3-3 Conditions for Agroforestry in La Union

3-3-1 Current Land Use

As previously mentioned, the topographical feature of La Union consists of plains along the coast, highlands rising behind the plains, plains between mountains and mountaneous areas. The below map 3 - 3 - 1 - a) specifies how the land is divided into farm land, waste land and land scattered with shrubbery without a trace of forests that are seen in the northern part of Region I and the inland provinces.

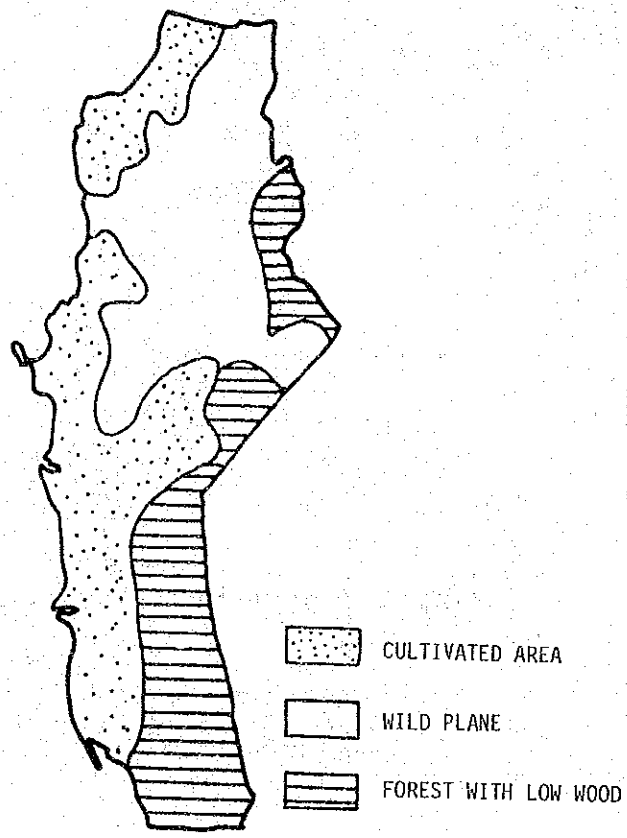


Fