at analysis efficiency

f. Training of PALs' staff and outside people

Another important role of PALs is to provide training or educational campaigns in cooperation with the FPA and the ATI. PALs' training is mainly composed of technical training/seminars on pesticide analysis, educational campaigns, and assistance in running seminars by other institutions. In addition to these activities, PALs plan seminars on study of analysis methods or crop protection to trainees also from other Asian countries with a support from UNDP.

1) Technical training/seminars on pesticide analysis

PALs will provide training/seminars on analytical skills and for primary understanding of pesticide analysis for PALs' staff, agricultural technicians, technical staff of pesticide dealers, pesticide diffusers, university students of chemistry department, etc. In particular, seminars to introduce basic understanding in the examinations of pesticide residual levels in crops, and seminars on practical method of the examination, will play significant roles, when PALs entrust the dealers for crop sampling before analysis to develop MRL.

i) Subject: Latest pesticide analytical technique
Target Clientele: PAL technical staff
Period : 5 days
Location, Participants, Frequency:
PAL-Central 40 persons, twice a year
Purpose: To introduce new techniques and to standardize analytical methods among the laboratories

ii) Subject: Basic understanding of pesticide analysis
Target Clientele: Chemists from private/governmental chemical laboratories, agricultural chemists, university students
Period : 2 days
Location, Participants, Frequency:
PAL-Central 10 persons, 6 times a year
Satellite 5 persons, twice a year
Purpose: To provide basic knowledge of pesticide analysis through practical training from sampling to qualitative/quantitative analysis

iii) Subject: Testing method of pesticide residual levels in crops
Target Clientele: Pesticide dealers
Period : 1 day
Location, Participants, Frequency:
PAL-Central 20 persons, once a month
Satellite 10 persons, once a month
Purpose: To instruct outline of residual level testing and practical technique

iv) Subject: Sample collection for the pesticide residue monitoring
Target Clientele: Regional agricultural technicians
Period : 1 day
Location, Participants, Frequency:
PAL-Central 10 persons, 4 times a year
Satellite 10 persons, 4 times a year
Purpose: To train agricultural technicians on the proper methods of sample collection

2) Training for educational campaigns
Subject: Pesticide effects to humans and in the environment
Target Clientele: Consumers groups, housewives, students, plantation owners, farm owners
Period : 1 day
Location, Participants, Frequency:
PAL-Central 20 to 40 persons, once a month
Satellites 10 persons, once a month
Purpose: To educate on residual pesticides and their monitoring through observation of analysis work

3) Assistance in training/seminars by other institutions

Regarding the proper usage of pesticides and their harmful effects to humans and in the environment, the FPA, with support from the ATI, provides seminars for pesticide dealers. The BPI's Crop Protection Division in collaboration with the FPA provides seminars for farmers as a part of the IPM promotional campaign. PALs will support these activities as an pesticide analysis expert, by dispatching lecturers, supplying necessary data, or assisting them in creating training materials, etc.

g. Structuring of Pesticide Data Bank

Valuable data will be collected through examinations and analysis of pesticide residues in crops for developing MRL and through the monitoring of crop samples in the market. These data should be filed and utilized continuously in the future. PALs intend to file them in the personal computer system to make a data base for future usage. This data bank will allow the BPI, the FPA and other authorities to access freely to the pesticide data bank, and will therefore supply required data instantaneously.

(3) Review of the Requested Facilities

The request proposal refers to new laboratory buildings and relocation of the present PAL-Central and PAL-Davao, together with upgrading of equipment. It refers to a new satellite in Bicol with supply of new equipment.

The existing PAL-Central building was constructed in 1976 with a donation from the former West Germany. In order to accommodate various new equipment to be provided by this project, and to cater for expansion of PAL's activities, the present laboratory needs extension, or restoration for larger space. Now, the pesticide residue monitoring unit and the formulation unit are situated on the same floor, separated by the main entrance. This layout may cause sample contamination. As the existing BPI compound has only limited extra space, a new laboratory building of PAL-Central needs be constructed in another location.

Davao is a major banana plantation and exportation center, and a production area of various fruits. Its importance as the crop supply source in the Philippines will increase. Mindanao Island attracts attention even from Malaysia or Indonesia as a potential development and crop exportation area. In these circumstances, the necessity for more strict monitoring of pesticide residues is high in Davao. The PAL-Davao building, originally constructed as DNCRDC's canteen, was restored to the pesticide analytical laboratory. The space is insufficient, and the layout is not suitable for efficient analysis processing. Therefore, a new laboratory building needs be constructed in the DNCRDC's compound, to intensify the capability of PAL-Davao and respond to the local needs.

The satellite in Bicol is planned to serve Region 5. PAL-Central serves this region now, but in fact analyzes only a few samples from there, because the traffic network between Region 5 and NCR causes delays in collection and dispatch of samples. There is a necessity to construct a new satellite to cater for this unfavorable situation.

According to PAL's plan, five technical staff are to be employed for PAL-Bicol, six months before the project completion. They will take in-house training at PAL-Central and then will be assigned to Bicol. The chief of PAL-Central will be positioned as the chief of PAL-Bicol for the first six months until PAL-Bicol can operate to its full capacity. 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.

(4) Reviews of the Requested Equipment

The necessity for the equipment has been reviewed based upon discussions with the BPI, setting the priority of equipment in each PAL, as shown in a table attached to ANNEX 4. Minutes of Discussions (2) Basic Design Phase 2. The request proposal from the Philippines included equipment for training purpose, laboratory furniture and utensils. The primary objective of this project is to intensify the PALs' analytical capability in order to develop basic data for establishing the MRL. Thus, upgrading of equipment for pesticide residue analysis shall be provided with priority. The request proposal listed GCs and HPLCs for pesticide analysis at the satellites, and high tech new equipment like GC/MS and LC/MS in addition to GC and HPLC for PAL-Central.

In principle, all the laboratories will use GCs with three to four detectors for typical pesticide analysis, and will use HPLC for the ones that may decompose during analysis using GCs. This is a commonly adopted standard analysis method today. PALs are experienced in GCs and HPLCs, so there appears to be no difficulty in operation of the new GCs and HPLCs to be provided by this project. The PAL-Central plans another GC and HPLC for pesticide formulation analysis. This equipment composition is suitable considering the types of formulations in question.

GC/MS and LC/MS are new to the PALs' staff, so they shall be considered together with training in operations. In particular LC/MS is a new instrument, and it shall be investigated furthermore as to the appropriateness of this instrument to PALs.

The BPI requested an atomic absorption spectrometer (AAS) in the additional equipment list. This instrument is for analysis of pesticides

with metallic ingredients. The necessity for AAS appears small, as the kinds of target pesticides requiring this instrument are considered few. Metallic ingredients can be detected using GCs.

1-2 Cooperation Principles

(1) Facilities

A new laboratory building is to be constructed for PAL-Central so that they can take full advantage of newly provided equipment. The building will mainly consist of the pesticide residue monitoring unit, the formulation analysis unit, and seminar rooms. Details of necessary rooms are listed in Chapter 4 4. Basic Design of this report.

Two four-bedded rooms will be considered in the PAL-Central building for men and women respectively. The sleeping rooms are to serve the PALs' staff who have to work past midnight; who have to leave for market basket sampling before dawn, or who come from the satellites to operate instruments only installed in PAL-Central, etc. Considering that similar facilities are also provided in the Agricultural Chemical Inspection Station in Japan to be used for overnight work, these sleeping rooms are required in this type of facilities.

A medium size green house with sprinkler system is planned at PAL-Central for the purpose of examining influence of temperature, humidity and rains upon residual levels of pesticides under controlled conditions. An artificially controlled environment is necessary for precise examination in the Philippines, where extraordinary rainfalls are frequently seen.

PAL-Davao also requires a new laboratory building to cater for upgrading of new equipment and to function to full capacity. A proposed site is near the present PAL-Davao building, both in the DNCRDC compound, situated at a favorable location.

PAL-Bicol is to be a new satellite to serve Region 5 with all new technical staff. Region 5 is a large region, however, as the other satellites serve two to three regions at the same time, it seems practical to set its capability at about half of other ones, and to provide equipment accordingly. There is a building being used for chemical analysis of marine products in the compound of the Bicol Experiment Station, and a part of this building is expected to be available for PAL-Bicol.

In compliance with the above-mentioned principles, table 4-6 shows general composition of considered facilities.

Table 4-6 Composition of Considered Facilities

Plan			Request	
Facilities	Rooms	Floor Area	Requested Facilities	Floor Area
PAL-Central			PAL-Central	2,675 m^2
1. Main Building	Pesticide residue monitoring rooms Formulation analysis rooms Admin. & training rooms	2,270.38m^2		
2. Annex	Electric room, Pump room, Garage, Storage room	286.72m^2		
3. Green house		81 m^2		
	Sub-total	2,638.10m^2		2,675 m^2
PAL-Davao	Instrument room, Extraction/Clean-up room, Staff office, Meeting room, etc.	430.25m^2	PAL-Davao	420 m^2
PAL-Bicol will be situated in an existing building, instead of constructing a new laboratory.		0 m^2	PAL-Bicol	420 m^2
	Total	3,068.35m^2		3,515 m^2

(2) Equipment

As was mentioned in (4) Review of the Requested Equipment, 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.

GCs and HPLCs as the principal analysis instruments are practical and appropriate selection in terms of future maintenance and operation, as PALs are familiar to these instruments. Regarding quantity: five GCs and one HPLC with suitable detectors shall be provided for one satellite, where approximately 2,000 samples will be analyzed a year, as stated in the review of operation programs. Three GCs and one HPLC will be sufficient for PAL-Bicol, according to its assumed capacity.

PAL-Central shall be equipped with eight GCs including the existing one and three HPLCs, to accomplish approximately 3,000 analyses in a year. An automatic injection apparatus, if equipped onto some instruments, will allow unattended analysis work during midnight, which will contribute to analysis efficiency.

GC/MS, being requested for PAL-Central, is indispensable for identifying AIs from other confusing similar substances, and is widely used in pesticide residue analysis in Japan. Quadrupole GC/MS, a simpler and cheaper type, has become dominant recently. The UP Crop Protection Center has adopted GC/MS into pesticide residue analysis, and it is easily available today in the Philippines, in terms of purchase, operation and maintenance. GC/MS is worth considering as the equipment supplyers. As this instrument is alien to the PALs' staff, technical cooperation such as instructions of operation and maintenance, or staff training in Japan is a precondition of supply.

On the other hand, LC/MS, requested for PAL-Central, is a brand new instrument, invented only a few years ago. It is still on its way to innovation, and is not yet common in Japan, either. According to an equipment agent, LC/MS has not been introduced to the Philippines. It seems premature to consider this instrument for PALs now. The necessity shall be reconsidered at the time of technical cooperation, together with training of its operation and maintenance.

The number of principal measuring instruments to be provided for each laboratory in this project are shown in table 4-7. Regarding those for sample storage and processing, adequate amounts will be supplied based on the composition of principal measuring instruments and the quantity of samples to be analyzed annually.

Table 4-7 Provision of Principal Measuring Instruments

	PAL-Central		Satellites					Total
	Pesticide Residue	Formu-lation	Baguio	Cebu	CDO	Bicol	Davao	
GC	7	2	5	5	5	3	5	32
HPLC	2	1	1	1	1	1	1	8
UV-VIS	1	1	1	1	1	1	1	7
GC/MS	1	0	0	0	0	0	0	1
IRSP	0	1	0	0	0	0	0	1

Table 4-8 shows ratio of considered equipment to requested one at each laboratory.

Table 4-8 Composition of Considered Equipment
(upper row: scheduled amount, lower row: requested amount)

	PAL-Central	PAL-Baguio	PAL-Cebu	PAL-CDO	PAL-Bicol	PAL-Davao	Total
Sample Collection	1 3	1 3	1 3	1 3	1 3	6 3	6 18
Sample Storage	6 9	2 3	2 3	3 3	3 4	4 5	20 27
Extraction	16 27	7 9	4 9	5 10	6 11	7 12	45 78
Clean-up	52 81	20 32	16 31	13 30	19 34	23 35	143 243
Analysis	18 32	7 13	7 13	7 13	5 13	7 13	51 97
Power Supply	0 6	1 3	1 3	1 3	1 3	0 3	4 21
Furniture, Others	193 204	10 19	14 24	14 29	37 51	52 58	320 385
Total	286 362	48 82	45 86	44 91	72 119	94 129	589 869
Schedule/ Request rate	79%	59%	52%	48%	61%	73%	68%

2. Objectives

The FPA has been enhancing proper distribution and usage of agricultural chemicals since its establishment in 1977. The results of monitoring will be utilized effectively, when the Philippines is equipped with the criteria for pesticide registration, permissible residue levels (in food and additives) or penalties in case that excessive concentration of pesticide is detected.

The DA, in cognizance with the current concerns with the pesticide usage in the Philippines, has set up four political thrusts to ensure the correct application of pesticides and safe food supply.

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

It needs to know how much of agricultural crops and the environment has been affected by pesticide residues, in order to pursue these thrusts. In particular, precise analysis data of pesticide residues are indispensable for the setting up of MRL, while PALs require upgrading of their equipment. Satellite PALs have collected and analyzed samples for the purpose of pesticide residue monitoring in the country. There still remains some districts that have not yet been fully monitored because of geographical conditions, etc. There is an urgent necessity, therefore, for establishing new pesticide laboratories in these districts so that the entire country may be monitored.

In these circumstances, this project has set its objectives in improving the PALs' capability through construction of new laboratory buildings for PAL-Central and PAL-Davao, together with the supply of new analytical equipment to all the laboratories. Futhermore, it aims for creation of a thorough monitoring network of intensified PALs throughout the country, for a more efficient accumulation of pesticide residue analysis data, and for the establishment of the Philippines' own MRL.

3. Implementation-Management Program

3-1 Organization and Personnel

(1) Organizations Involved in the Project

In order to achieve the project objectives (improvement of the national monitoring system of pesticide residues, education concerning the proper usage of pesticides and their harmful effects to human life and in the environment, and establishment of MRL), PALs will need collaboration with the FPA and other governmental institutions relevant to foods and crops. For this purpose, the Government of the Philippines is to establish a project implementation system, as shown in figure 4-5.

As this project is to contribute to safe food supply and health of the Filipinos, the Program Management Council (PMC) will be established, and will be composed of the Secretary and Undersecretary for Research and Extension of DA, the Executive Director of FPA and the Director of BPI, in order that smooth negotiations and coordination may be made at executive level regarding such matters. The LSD and the FPA consist of the Secretariat.

In the Program Advisory Council (PAC), an opinion renderer to the project, the International Agricultural Development Cooperation Coordinating Office (IADCCO) will participate as a chairperson to clarify the status of this project among other governmental policies on agriculture, while the National Economic and Development Authority (NEDA) will associate in terms of budgetary appreciation for the implementation of this project. The Council also involves the Bureau of Food and Drug (BFAD) as well as the Environment Management Bureau, because food sanitation and environmental concerns need to be incorporated. The Program Technical Committee will be established involving the Pesticide Technical Advisory Committee, FPA officers and LSD staff to give technical reviews on the project.

With regard to the establishment of MRL, the MRL technical committee will be set up to review analysis data presented by PALs. With participation of the BFAD, FNRI, BPI, FPA, NFA, DEOH, NCPC, and CPAP, this committee will be capable of considering various factors such as safe food supply, health of nations, environment conservation, work safety of farmers, etc. when developing MRL of the Philippines.

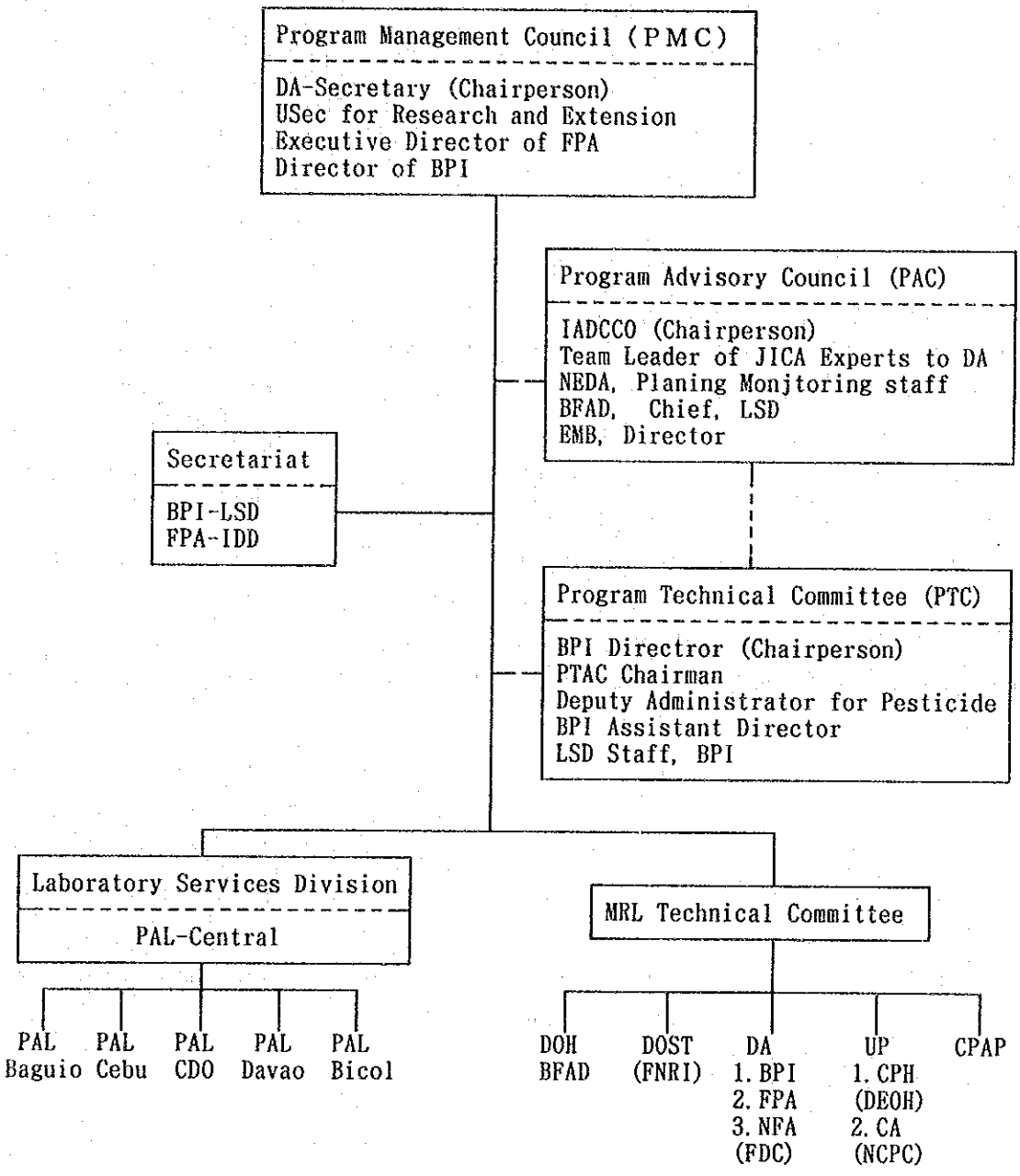


Figure 4-5 Organizations Involved in the Project

(Source: BPI data)

(2) PALs' Operation System

Currently, all the satellites belong to the BPI in terms of operation, while in administration, some satellites belong to DA's Regional Offices.

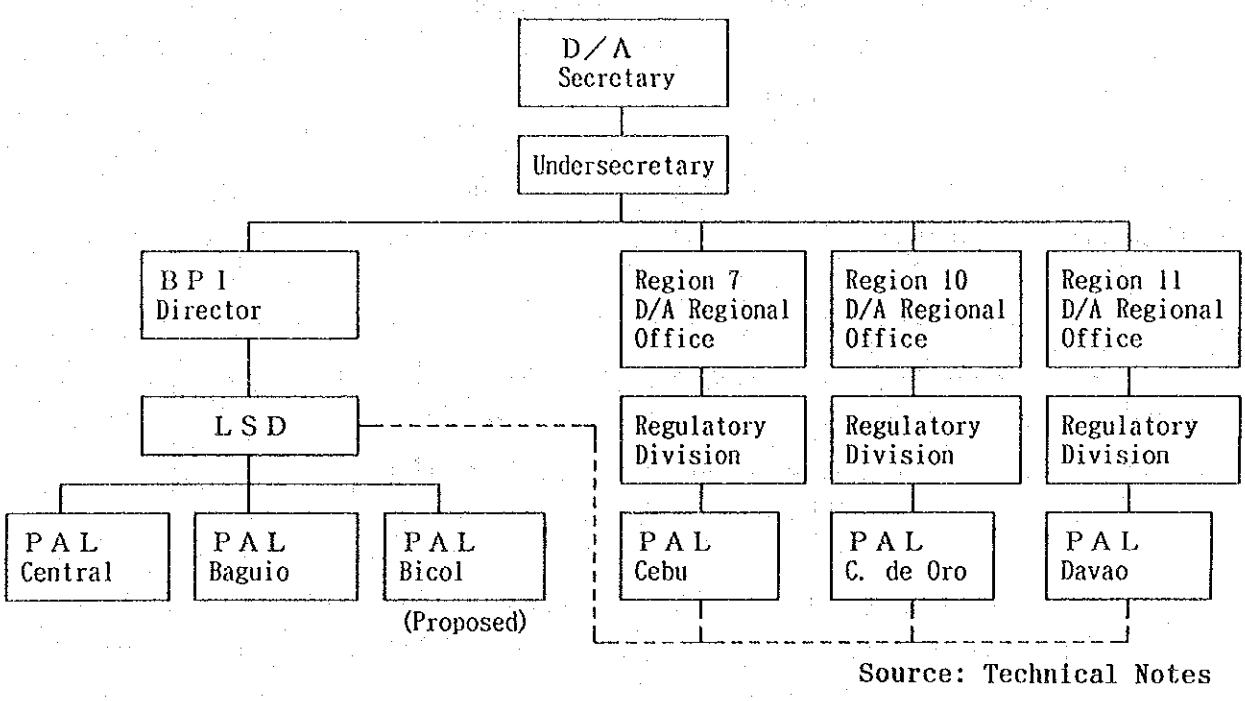
As of the Basic Design Study (Phase 1) carried out in February 1994, PAL-Central, PAL-Baguio and proposed PAL-Bicol directly belong to the BPI, while PAL-Cebu, PAL-CDO and PAL-Davao receive technical support from the BPI but belong to the DA's Regional Offices in terms of budgets and personnel assignment.

The situation of some satellites belonging to the Regional Offices in administration may be obstructive to smooth operations in staff personnel employment, their skill improvement programs, etc. Close cooperation between each PAL under integral strategy will be vital for the achievement of the project objectives. Thus, the BPI should have entire jurisdiction over PALs, both in engineering and administration. It will be more advantageous, if the BPI can manage all the equipment, in view of maintenance cost and efficiency. The BPI reiterated its request to the Secretary of DA and has obtained approval that the BPI should manage all PALs both in engineering and administration. The past status of each PAL is shown in figure 4-6, and the organization under the BPI's direct management in figure 4-7.

PAL-Central will function as the core center of PALs, overseeing the operations of the satellites, and providing technical assistance. For instance, pesticides undetectable with the satellite's equipment, can be identified with PAL-Central's GC/MS. Analysis data prepared at the satellites will be accumulated at PAL-Central, and PAL-Central will present them to the FPA for scientific support to its pesticide administration, or will file them into the pesticide data bank.

(3) Personnel Planning

When the BPI's request for direct management of all PALs is approved, personnel planning will also come under BPI's control. The BPI plans to assign 27 persons at PAL-Central and average 10 at each satellite, making the total staff personnel 77. Figure 4-8 shows a proposed organization of PALs according to this personnel assignment schedule. The chief of the LSD's residue monitoring unit will serve as the chief of PAL-Central concurrently. Table 4-9 indicates the number of present staff and expected staff when this project is completed.



Source: Technical Notes

Figure 4-6 Current Status of Each PAL

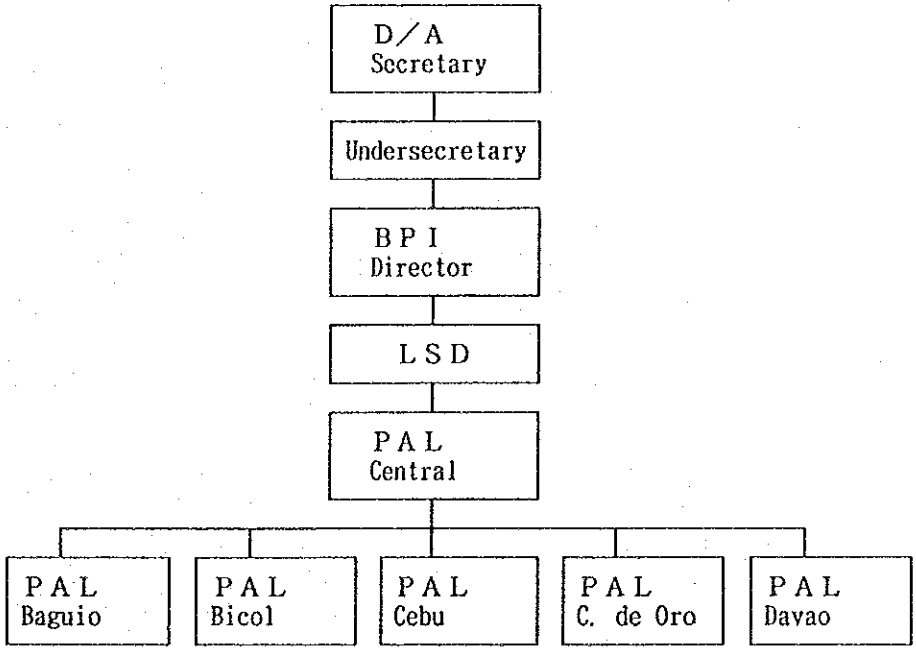


Figure 4-7 Future Status of Each PAL

——— Management
- - - - - - Technical Support

For PAL-Bicol, five technical staff are to be employed six months before the project completion. They will take in-house training at PAL-Central, and then will be assigned to Bicol. The chief of PAL-Central will be positioned as the chief of PAL-Bicol for the first six months until PAL-Bicol can operate in its full capacity.

The new employment for the existing satellites is drivers and a laboratory technician for PAL-Cebu. The other satellites plan to manage the operation programs after the project with the current staff personnel. These personnel are all university graduates, and are qualified chemists with ample experience. The amount of analysis will expand considerably after the completion of the project. Each satellite except for PAL-Bicol is to analyze 1,560 samples (assumed amount) in a year. It depends on the kinds of pesticide to be analyzed, but is possible to analyze 10 to 20 samples a day with five GCs by nine laboratory staff, with reference to analysis work in average Japanese laboratories. With the expertise and experiences of PALs' staff, the current number of staff is well capable of 1,560 analyses annually. In accordance with the expansion of the analysis work, there will be many concerns which need be improved in the future. These include analysis work efficiency and standardization, data evaluation methods, etc. A systematic improvement plan should be investigated among PAL-Central and the satellites.

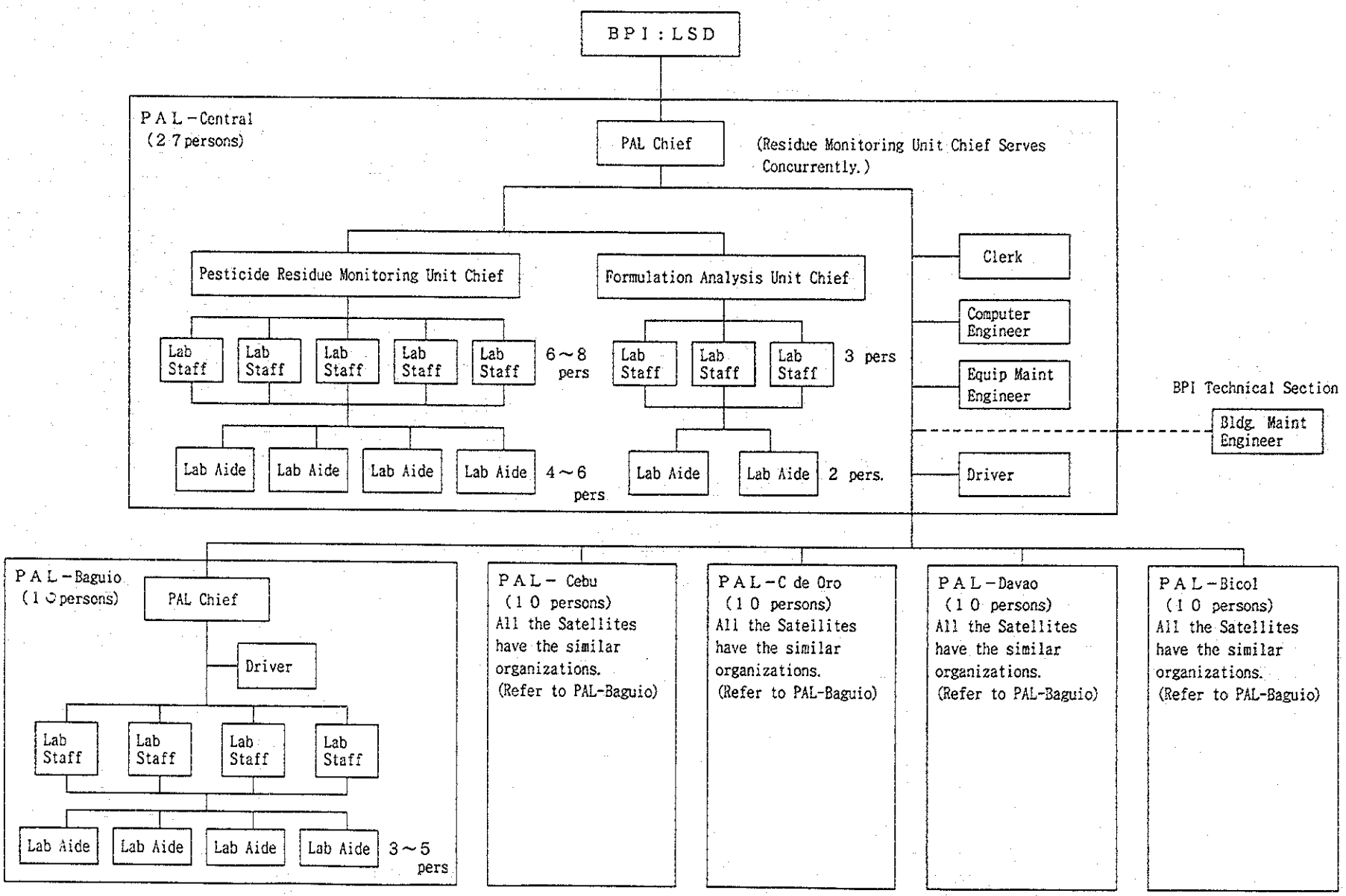


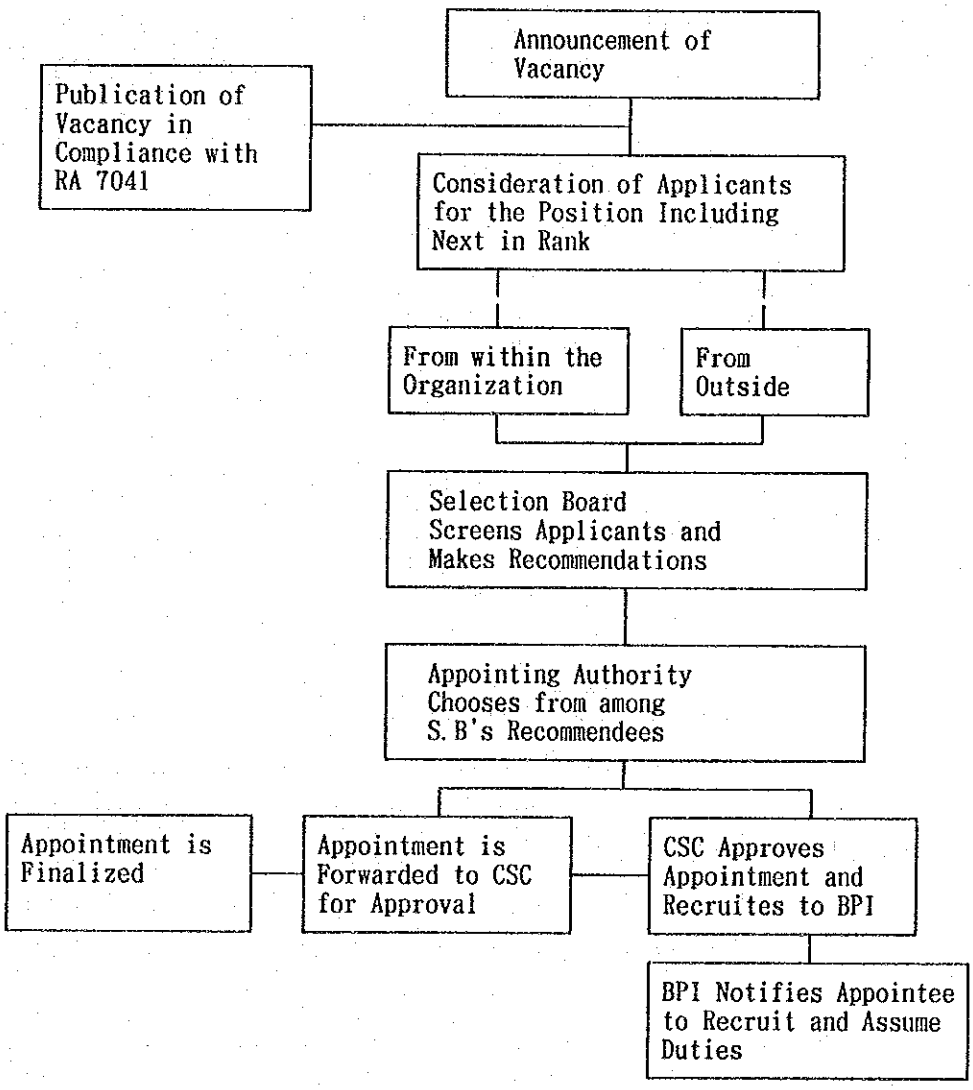
Figure 4-8 Organization of PALs

Table 4-9 Personnel Planning

Positions	Grade	PAL Central	Baguio	Cebu	Ca de Oro	Davao	Bicol	Total
Supervisory Agriculturist	22	1						1
Supervising Chemist	22						(1)	(1)
Research Chemist	19	(1)					(1)	(2)
Senior Agriculturist	18	1						1
Senior Chemist	18		1	1		1		3
EngineerIII	18	1						1
Analytical ChemistIII	18	(1)	1	2	2	2	(1)	7 (2)
Analytical ChemistII	15	1 (2)	3	1	2	2		9 (2)
Analytical Chemist I	11	(2)	1		3	2	(2)	6 (4)
Agriculturist II	15	5		1				6
Agriculturist I	12			1				1
Laboratory Technician II	8		1					1
Laboratory Technician I	6	(2)	2	(1)	1		(2)	3 (5)
Laboratory Aide II	4	1 (2)		2	1	2		6 (2)
Laboratory Aide I	2	1					(2)	1 (2)
Computer Operator	12	(1)						(1)
Lab. Equip. Specialist	15	(1)						(1)
Driver-Mechanic II	5	(1)	(1)	(1)	(1)	(1)	(1)	(6)
Clerk		1 (1)						1
Casuals		1						1
Total		13(14)	9 (1)	8 (2)	9 (1)	9 (1)	(10)	48 (29)
Total Staff after the Project Completion		27	10	10	10	10	10	77

Figures in parentheses are new employees.

In the Philippines, about 500 chemists pass the Board Examination for Chemists every year. Therefore it will not be difficult to procure experienced registered personnel as there are limited employment opportunities in the chemistry related sectors. Figure 4-9 shows the BPI's employment procedure. In principle, the LSD provides advice on the employment of PALs' staff.



Source: BPI data

Figure 4-9 BPI's Employment Procedure

3-2 Budgets

Table 4-11 indicates budgets appropriated for each PAL in the five years from 1990 to 1994, and the budget plan for the years from 1995 to 2000.

As this budget plan assumes that PALs commence their operations in full capability from the year 1996, maintenance and operation expenses (MOE) will increase drastically from 1995 to 1996. The total expense for personnel services (PS) and MOE is planned at 14,649,000 pesos or 184% of the previous year. Table 4-10 compares budgets for the years 1995 and 1996. In the budgets for the fiscal year 1995, 1,219,318.70 pesos, 109,300.10 pesos and 2,213,430.25 pesos will be appropriated to PAL-Central, PAL-Davao and PAL-Bicol respectively for the land preparation work of the sites. (3,538,048.95 pesos in total)

Table 4-10 Budget Increase from 1995 to 1996

(1,000 pesos)

	1995 (Regular Budgets)	1996 (Including Supplementary Budgets)	Increase Rate (1996/1995)
PS	4,465	5,297	119 %
MOE	3,486	9,352	268 %
Total	7,951	14,649	184 %

When a considerable increase of budget is needed in line with the implementation of a foreign-assisted project, a supplementary budget is availed with proof that that project is in mutual agreement by both the Philippine government and the donor country. Such a supplementary budget is to be appropriated to this project. Philippines' national budgets are open to the public in the General Appropriation Act. Seeing this Act, past foreign-assisted projects were all granted with the supplementary budgets from the Foreign-Assisted Project Fund (FAPF) by the Department of Budget & Management (DBM) without exception. For example, in the Soil Research and Development Center project, the budget for MOE was 24,455,000 pesos in 1990, which augmented to 86,297,000 pesos in 1992 after the Japanese grant was carried out, 3.5 times as much as the 1990 budget. This supplementary budget will be included in succeeding regular budget appropriation, when it is approved necessary for continuous operation. The principal factors of

Table 4-11 Budgets for Each PAL (1990 to 2000)

(1,000 pesos)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
PAL-Central											
PS	460	460	430	1,395	2,076	1,744	1,827	2,193	2,631	3,157	3,789
MOE	1,127	1,072	958	1,301	1,466	1,662	3,664	4,396	5,276	6,331	7,597
TOTAL	1,587	1,532	1,388	2,696	3,542	3,406	5,491	6,589	7,907	9,488	11,386
PAL-Baguio											
PS	511	511	512	512	452	1,019	694	833	999	1,199	1,438
MOE	127	29	104	105	244	760	1,218	1,462	1,754	2,105	2,526
TOTAL	638	540	616	617	696	1,779	1,912	2,295	2,753	3,304	3,965
PAL-Cebu											
PS	470	470	470	470	470	470	694	833	999	1,199	1,438
MOE	125	150	148	105	154	556	1,218	1,462	1,754	2,105	2,526
TOTAL	595	620	618	575	624	1,026	1,912	2,295	2,753	3,304	3,965
PAL-CDO											
PS	452	452	452	452	575	543	694	833	999	1,199	1,438
MOE	273	272	172	200	180	292	1,218	1,462	1,754	2,105	2,526
TOTAL	724	724	624	652	755	835	1,912	2,295	2,753	3,304	3,965
PAL-Davao											
PS	575	470	477	479	470	689	694	833	999	1,199	1,438
MOE	110	168	130	150	154	216	1,218	1,462	1,754	2,105	2,526
TOTAL	585	645	607	629	624	905	1,912	2,295	2,753	3,304	3,965
PAL-Bicol											
PS							694	833	999	1,199	1,438
MOE	(To be opened in 1996)						815	978	1,174	1,409	1,691
TOTAL							1,509	1,811	2,173	2,608	3,129
All PALs											
PS	2,368	2,370	2,341	3,308	4,043	4,465	5,297	6,358	7,826	9,152	10,984
MOE	1,761	1,691	1,512	1,861	2,198	3,486	9,351	11,224	13,466	16,160	19,392
TOTAL	4,129	4,061	3,853	5,169	6,241	7,951	14,648	17,582	21,292	25,312	30,376

(NOTE PS: Personal Services, MOE: Maintenance & Operation Expenses)

requesting for the supplementary budget in this PAL project are expansion of PALs' analytical services, from current 2,397 samples to 11,328 or 4.7 times of increase, and employment of 28 more staff. The supplementary budget is certain to be approved on the grounds that this project is highly significant to the Philippines, in terms of ensuring safe food supply and health of the Filipino nation.

PALs have charged dealers on analysis service for pesticide registration. In the past, such income was once submitted to the National Treasury, and then a portion of the income could be availed by the earning body as the revolving fund on condition that it should be applied to maintenance of buildings and equipment. This revolving fund is, in principle, unable to be obtained now, since the Circular No.1-93 abolished the revolving fund. However, it is still possible, if an application is made for an exemption of the Circular using the agreement of the budget committee. Then a maximum of 20% of the income may be appropriated to the budget for maintenance and operation of the earning body.

The BPI's current analysis charge is 1,500 pesos per sample for the monitoring of both pesticide residues and formulations. Assuming that all the analyses on commission are from private dealers, that PAL-Central and all the satellites will be entrusted with pesticide residue monitoring of 1,000 sample crops a year, and PAL-Central will be entrusted with analyses of 100 formulation samples a year, the income of all PALs for analysis service is estimated at 1.65 million pesos. Twenty percent refund of this income will become 330,000 pesos. PALs are considering application for this revolving fund.

<Estimation of Revolving Fund>

- Pesticide residue monitoring upon commission

  1,500 pesos/sample x 1,000 samples = 1,500,000 pesos

- Formulation analysis upon commission

  1,500 pesos/sample x 100 samples = 150,000 pesos

T o t a l 1,650,000 pesos

x 20 %

330,000 pesos

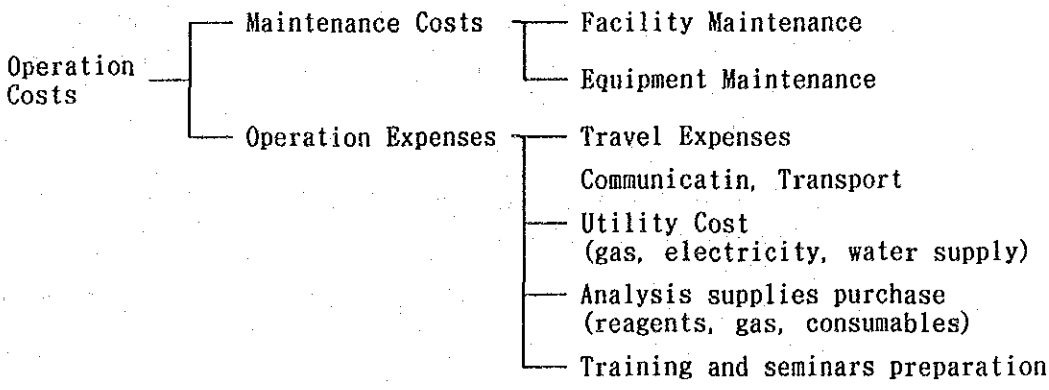
3-3 Maintenance and Repair Planning

(1) Maintenance System

In the personnel plan after the project completion, a precision equipment engineer is to be assigned at PAL-Central, who will commute among the five satellites to maintain and repair the laboratory equipment. An electrical engineer at PAL-Central, who maintains the equipment at present, is expected to be in this position permanently. As for facility maintenance, PALs have not employed a maintenance specialists, but a civil engineer from the engineering division of the BPI maintains the PAL-Central building. The satellites ask engineers stationed at the regional offices for maintenance. When this project is completed, regular maintenance work will be required for newly installed generators, AVR and upgraded air conditioning systems. The current maintenance system needs not be changed, but the BPI engineer will visit each satellite regularly, check defects or damages, and take any required actions by utilizing outside expertise. For this purpose, floor plans and other building drawings and equipment manuals shall be filed at the BPI's engineering division.

(2) Operation Costs

In principle, the operation costs consist of facility and equipment maintenance costs, and PALs' operation expenses, that is, costs for their analysis services. In addition, special expenditures will be necessary for site preparation work for new PAL building construction, restoration of existing satellite buildings, etc. The operation costs are further broken down into categories as shown below.



According to the BPI's estimation, annual operation costs will be as follows:

PAL-Central		3,663,592 pesos
Satellites (Baguio, Cebu, CDO and Davao)	1,230,225 x 4 =	4,872,900 pesos
PAL-Bicol		815,370 pesos
Total		9,351,862 pesos

a. Initial Estimation of PAL-Central Operation Costs

1) Maintenance costs

- Facilities 6,000 pesos/month x 12 = 72,000 pesos
- Equipment 2,000 pesos/month x 3 x 12 = 72,000 pesos
  (vehicles maintenance)

2) Operation expenses

- Travel expenses

Gasoline for sample collection (500 lit/month) 72,800 pesos
(PAL-Central will bear the expenses for inviting two staff from each satellite at every quarter of the year.)

from Cebu	1,539 x 2 x 2	6,156 pesos
Baguio	180 x 2 x 2	720
Cagayan de Oro	1,840 x 2 x 2	7,360
Davao	2,514 x 2 x 2	10,056
Bicol	589 x 2 x 2	2,356
		26,648
4 times a year		x 4
		106,592
Staff's daily wage $125_{₱/day} \times 2_{pers} \times 3_{days} \times 44_{times}$		+ 33,000
		139,592
Gasoline for supervising examinations of pesticide residual levels in crops (500 lit/month)		72,000
	Sub-total	283,592 pesos

- Communication

4,000 ₱/month x 12 months = 48,000 pesos

- Transport

2,000 ₱/month x 12 months = 24,000 pesos

- Gas & electric power supply

  24,000 ₱/month x 12 months = 288,000 pesos

- Water supply

  12,000 ₱/month x 12 months = 144,000 pesos

- Analysis supplies purchase

Reagents (for 3,500 samples)		1,680,000 pesos
Utensils 4,000 ₱/month x 12 months	=	48,000
Standard agricultural chemicals 30 ₱/sample x 3,500	=	105,000
Formulation samples 350 ₱/sample x 500	=	175,000
Consumable goods 2,000 ₱/month x 12 months	=	24,000
Sub-total		2,032,000 pesos

- Training & seminars preparation	100,000 pesos
- Miscellaneous	600,000 pesos
Total	3,519,592 pesos

b. Initial Estimation of One Satellite Operation Costs (Bicol, Cebu, CDO, Davao)

1) Maintenance costs

- Facilities	2,000 pesos/month x 12	=	24,000 pesos
- Equipment (vehicles maintenance)	2,000 pesos/month x 12	=	24,000 pesos

2) Operation expenses

- Travel expenses

Gasoline for sample collection (200 lit/month)	28,800 pesos
Staff's daily wage $125_{₱/day} \times 3_{pers} \times 3_{days} \times 45_{times}$	50,625
Gasoline for supervising examinations of pesticide residual levels in crops (200 lit/month)	28,800
Sub-total	108,225 pesos

- Communication

  1,000 ₱/month x 12 months = 12,000 pesos

- Transport

  1,000 ₱/month x 12 months = 12,000 pesos

- Gas & electric power supply

  6,000 ₱/month x 12 months = 72,000 pesos

- Water supply

  3,000 ₱/month x 12 months = 36,000 pesos

- Analysis supplies purchase

  Reagents 720,000 pesos

  Utensils 2,000 ₱/month x 12 months = 24,000

  Standard agricultural chemicals

  (1,500 samples) 30,000

  Consumable goods

  1,000 ₱/month x 12 months = 12,000

  Sub-total 786,000 pesos

- Training & seminars

  Training for PALs' staff

  6,500 pesos x 8 pers = 52,000

  Training for pesticide dealers

  150 pesos x 120 pers = 18,000

  Training upon commission

  150 pesos x 40 pers = 6,000

  Training for consumers

  150 pesos x 120 pers = 18,000

  Sub-total 94,000 pesos

- Miscellaneous 50,000 pesos

  Total 1,170,225 pesos

c. Initial Estimation of PAL-Bicol Operation Costs

1) Maintenance costs

- Facilities 1,200 pesos/month x 12 = 14,400 pesos
- Equipment 1,200 pesos/month x 12 = 14,400 pesos

  (vehicles maintenance)

2) Operation expenses

- Travel expenses		
Gasoline for sample collection (140 lit/month)		20,160 pesos
Staff's daily wage		
$125_{₱/day} \times 2_{pers} \times 3_{days} \times 35_{times}$		26,250
Gasoline for supervising examinations of pesticide residual levels in crops (140 lit/month)		20,160
	Sub-total	66,570 pesos
- Communication		
1,000 ₱/month x 12 months =		12,000 pesos
- Transport		
1,000 ₱/month x 12 months =		12,000 pesos
- Gas & electric power supply		
4,500 ₱/month x 12 months =		54,000 pesos
- Water supply		
2,000 ₱/month x 12 months =		24,000 pesos
- Analysis supplies purchase		
Reagents		432,000 pesos
Utensils 1,500 ₱/month x 12 months =		18,000
Standard agricultural chemicals (1,500 samples)		30,000
Consumable goods 750 ₱/month x 12 months =		9,000
	Sub-total	489,000 pesos
- Training & seminars		
Training for PALs' staff 6,500 pesos x 8 pers =		52,000
Training for pesticide dealers 150 pesos x 120 pers =		18,000
Training upon commission 150 pesos x 40 pers =		6,000
Training for consumers 150 pesos x 120 pers =		18,000
	Sub-total	94,000 pesos
- Miscellaneous		35,000 pesos
	Total	786,570 pesos

4. Basic Design

4-1 Design Policy

(1) Climatic Conditions

Both the NCR and Davao City are located in the tropical monsoon climate zone. The difference is that Luzon Island lies on the typhoon course, but Mindanao Island has only a few records of typhoon damage.

The rainy season is from December to May and the dry season from June to November in Manila. High rainfalls are observed during the typhoon season in July and August. Davao has the earlier rainy season, from May to October, and has comparatively high rainfalls in the dry season. Rains in the Philippines are squall type, in which heavy rain lasts a few hours and stops suddenly. Annual average temperature is from 25 to 30°C, with average humidity about 80%. To adapt to this tropical climate, the following policies will be adopted in drawing up the basic design:

a. Design sections to cope with heat exposures on the roof.
b. Design wide and deep canopies and balconies to avoid direct sun rays coming into the rooms with provision against rain water.
c. Design large openings (windows, etc.) to introduce natural breeze and lighting as much as possible.

As most areas of the Philippine Islands are in the Circum-Pan Pacific Earthquake Belt, and as the NCR suffers from frequent typhoons every year, provisions against seismic forces and wind pressures need consideration in structural design.

(2) Social Conditions

This project is to construct chemical laboratories, which are function-oriented buildings. There hardly seem need for special concerns to Philippine customs, traditional architectural style, or regional restrictions.

(3) Construction Conditions and Materials Made in the Philippines

Building construction seems active in urban areas, and most of it is carried out by Philippine companies. Construction skills are assumed to be reliable, seeing many skyscrapers in the cities.

The Philippines is equipped with the National Building Code and other architectural standards concerned to structure, electricity, plumbing design, etc. New building construction projects or large-scale restoration projects have to apply approvals in compliance with these standards prior to construction work.

Though the Philippine construction companies appear to have good engineering skills, they do not seem as conscientious about quality control and safety precautions as Japanese companies. It is recommended that Japanese general contractors experienced in the Philippines supervise local subcontractors in terms of construction schedule and safety management.

Philippine consultants also seem to have reliable proficiency. Since the signatures of the qualified Filipino architect or engineer are required for the building permit, this project is to be carried out in cooperation with local consultants.

In line with active building construction in recent years, production of construction materials has been improved both qualitatively and quantitatively. Basic materials are manufactured or assembled in the Philippines, but some finishing materials or special products are imported from Japan, U.S.A. or neighboring countries. For example, roofing steel sheets with special coating on the surface are Japanese imports. Therefore, Philippine-made products will be employed in principle, and some materials which are not available or are of unfavorable quality will be imported from Japan.

(4) Operation and Maintenance Capability of the Implementing Organization

PALs have been providing pesticide residue monitoring services since the opening of PAL-Central in 1976, satellites in Baguio, Cebu and Cagayan de Oro in 1984 and PAL-Davao in 1988. Most of the technical staff are university graduated qualified chemists, and are well concerned to the significance of analysis work and equipment. They give maximum care in handling the remaining operationable equipment.

After this project is completed, supplementary budgets are to be availed from the Foreign Assisted Project Fund for maintenance of buildings and equipment. An engineer from the engineering division in the BPI will visit each PAL regularly, and will take any necessary actions for facility maintenance and repairs. For the future convenience, the buildings are to be designed as to need a minimum maintenance requirement to the Philippines in terms of cost and engineering.

For equipment maintenance, a precision equipment engineer is assigned at PAL-Central now, who will commute among the satellites to maintain and repair the laboratory equipment. This engineer shall attend the installation and trial-runs of the supplied equipment. He will also be responsible for management of accessories and spare parts.

(5) Scope and Quality of Facilities and Equipment

Scope and quality of facilities and equipment will be planned in accordance with the operation programs of PALs, as referred to in Chapter 4.1 Project Description

a. Facilities

The facility planning principles stated in the "Codex Guidelines on the Good Analytical Practice (GAP)" issued by FAO/WHO are as follows:

1) Laboratories shall have appropriate quality and environment to accommodate precision analysis equipment and to maintain their required performance.
2) Laboratories shall have sufficient operating space to ensure the work efficiency.
3) Sample contamination shall be avoided.
4) The safety of laboratory staff shall be secured.

In addition to these principles, this project will endeavor to clear out deficiency seen among existing PALs as much as possible. Specific planning concerns will be detailed in the section of Study and Examination of Design Criteria in this report.

b. Equipment

GCs are principal measuring instruments in qualitative/quantitative analysis of agricultural chemicals. PALs' staff are well experienced in GCs. Although some high-tech instruments like LC/MS are being introduced in developed countries, they require highly advanced technology and special

handling technique. For the equipment supply in this project, it is recommended to set GCs and HPLCs as the main instruments with provision of suitable detectors and accessories for convenience of handling and maintenance.

Quality of the equipment is determined on the condition that all the PALs' staff are able to operate, that reliable data are obtained without difference by the operators, and that local maintenance is easily available. Table 4-12 shows major specifications and review for selecting the equipment.

Table 4-12 Quality of Major Equipment

Equipment	Specifications	Review
Vehicles with refrigerator (4WD)	4.8L x 1.W x 1.8 Hm Refrigeration Unit 60L Diesel engine, 6 cylinders, OHV, Seating capacity 4-5 Output 115 ps/400 rpm	Sample collection is an important work to improve the reliability of analysis. 4WD cars are required to transport samples from distant moutnanous places. Refrigerator unit is for preventing samples from damages or deterioration.
Automated Gel Permeation Chromatograph (GPC) (PAL-Central only)	Amount of samples:7-10 mL No. of samples: 23 Column: 25mmΦ, 600 mm long Resin: Bio-beads	GPC processes AIs in pesticide automatically. It will contribute to save time and energy for processing samples before analysis.
Gas Chromatograph	Column: Capillary column Injector:split/splitless Cold-on column, gas flow control, electronic pressure control One GC for each detector GC-ECD -NPD -FPD -FID	Different GCs are selected for each detector aiming at speedy analysis. As many pesticides are chemically unstable, fused silica capillary columns made of inert silica glass should be used. Capillary columns with good resolution are selected for the convenience of multi-residue analysis. As the quantity of injected samples should be kept small, those with high concentration of residues should be injected by the split method, while those with less residues are to be injected by the splitless method. It will be necessary to provide injectors applicable to both methods. For analysis of samples containing thermal cracking pesticides, cold-on column injectors need be supplied. In case of what type of pesticides are contained is uncertain, analysis data should be obtained with the use of cold on-column injector and split/splitless injector and compared to each other. Though it is possible to analyze samples by controlling gas flows with flow meters, this method may cause difference depending on the operators. Automatic flow control system enables prompt setting and precise analysis without individual difference or the use of flow meter.

Equipment	Specifications	Review
HPLC (with multi-detector) (PAL-Central only)	Detectors: UV, fluorescent UV-VIS, multi-detector Gradient system: high-pressure, w/ auto injector	HPLC is indispensable for qualitative/quantitative analysis of non-volatile ingredients that are hard to analyze with GC. High-pressure gradient method is selected as it creates stable and optimum analysis condition. It generates few bubbles in dissolved solution in the analysis line during the mobile phase. Low-pressure method requires degassing unit in each phase, which is unfavorable in terms of cost merit. If degassing is inadequate, bubbles generated in the line will considerably affect the analysis reliability. Inferiority of thehigh-pressure gradient method is that it requires more number of pumps and a system controller to operate these pumps. Ordinary UV detectors create only peak area and retention time data, while photodiode alley (PDA), which is a multi-detector, can also provide spector data of each ingredient, and enables more accurate qualitative analysis. For analyzing samples in which what kind of ingredients are conteined is uncertain, it is required to ensure qualitative analysis accuracy before quantitative precision. PDA is useful for this purpose.
GC/MS (PAL-Central only)	Detector: quadruple MS Ionization: EI Measurement mode: scan, SIM	GC/MS is the most sensitive and reliable method to confirm AIs. MS measures molecular weight of components that are separated with GC, and identifies AI. It is useful for analyzing samples containing confusing elements. GCs are selected according to the same criteria as stated above.
Infrared Spectrophotometer (PAL-Central only)	Fourier-transform type Wavelength: 4600 to 400 cm - 1	Fourier-transform infrared spectrophotometer is highly sensitive and can measure various wavelength at the same time. It is indispensable for detecting minimum amount of AIs and obstacles, or deterioration of their surfaces.

(6) Work Schedule

Laboratory buildings will be constructed at two locations, PAL-Central and PAL-Davao, while equipment will be supplied to all six PALs; PAL-Central and five satellites.

PAL-Central will be a two-story building with approx. 2,640 m^2 floor area. The construction period is estimated at 11 months. PAL-Davao will be single story with approx. 430 m^2 floor area. Its construction period is estimated at 6 months, considering its distance from the capital region.

PAL-Central and PAL-Davao are designed on the basis of the same design concept. It will be advantageous to construct them at the same time, for the convenience of material purchase, construction supervision and cost economy in site management. PAL-Central will be considered first for building construction and equipment upgrading, since it is to serve as

the core center of all PALs. Analytical equipment in the satellites will be provided in time for the installation of equipment for training and seminar purpose at PAL-Central.

The entire construction schedule will consist of two phases, in which following works will be carried out respectively.

Table 4-13 Works in Each Phase

Phase	Work Items
First Year	Construction of PAL-Central building and equipment supply (partly in the second year) Construction of PAL-Davao building and equipment supply
Second Year	Equipment supply to the five satellites (Baguio, Cebu, CDO, Davao, Bicol) Supply of equipment for training and seminar to PAL-Central

4-2 Study and Examination of Design Criteria

(1) Current Conditions

For designing PAL-Central and PAL-Davao, current conditions of the existing PAL buildings will be referred to.

a. PAL-Central

The existing PAL-Central is located in the BPI Compound at 692 San Andres St., Malate, Metro Manila. The pesticide residue monitoring section and the formulation analysis section are situated on the same floor, separated by the main entrance. This layout may cause sample contamination with personnel circulation. The corridor is wide (about 2.5 m), but chemical gas cylinders are mounted therein, which is not desirable for safety precautions. The electrical fans (draft chamber) for local exhaust in the extraction/clean-up room, where a large amount of organic solvent is used, are out of order, and only the room exhaust fans are used for ventilation. The GC rooms appear small for adequate work efficiency. As the corridor is sealed at both ends, it may cause concern in the case of any emergency

evacuation. The room lighting is considered inadequate, due to the small windows set at high positions.

b. Satellites at Baguio, Cebu and Cagayan de Oro

These three PALs have the same floor plan, having been constructed in 1984 by donations from the Government of West Germany. The central corridor is 2.0 m wide, slightly small for laboratory equipment carriage. Rooms are arranged indifferent to the extraction/clean-up and analysis procedures. This layout seems unfavorable for work efficiency. The intersecting line of sample circulation and personnel flow may cause sample contamination. A gas cylinder room is provided outside of the measuring room, connected with two doors, which appears convenient for use. Lighting in the measuring room seems inadequate, due to limited window space. Though it is unavoidable in the central-corridor type buildings, natural lighting and ventilation is insufficient, so two entrance doors are always open. In this type of laboratory that deals with the least amount of chemicals, entrance doors should be kept closed. The extraction/clean-up room is designed to have a peninsula shape table layout, which seems obstructive to work efficiency and allows only one-way emergency evacuation.

c. PAL-Davao

The PAL-Davao building, once used as DNCRDC's canteen was restored to the pesticide analytical laboratory, and is incapable of the functions expected for future operation programs. When considering that each separate room is to be utilized for sample receiving, storage, processing, extraction/clean-up, and quantitative analysis, to ensure precise measurement of minimal amount of components, and that good work efficiency shall be ensured for the 10 laboratory staff, more space will be needed. In terms of the utility systems such as air-conditioning, ventilation, electric power, water supply and drainage, the present building is incapable of the functions required for future operation programs.

Table 4-14 and figure 4-10 indicate comparison of the new satellite in Davao and the existing ones in Baguio, Cebu and Cagayan de Oro. Several rooms will be newly designed at PAL-Davao in order to cater for the increased amount of analysis and the development of analytical methods. On the whole, the new satellite building is designed to have about 27% enlarged floor areas to ensure sufficient spaces for analysis work and safe work environment.

Table 4-14 Comparison of New and Existing Satellites

	Existing Satellites (Baguio,Cebu, CDO)	New Satellite (Davao)
Circulation of samples and people	Samples are delivered from room to room via the corridor, intersecting the circulation of people. This may cause contamination of sample.	Once received, samples are delivered to the final analysis room without passing the corridor. Relevant rooms are located next to each other, allowing direct path of people.
Extraction/ Clean-up	The room is narrow. (4.0 m deep) The peninsula type of lab table layout is un-favorable to work efficiency and emergency evacuation.	The room is designed based on 3.2 m unit bay and 6.4 m depth. The island type table layout ensures good work efficiency and two-way evacuation route. (Refer to Sec 4. (3) as to the lab unit bay.)
Instrument room	As GCs and HPLCs need be located separately, HPLCs are installed in the Balance room.	GCs will be installed in the Instrument Room No.1 and HPLCs in Room No.2.
Sample receiving and processing	Sample receiving and processing work are done in the same room, which makes the room crowded.	Separate rooms for sample receiving and processing are designed as adjacent locations.
Electric room	There is no specific electric room. AVR is installed in the room for visiting consultants.	An electric room is provided where the electric panel and AVR are installed. It will be convenient for maintenance and will not cause noise or heat transmission problems.
Garage	There is no garage. Vehicle for sample collection is stored in a garage of the neighboring DA's building.	A garage is provided.
Storage	There is no room for storage. A space in the room for visiting consultants is used as storage.	A storage is provided for spare parts for building maintenance and repairs.

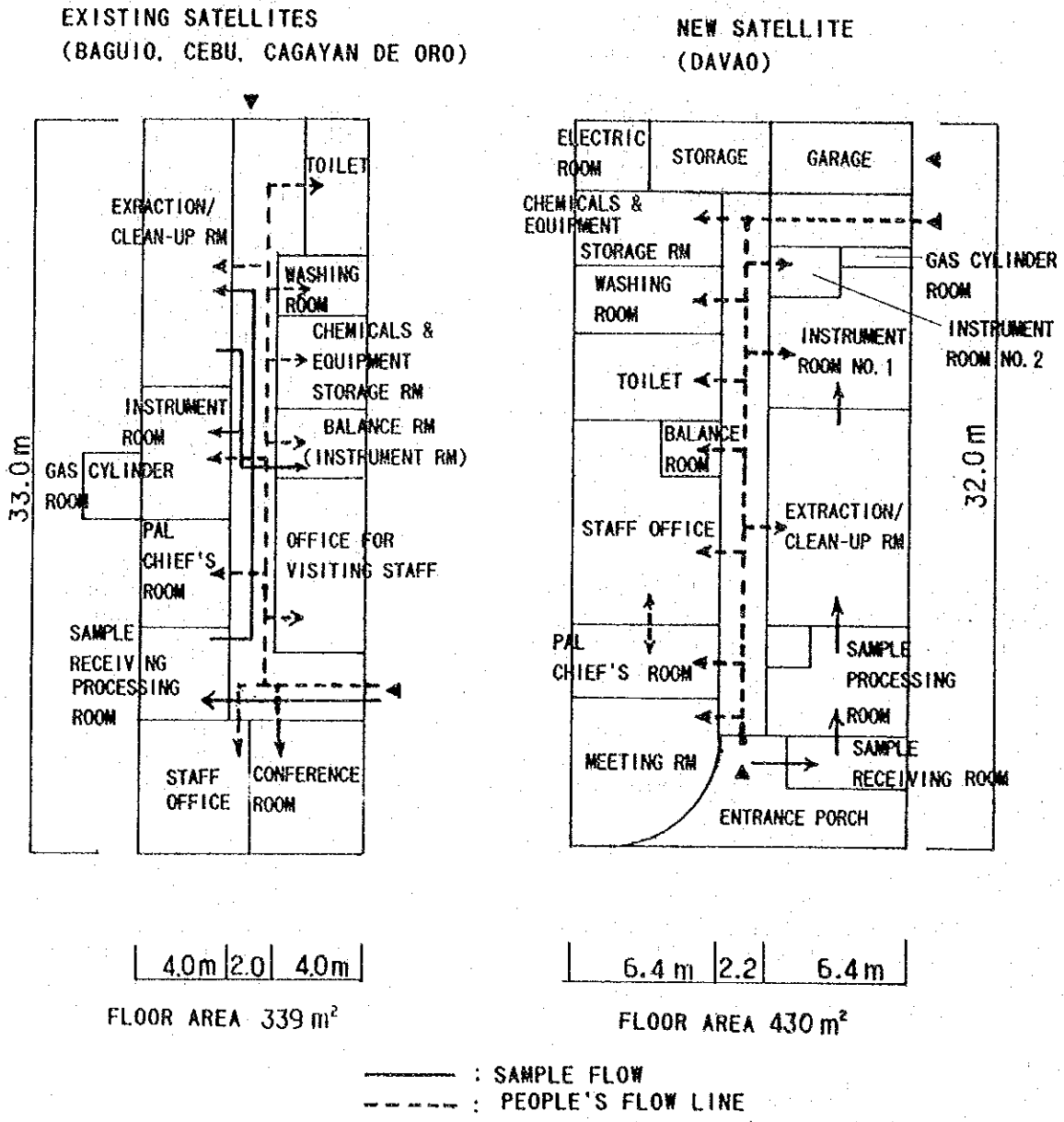


Figure 4-10 Comparison of New Satellite and Existing Ones

(2) Review of the Operation Programs

The required facilities and equipment for the implementation of the project shall be investigated according to the operation programs.

a. Analysis

1) Pesticide residue monitoring

Figure 4-11 shows the procedure of pesticide residue monitoring with GCs or atomic absorption spectrometers, which are able to analyze a few ppm to ppb-level quantities of pesticide residues in the samples. The figure also specifies major operations and equipment, giving concern to the facility planning at each process. Samples are spread in a wide range from agricultural crops, organic soils, water and various other forms and species. Typical samples for each species will be assumed, in order to examine the quality and quantity of the necessary equipment.

2) Formulation analysis

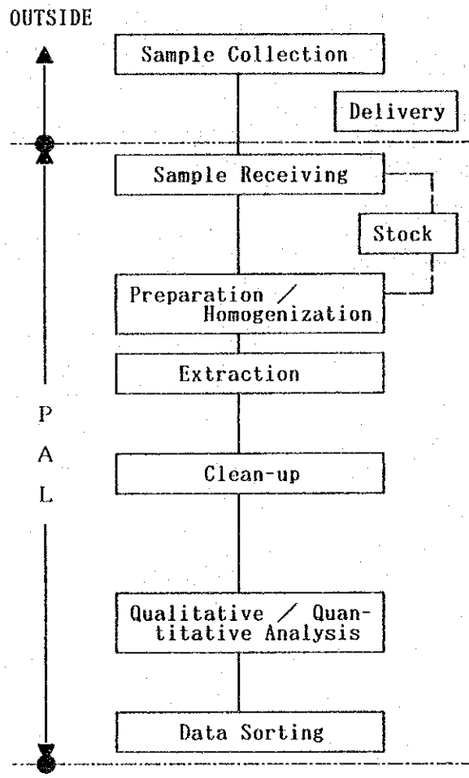
Analysis of pesticide formulations is to examine the quality of pesticide products. Samples will be received in the form of finished products ready for sale. Therefore, no processing/homogenization will be necessary, which is an indispensable preparation for the residue monitoring. Major operations, equipment and concerns for the facility planning are explained in figure 4-12.

b. Research and Study

The equipment for pesticide diffusion in the experimental farms, for sample collection, analysis and data filing during each operation shall be considered. In addition to the experimental firms, a middle size green house with an anteroom will be provided for PAL-Central for the use of research and examinations under controlled climatic conditions.

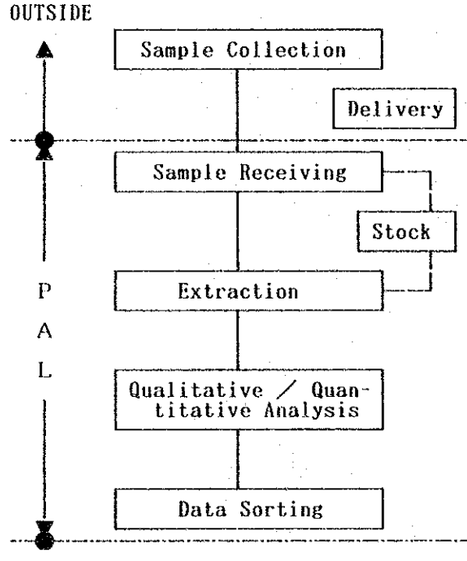
c. Training, Seminars and Educational Campaign

As is referred to in Chapter 4.1-2(2) Operation Programs, PALs' training programs mainly consist of technical training on pesticide analysis, educational campaign and assistance to seminars by other institutions such as the FPA, ATI and BPI's Crop Protection Division. PALs are supposed to dispatch instructors to the seminars when asked by these institutions, but there will not be any need for the equipment or a space for this particular purpose. The equipment to sort research and study results and to prepare



Operation	Major Equipment	Concerns for Facility Planning
• Market basket sampling, Spot check sampling from the experimental farms		
• Sample delivery to the PAL.	• Vehicle with refrigerator	• Garage, and a storage room for spare parts.
• Sample receiving.		• Separate entrance to avoid contamination
• Freezing to avoid deterioration and decomposition of pesticides.	• Freezer, Refrigerator • Glass bottles	• Freezer capacity will be determined from the amount of samples requiring cold storage.
• Processing and homogenizing samples.	• Blender, Homogenizer, Grinder, etc.	
• Extracting AIs into organic solvents • with shaker • with blender • with Soxhlet exractor	• Shaker • Soxhlet extraction apparatus • Centrifuge	• Ventilation (draft chamber) system to exhaust organic solvents efficiently.
• Excluding lipochromes and other mixtures in the solvents. • with Column Chromatography • clean-up w/ thin layer chromatography • vacuum concentration	• Column Chromatography • Rotary Evaporator • Vacuum Pump • Vacumm Manifold	• Isolate treatment system for solvents shall be considered. • Glassware cleaning room, equipped with distilling apparatus. • Separate room for weighing reagents.
• Analysis with GCs • with Spectrophotmeter • with FTIR • with HPLC	• Gas Chromatograph GC/ECD, GC/NPD, GC/FPD • UV-VIS Spectrophotometer • FTIR • HPLC	• GC layout to secure space for efficient analysis work. • Installing chemical gas tank (herium, hydrogen, nitrogen, etc.) and piping.
	• Computer	

Figure 4-11 Flow of Pesticide Residue Monitoring



Operation	Major Equipment	Concerns for Facility Planning
• Product sampling from the market.		
• Sample delivery to the PAL.		
• Sample receiving.		• Separate entrance to avoid contamination
• Freezing to avoid deterioration and decomposition of pesticides.	• Freezer, Refrigerator • Glass bottles	• Investigate necessity for a dark room (storage)
• Extracting AIs into organic solvents	• Shaker	• Ventilation (draft chamber) system to exhaust organic solvents efficiently. • Isolate treatment system for solvents shall be considered.
• Analysis with GCs • with Spectrophotometer • with FTIR • with HPLC	• Gas Chromatograph GC/FID, GC/NPD, • UV-VIS Spectrophotometer • FTIR • HPLC	• GC layout to secure space for efficient analysis work. • Installing chemical gas tank (herium, hydrogen, nitrogen, etc.) and piping.
	• Computer	

Figure 4-12 Flow of Formulation Analysis

textbooks shall be considered. Special emphasis shall be given to the equipment for producing video materials. They are attractive teaching aids and thus favorably used at many training or seminar places. Table 4-15 shows training and seminars to be held at PAL-Central and the satellites.

Table 4-15 Training and Seminars at PALs

PAL-Central

Subjects	Target Clientele	Period (days)	Partici-pants	Frequency	Methods
Latest pesticide analytical technique	PAL technical staff	5	40	2/year	Seminar, Analysis practice
Basic understanding of pesticide analysis	tecnical staff from other institutions, students, etc.	2	10	10/year	Seminar, Analysis practice
Testing method of pesticide residual levels in crops	pesticide dealers	1	20	1/month	Seminar, Farm practice
Sample collection for the pesticide residue monitoring	agricultural tecnicians	1	10	4/year	Seminar, Farm practice
Pesticide effects to humans and in the environment	consumers groups, housewives, students, farmers	1	20 - 40	1/month	Seminar, Analysis observation

Satellites

Subjects	Target Clientele	Period (days)	Partici-pants	Frequency	Methods
Basic understanding of pesticide analysis	tecnical staff from other institutions, students, etc.	2	5	2/year	Seminar, Analysis practice
Testing method of pesticide residual levels in crops	pesticide dealers	1	10	1/month	Seminar, Farm practice
Sample collection for the pesticide residue monitoring	agricultural tecnicians	1	10	4/year	Seminar, Farm practice
Pesticide effects to humans and in the environment	consumers groups, housewives, students, farmers	1	10	1/month	Seminar, Analysis observation

PAL-Central will need one seminar room with a space for 10 to 40 candidates, to be equipped with audio-visual system. Satellite PALs, where seminars will not be held so frequently (maximum three times a month), and the number of participants will be assumed at only five to 10 persons, can arrange the meeting rooms as necessary for seminars. They will be equipped with small, simple audio-visual system. PAL-Central and the satellites will both provide analysis practice for PALs' technical staff and university students, but special analysis instruments for training use are not

considered necessary. The instruments used for analysis work can also be utilized for training, while they are not in operation.

d. Personnel Plan

Personnel assignment is another significant factor of facility planning. The facilities will be designed with reference to PAL's organization and personnel assignment.

What has to be considered for PAL-Central is that several consultants who are concerned with PALs' operation will join, and that the LSD chief will have an office in PAL-Central. A space for the engineer from the BPI engineering division will also be necessary. A night guard employed by the BPI will be stationed. In total, there will usually be around 35 people in PAL-Central, 27 staff plus seven to eight more people. When training and seminars are held, a maximum of 40 trainees are to stay at PAL-Central.

Ten technical staff and another 10 trainees will be assumed for PAL-Davao.

(1) Laboratory Layout and Module

The preferable way to set up the laboratory room modules is based on the laboratory equipment layout. An island type layout and the peninsula type layout are two common table layouts. The PALs' facility planning will, in principle, adopt the island type layout, which provides better work efficiency and a two-way emergency evacuation route.

The appropriate unit bay, composed of a center and side tables, is calculated to be 3.2 m, considering the depth of the tables, work space and passage width.

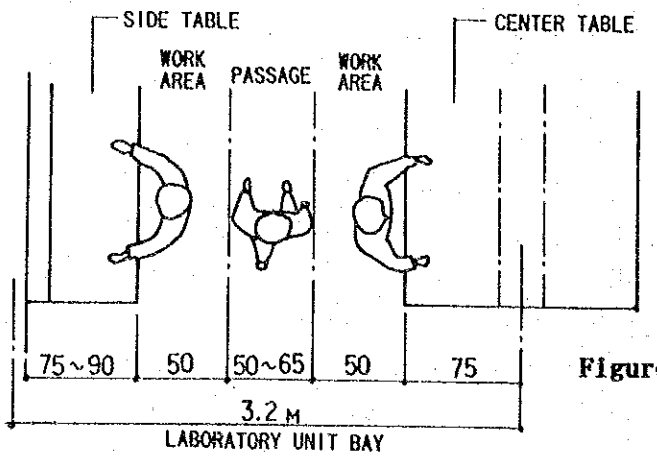


Figure 4-13 Laboratory Unit Bay

A standard table width per person is 2.4 meters for work efficiency. The standard size of a center table will be designed at 2.4 m x 1.5 m. As shown below, distance between the side table along the windows and the center table will be 1,500 to 1,650 mm (work areas plus space to pass). Windows will be provided on the corridor side wall so that people can observe analysis work in the room. Side tables will not be installed there. The entire depth of an instrument room will be 6.4 meters between the center-to-center of the walls.

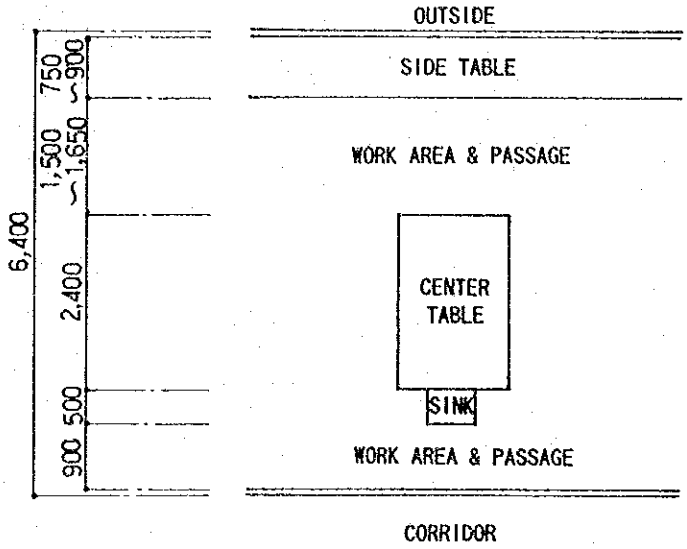


Figure 4-14 Depth of Instrument Room

b. Avoidance of Sample Contamination

Sample contamination shall be kept to a minimum in PALs. The following diagram indicates connection of each section in the pesticide residue monitoring unit together with the flow lines of people and samples. Spaces for sample receiving, storage, processing/homogenization, extraction/clean-up and qualitative/quantitative analysis are to be designed in each room to avoid contamination.

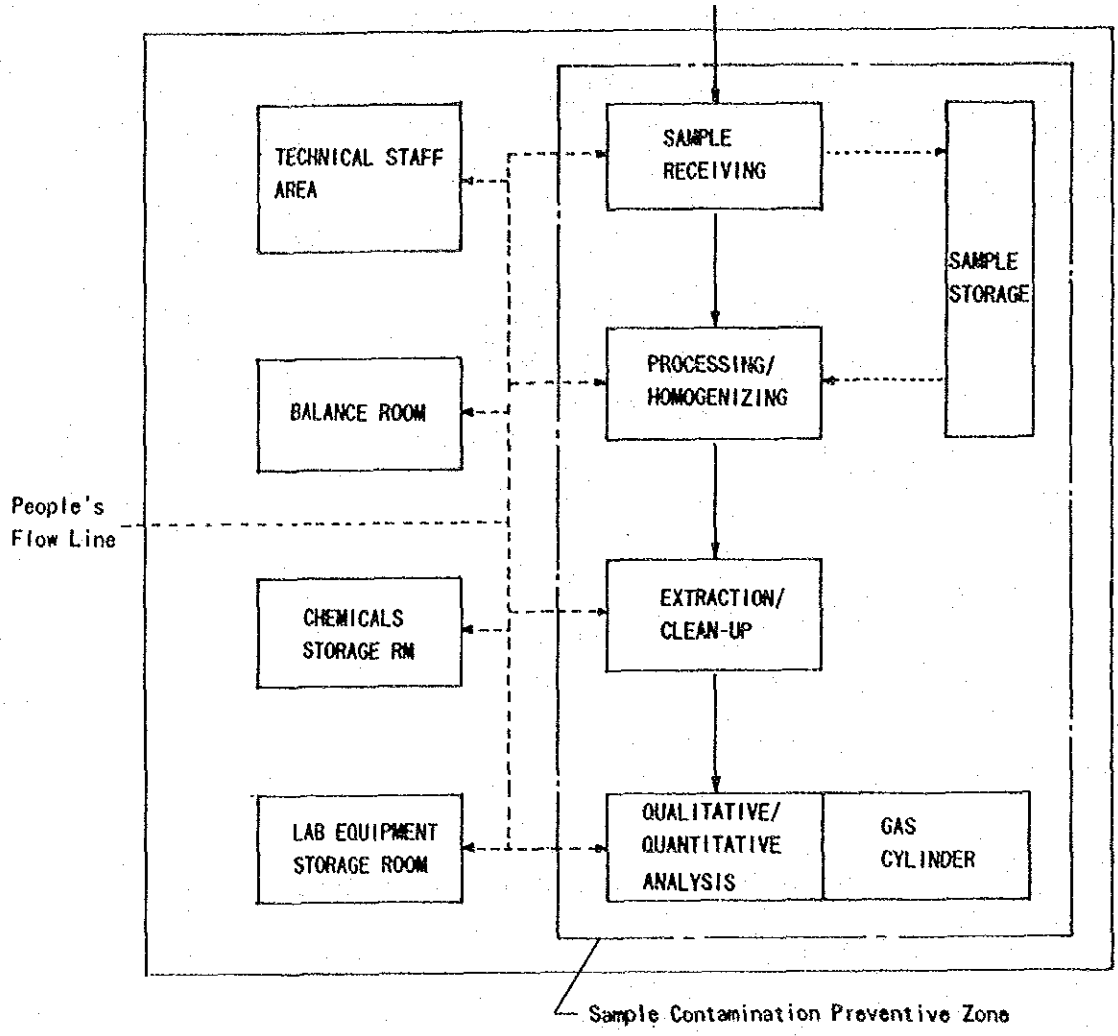


Figure 4-15 Pesticide Residue Monitoring Diagram

4-3 Basic Planning

(1) Site and Layout Plan

a. PAL-Central

The project site is located in the BPI Nursery Compound, near its main gate. The perimeter is about 320 meters, surrounded by compound roads. In a part of this Nursery the National Seed Quality Control Center and the Seed Storage, another Japanese Grant Aid project in 1993, has been under construction since March 1994. The BPI intends to move its administrative divisions to this compound in the future. The ground is almost flat, having the maximum level difference of about 1.2 meter. The subsoil investigations indicate that there is an adobe layer between 1.5 and 2.0 meters below the existing ground surface, which can be taken as the bedrock.

Electric power and water can be taken from the main lines both running on the north of the site. A sewage main runs on the west of the site, along Visayas Avenue. Sewage water from the laboratory will be discharged into this main via a septic tank. This ground is appropriate for the construction of PAL-Central building in terms of its shape, soil rigidity, infrastructure, etc.

The project building will come into sight on the left hand side soon after entering the main gate, and will be approached via the compound road to its main entrance.

There are palm trees along the north, south and west roads around the site. They are to be left for aesthetic purposes. Some mangos grow in the south corner of the site, which are to remain as long as they are not obstructive to people's access to the building.

The main building will be composed of a pesticide residue monitoring unit in the west wing, formulation analysis unit in the east wing, and administrative/training division in the center. This layout is to restrain sample contamination.

An annex building will be located north of the main building. It will be accessible directly from the compound road. A green house will be constructed in the court yard of the main building. Two parking areas, each having a capacity for six cars, will be provided in front of the east and west wing entrances.

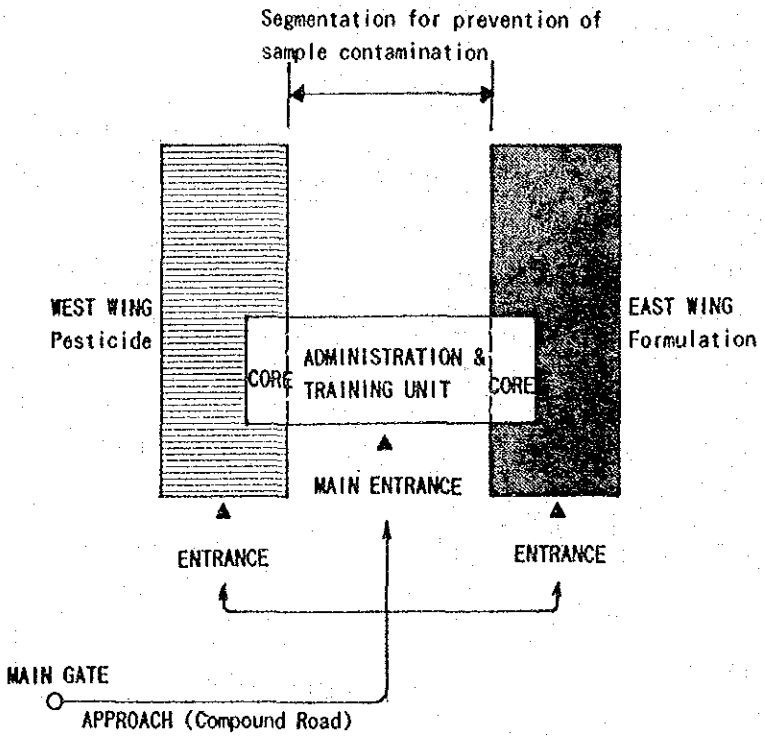


Figure 4-16 PAL-Central Layout Concept

b. PAL-Davao

The site is about 2,000 m^2 large. It is located along the DNCRDC compound road. The ground is almost flat, having about a 1/50 gradient from east to westward. An aerial electric line runs from east to west over the site. DNCRDC is requesting the local electric corporation for relocation of this wiring. Electric power can be taken from this line after its relocation. Water can be supplied from a water main (100 Φ) laid along the opposite side of the compound road. Sewage water is to be discharged via a septic tank into a creek running about 50 meters south of the building. The subsoil investigations indicate a silty clay layer having 0.7 kg/cm^2 (1,500 psf) bearing capacity between 0.7 and 1.0 meter deep. For a single story PAL-Davao building, footings may rest on this layer, tied to each other with stiff footing beams.

There are a number of trees in the site ground. The building will be designed with care not to cut down too many trees. In particular, three beautiful mangosteen trees about 40 years old, standing near the compound road, will be left as they are. The building will be designed behind these trees, arranged in parallel to the road. A parking area for four cars will be provided.

(2) Architectural Plan

a. Floor Plan

The rooms required for PAL-Central and PAL-Davao are as shown in tables 4-16 and 4-17. Floor areas of laboratory rooms are calculated based upon the laboratory unit bay (LUB) as mentioned in the previous section.

Table 4-16 Rooms to be Required for PAL-Central

MAIN BUILDING

Pesticide Residue Monitoring Unit

Rooms	Purposes	Floor Area Floor Calculation Criteria	Design Floor Area (m^2)
Sample Receiving Room	Sample receiving, registration & sorting	Office space behind the reception counter A work table (2.4mx1.5m) for sorting	(4.0x6.4) - (2.0x2.0) = 21.6
Freezer/ Refrigerator Room	Installing pre-fabricated freezer & refrigerator	Freezer 2.7m x 1.8m Refrig. 2.8m x 1.8m Ante rm 1.8m x 0.9m 50 cm space for maintenance	6.4 x 3.4 = 21.76
Refrigerator Storage	Installing several refrigerators, Also serving as anteroom	0.9 m depth for storing refrigerator, freezers, carts and 2.0 m for passage	6.4 x 3.0 = 19.20
Sample Processing Room	Storing samples, preparing for the extraction process or for storage	A center table (2.4x1.5) 2 LUB, partly used for the balance room	(3.2x6.4x2) - (2.5x2.5) = 34.71
Processing Room of Samples for Environment Monitoring	Extracting samples for environment monitoring	1 LUB	3.2 x 6.4 = 20.48
Extraction/ Clean-up Room	Extracting pesticides using solvents	4 LUB for installing 3 center tables	6.4x3.2x4 = 81.92
Instrument Room No.1	Qualitative & quantitative analysis w/ HPLC	Side tables along both walls 1 LUB	6.4 x 3.2 = 20.48
Instrument Room No.2	Qualitative & quantitative analysis w/ GC	One center table 2 LUB, partly used for gas tank room	(6.4x3.2x2) - (2.0x0.9) = 39.16

Instrument Room No.3	Qualitative & quantitative analysis w/ GC/MS	One GC/MS L-shaped layout of a 1,200 deep work table and 750 deep side tables	3.2 x 4.4 = 14.08
Gas Cylinder Room	Installing 5 gas cylinders (2 hydrogen, 2 helium, 1 nitrogen)	Space for 5 gas cylinders and their exchange	2.6 x 2.0 = 5.2
Air Compressor Room	Installing an air compressor for GC		1.5 x 2.0 = 3.0
Balance Room	Installing lab-use balances for weighing reagents, standard AIs, etc.	A 1.8 m wide table and a freezer-refrigerator Space for weighing work	2.5 x 2.5 = 6.25
Washing Room	Making distilled water & glassware cleaning	2 LUB according to the equipment layout	3.2x6.4x2 = 40.96
Lab Equipment Storage Room	For spare parts, consumable goods, glasswares, etc.	750 deep steel racks on both walls, Central space for cart passage 1 LUB	3.2 x 6.4 = 20.48
Chemicals Storage Room	For reagents, standard AIs and solvents	750 deep steel racks on both walls, Central space for cart passage 1 LUB	3.2 x 6.4 = 20.48
Unit Chief's Room		Work space 7.5 -- 10 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 15.5 -- 22 m^2	3.2 x 6.4 = 20.48
Advisor's Room		Work space 7.5 -- 10 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 15.5 -- 22 m^2	3.2 x 6.4 = 20.48
Staff Office	For technical staff and lab aides Installing a PC	Tec staff 7 x 6 -- 7.5 = 45 -- 52.5 Lab aides 6 x 5 -- 6 = 30 -- 36 PC ≃ 4 Total 76 -- 92.5 m^2	6.4 x 12.8 = 81.92
Locker Room	Space for changing clothes, Installing a shower booth	Lockers for 14 staff and an advisor Dressing/undressing for 5 to six persons at a time 1 shower booth	3.2 x 6.4 = 20.48

Meeting Room	For the unit staff meetings, Installing a magazine rack	(staff + advisor) 15 x 2.5 -- 4 = 37.5 -- 60 Magazine rack 6 Total 43.5 -- 66 m^2	53.28
		Sub Total	567.2 m^2

Formulation Analysis Unit

Rooms	Purposes	Floor Area Floor Calculation Criteria	Design Floor Area (m^2)
Sample Receiving Room		Office space behind the reception counter	2.4 x 4.4 = 10.56
Sample Storage Room	Sample storage	A refrigerator and shelves for sample storage	(4.8x6.4) - (2.5x2.5) = 24.47
Physical Inspection Room	Physical inspections of formulation samples	Side table 1 LUB	3.2 x 6.4 = 20.48
Extraction/ Clean-up Room	Extraction/clean-up of formulation samples	3 LUB for installing 2 center tables (2.4m x 1.5m)	3.2x6.4x3 = 61.44
Instrument Room No.1	Qualitative & quantitative analysis w/ GC	One center table 2 LUB, partly used for gas tank room	(3.2x6.4x2) - (2.0x0.9) = 39.16
Instrument Room No.2	Qualitative & quantitative analysis w/ HPLC	Side tables along both walls 1 LUB, partly used for gas tank room	(3.2x6.4) - (2.0x3.2) = 14.08
Gas Cylinder Room	Installing 4 gas cylinders (2 hydrogen, 2 nitrogen)	Space for gas cylinders and their exchange	2.6 x 2.0 = 5.2
Air Compressor Room	Installing an air compressor for GC		1.5 x 2.0 = 3.0
Balance Room	Installing lab-use balances for weighing reagents, standard AIs, etc.	A 1.8 m wide table and a freezer-refrigerator Space for weighing work	2.5 x 2.5 = 6.25
Washing Room	Making distilled water & glassware cleaning	2 LUB according to the equipment layout	3.2x6.4x2 = 40.96

Lab Equipment Storage Room	For spare parts, consumable goods, glasswares, etc.	750 deep steel racks on both walls, Central space for cart passage 1 LUB	3.2 x 6.4 = 20.48
Chemicals Storage Room	For reagents, standard AIs and solvents	750 deep steel racks on both walls, Central space for cart passage 1 LUB	3.2 x 6.4 = 20.48
Unit Chief's Room		Work space 7.5 -- 10 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 15.5 -- 22 m^2	3.2 x 6.4 = 20.48
Advisor's Room		Work space 7.5 -- 10 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 15.5 -- 22 m^2	3.2 x 6.4 = 20.48
Staff Office	For technical staff and lab aides Installing a PC	Tec staff 3 x 6 -- 7.5 = 18 -- 22.5 Lab aides 2 x 5 -- 6 = 10 -- 12 PC ≃ 4 Total 32 -- 38.5 m^2	6.4 x 6.4 = 40.96
Locker Room	Space for changing clothes, Installing a shower booth	Lockers for 6 staff and an advisor Dressing/undressing for 4 persons at a time 1 shower booth	3.2 x 4.4 = 14.08
Meeting Room	For the unit staff meetings, Installing a magazine rack	(staff + advisor) 7 x 2.5 -- 4 = 17.5 -- 28 Magazine rack 6 Total 23.5 -- 34 m^2	36.01
		Sub Total	398.57 m^2

Administration & Training Unit (including common space)

Rooms	Purposes	Floor Area Floor Calculation Criteria	Design Floor Area (m^2)
Admin. Office	For reception and admin work, guard's anteroom, Installing telephone exchange, facsimile, alarm panels, etc.	Reception ≃ 5 m^2 Guard's space ≃ 5 Telephone exchange, FAX ≃ 6 Alarm panels ≃ 10 Total ≃ 26 m^2	4.0 x 6.4 = 25.6
Reception Room	Guest reception (8 pers) and for meetings	8 pers x 3 -- 4 m^2/pers = 24 -- 32 m^2	4.4 x 6.4 = 28.16
Data Bank Room	Filing of data from all the PALs Storing equipment operation manuals	Installing a computer set, Shelves for floppy disks and documents, Desk work space	4.0 x 6.4 = 25.6
Lab Equipment Maintenance Room	Equipment maintenance work	One center table and a side table	4.4 x 6.4 = 28.16
Equipment Maintenance Storage Room	For spare parts fittings		4.4 x 3.2 = 14.08
Storage Room	For storing records, office supplies, etc.		4.4 x 3.2 = 14.08
Sleeping Room (Men)	For midnight work, or for satellite staff visiting PAL-Central (4 beds)	Bed, night table & locker per person Center table (common) Attached with a lavatory and linen closet	6.4 x 5.6 = 35.84
Sleeping Room (Women)	For midnight work, or for satellite staff visiting PAL-Central (4 beds)	Bed, night table & locker per person Center table (common) Attached with a lavatory and linen closet	6.4 x 5.6 = 35.84
PAL-Central Chief's Room		Work space approx 15 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 23 -- 27 m^2	4.4 x 6.4 = 28.16
Secretary's Room (PAL Chief's)		Work space 7.0 m^2 Waiting space 7.0 Total 14.0 m^2	4.4 x 3.2 = 14.08

LSD Chief's Room		Work space approx 15 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Total 23 -- 27 m^2	4.4 x 6.4 = 28.16
Secretary's Room (LSD Chief's)		Work space 7.0 m^2 Waiting space 7.0 Total 14.0 m^2	4.4 x 3.2 = 14.08
Advisor & Consultant's Room	Expecting 3 pers for analysis work, PAL administration, etc.	Equivalent space for the Unit chief's office, to be divided w/ simple partitions	20.48 x 3 = 61.44
Conference Room	For meetings of technical staff (about 24 pers) Also serving as the library Bookshelves along the walls	24 pers x 2.5 -- 4/per = 60 -- 96 m^2	9.6 x 6.4 = 61.44
Seminar Preparation Room			
Seminar Room	For seminars, with the use of AV equipment	Tables & chairs for 40 trainees (In general, AV room space is estimated at 1.2 - 3.3 m^2/per) 300 mm high platform	(2.1 m^2 per person, excluding platform) 124.76
Storage Room (for Seminar Room)	Storing folding tables & chairs for diversified usage of the seminar room		3.2 x 6.4 = 20.48
AV Materials Production Room	For producing AV materials	Video editor, work table	3.2 x 6.4 = 20.48
		Sub Total	590.44 m^2
		Total	1,556.21 m^2
	Common Space (Corridors, Toilets, Stairways, Hall, etc.)		714.17 m^2
		MAIN BUILDING TOTAL	2,270.38 m^2

ANNEX

Rooms	Purposes	Floor Area Floor Calculation Criteria	Design Floor Area (m^2)
Chemicals Storage Room	Storing used solvents and chemicals under normal temperature	750 mm deep steel racks along walls, central for lab cart passage 1 LUB	3.2 x 6.4 = 20.48
Storage Room	Storing building maintenance spare parts to be provided in the project		6.4 x 6.4 = 40.96
Vehicles Maintenance Room	Storing maintenance parts for vehicles		3.2 x 3.2 = 10.24
Toilets		One each for men and women	1.6x3.2x2 = 10.24
Garage	Two cars for sample transport (1 existing & 1 supplied) A motorcycle	For truck-type vehicles, space is usually estimated at 1.5 m^2/car (3 x 5), plus space for a motorcycle and maintenance work	6.4 x 6.4 = 40.96
Pump Room	Installing a water reservoir tank and a pump		9.6 x 6.4 = 61.44
Workshop for Green House	Preparatory work for research & exams in the green house	One center table (2.4m x 1.5m) 2 LUB	3.2x6.4x2 = 40.96
Electric Room	Installing distribution panels, AVR, etc.		6.4 x 6.4 = 40.96
Generator Room	Installing a generator		6.4 x 3.2 = 20.48
		ANNEX TOTAL	286.72m^2
GREEN HOUSE	Research of pesticide performance under controled environment	3 rows of 1.8 m wide plant gardens, and 0.9 m wide aisles in between.	9.0 x 9.0 = 81 m^2
		PAL-CENTRAL GRAND TOTAL	2,638.10 m^2

Table 4-17 Rooms to be Required for PAL-Davao

Rooms	Purposes	Floor Area Floor Calculation Criteria	Design Floor Area (m^2)
Sample Receiving	Sample receiving & registration	Office space behind the reception counter	2.4 x 4.4 = 10.56
Sample Processing Room	Storing samples, preparing for the extraction process	1 LUB in principle, but irregular shape, due to the building layout	(4.8x6.4) - (2x2) = 26.72
Extraction/ Clean-up Room	Extracting pesticides using solvents	3 LUB for installing 2 center tables	6.4x3.2x3 = 61.44
Instrument Room No.1	Qualitative & quantitative analysis w/ GC	One center table 2 LUB, partly used for Instrument Room No.2	(6.4x3.2x2) - (1.5x3.2) = 36.16
Instrument Room No.2	Qualitative & quantitative analysis w/ HPLC	900 mm deep side table & 1500 mm wide work space	3.2 x 2.5 = 8.0
Gas Cylinder Room	Installing 4 gas cylinders (2 hydrogen, 2 nitrogen)	Installing a wide louvre door facing the exterior corridor, for the convenience of cylinder exchange	1.0 x 3.2 = 3.2
Washing Room	Making distilled water & glassware cleaning	1 LUB	3.2 x 6.4 = 20.48
Chemicals & Equipment Storage Room	For spare parts, standard AIs, solvents, spare parts, glasswares, etc.	750 deep steel racks on both walls, Central space for cart passage 1 LUB	3.2 x 6.4 = 20.48
Balance Room	Installing lab-use balances for weighing reagents, standard AIs, etc.	A 1.8 m wide table and a freezer-refrigerator Space for weighing work	2.5 x 2.4 = 6.0
PAL-Davao Chief's Room	Installing a photocopier and a facsimile	Work space 7.5 -- 10 m^2 Meeting with a few staff 4 x 2.0--3.0 = 8 -- 12 Equipment ≃ 4 Total 19.5 -- 26 m^2	3.2 x 6.4 = 20.48
Staff Office	For technical staff and lab aides Installing a PC	Tec staff 4 x 6 -- 7.5 = 24 -- 30 Lab aides 4 x 5 -- 6 = 20 -- 24 PC ≃ 4 Total 48 -- 58 m^2	6.4 x 6.48 + 2.5 x 4 = 50.96

Meeting Room	For the satellite staff meetings, Installing a magazine rack Also used for seminars	9 persons x 2.5 -- 4 = 22.5 -- 36 Magazine rack 6 Total 28.5 -- 42 m^2	36.01
Electric Room	Installing a distribution panel, AVR, etc.		3.2 x 3.2 = 10.24
Garage	A car for sample transport and a motorcycle for sample collection	For truck-type vehicles, space is usually estimated at 1.5 m^2/car (3 x 5), plus space for a motorcycle and maintenance work	3.2 x 6.4 = 20.48
Storage	Storing building maintenance and spare parts		5.4 x 3.2 = 17.28
	Corridor, Toilets, etc.		81.76 m^2
		PAL-DAVAO TOTAL	430.25 m^2

b. Sectional Plan

1) PAL-Central Main Building and PAL-Davao

PAL-Central's pesticide residue monitoring unit (west wing), formulation analysis unit (east wing) and PAL-Davao will be single-story buildings. Center corridors will have flat roof, in which sky lights will be installed to take in natural lighting and breeze. Some exterior units of air conditioners will be installed there.

The ceiling height of laboratories, staff offices, meeting rooms and other ordinary rooms will be 2.7 meters. Both the first and second floors will be 3.5 meters high, to have a space for exhaust ducts.

2) PAL-Central Annex

The roof will be 9.8 meters wide, made up of 6.4 meters for the building, 2.2 meters for the exterior corridor and 1.2 meters for the canopy. The roof of this size can be covered with one folded steel roofing plate, with no seams. The roof gradient will be designed as 1/50. As to window and other openings, the beam soffits are to be 2.7

meters high, equivalent to those of the main building. As the room ceilings will be the rear side of the roof, they will be 3.4 meters high including beam depth.

c. Structural Plan

Seismic force and wind pressures must be taken into consideration, because the Philippine Islands are a part of the Circum-Pan Pacific Earthquake Belt and are prone to typhoons.

1) Foundations

a) PAL-Central

An adobe layer (silt stone) lies at about 1.5 meters below the surface of the ground. This layer has 3.0 kg/cm^2 (6,000 psf) bearing capacity. For the 2-story project building, this adobe layer can be taken as the bedrock. The foundation system will be of reinforced concrete independent footings.

b) PAL-Davao

A silty clay layer having 0.7 kc/cm^2 (1,500 psf) bearing capacity lies between 0.7 and 1.0 meter below the surface of the ground. For the single-story building, this layer can be taken as the bedrock. The foundation system will be of reinforced concrete continuous footings.

2) Framing

The main building of PAL-Central is to be 2-story, and PAL-Davao is to be single story, both having reinforced concrete structures with rigid frames. A part of the reinforced concrete walls is to be designed as an earthquake-resistant wall in order to lower the construction cost of framing. Partition walls are to be of concrete blocks or wooden construction for cost economy, and will permit removal with partition design change to accommodate usage change in the future. The first floor is planned to be a reinforced concrete floor slab that will not sink due to settlement of the filled soil under the slab.

The annex is to be single story reinforced concrete structure with rigid frames. The green house is to be of structural steel frames.

3) Design Standards

The structural design of the project is to be based on the present construction regulations in the Philippines, and where the local standards are not available, the U.S. standards will be applied.

National Structural Code for Buildings (NSCB)

Uniform Building Code (UBC)

ACI Code (Building Code Requirements for Reinforced Concrete, American Concrete Institute)

Timber Design Specifications

4) External Forces and Loads

a) Dead load

Dead load will include the weights of all the structural members, partitions, finishing materials, etc.

b) Live load

Live load of each room will be as follows, calculated in compliance with the NSCB and UBC:

Room	Live load (kg/m^2)
Office	300
Laboratory	300
(This figure may be increased if necessary to accommodate heavy equipment.)	
Library	615
Conference Room	490
Lavatory	250
Corridor & Stairs	490

c) Seismic force

The base shear assumed to act on the structure and distribution of seismic force to each element will be determined according to the NSCB:

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

where,

V: base shear

Z: numerical coefficient depending on the zone

Refer to figure 4-17. Z = 1

I: occupancy importance factor

Refer to table 4-18. I = 1.0

K: horizontal force factor

Refer to table 4-19. K = 1.0

C: coefficient determined by the natural frequency of the structure; must be less than 0.12

$C = \frac{1}{15\sqrt{T}}$ therefore, $T = \frac{0.05hn}{\sqrt{D}}$

S: numerical coefficient for site-structure resonance

C•S = 0.14 [as per UBC 2312 (d)]

W: total load for calculation of seismic force

d) Wind force

The wind force affecting the structure will be determined according to the NSCB. Quezon City belongs to ZONE II, (figure 4-18), therefore, the column of ZONE II in table 4-20 will be applied. Davao City belongs to ZONE III, and the column of ZONE III in the same table will be applied likewise. As for the wind pressure coefficient, the recommended value prescribed by the NSCB will be applied.

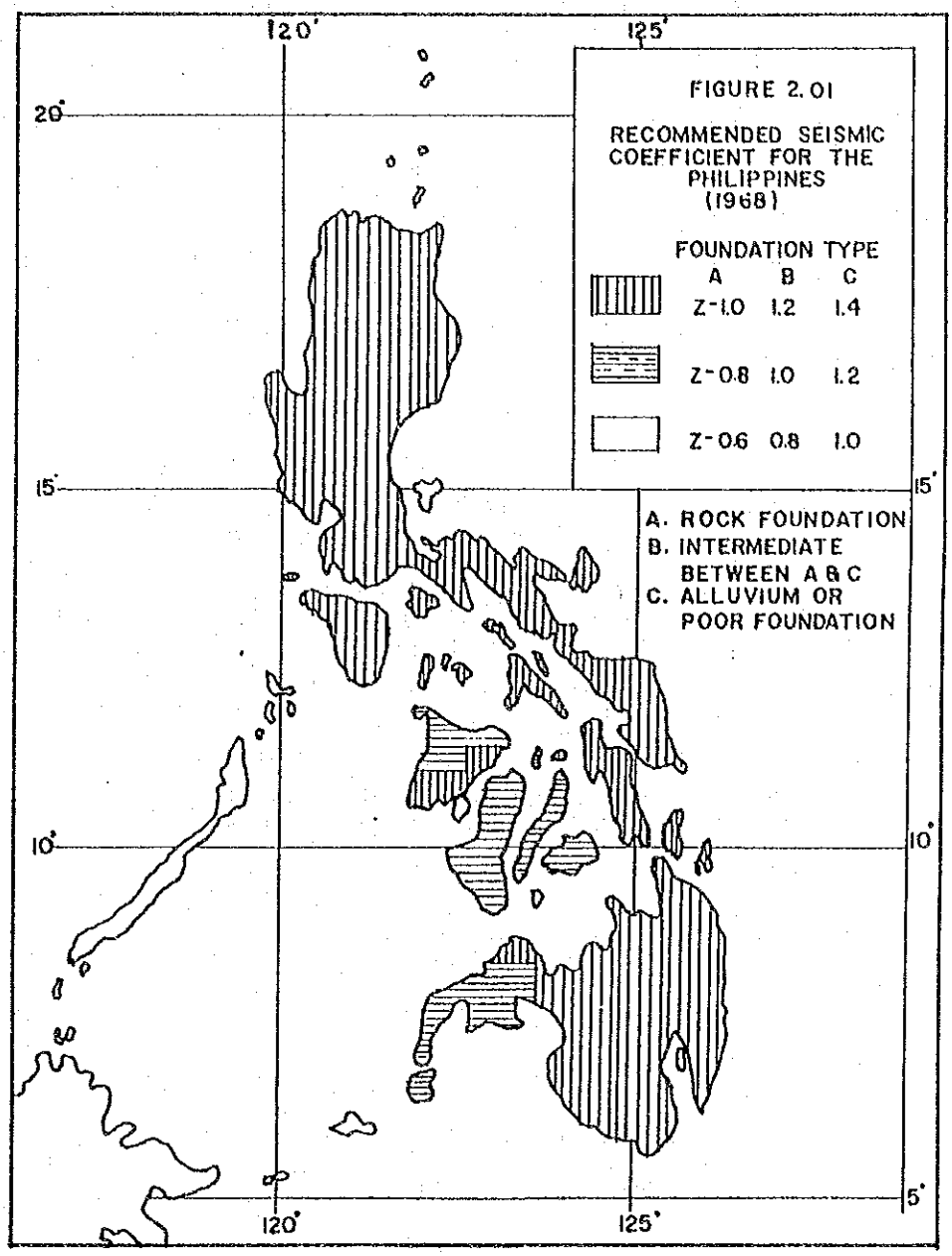


Figure 4-17 Seismic Map of the Philippines

(Source: NSCB)

Table 4-18 Values for Occupancy Importance Factor

TYPE OF OCCUPANCY	I
Essential Facilities*	1.5
Any building where the primary occupancy is for assembly use for more than 300 persons (in one room)	1.25
All others	1.0

*See Section 2312 (k) for definition and additional requirements for essential facilities.

(Source: National Structural Code for Buildings)

Table 4-19 Horizontal Force Factor "K" for Buildings or Other Structures

TYPE OR ARRANGEMENT OF RESISTING ELEMENTS	VALUE[2] OF K
1. All building framing systems except as hereinafter classified	1.00
2. Buildings with a box system as specified in Section 2312 (b)	1.33
3. Buildings with a dual bracing system consisting of a ductile moment-resisting space frame and shear walls or braced frames using the following design criteria: a. The frames and shear walls shall resist the total lateral force in accordance with their relative rigidities considering the interaction of the shear walls and frames b. The shear walls acting independently of the ductile moment-resisting portions of the space frame shall resist the total required lateral forces c. The ductile moment-resisting space frame shall have the capacity to resist not less than 25% of the required lateral force	0.80
4. Buildings with a ductile moment-resisting space frame designed in accordance with the following criteria: The ductile moment-resisting space frame shall have the capacity to resist the total required lateral force	0.67
5. Elevated tanks plus full contents, on four or more cross-braced legs and not supported by a building	2.5[3]
6. Structures other than buildings	2.00

[1]Where wind load as specified in Section 2311 would produce higher stresses, this load shall be used in lieu of the loads resulting from earthquake forces.

[2]See definition of "Z" as specified in Section 2312(c).

[3]The minimum value of "KC" shall be 0.12 and the maximum value of "KC" need not exceed 0.25.

The tower shall be designed for an accidental torsion of 5 % as specified in Section 2312(e)5. Elevated tanks which are supported by buildings or do not conform to type or arrangement of supporting elements as described above shall be designed in accordance with Section 2312(g) using "Cp" = 0.3.

(Source: NSCB)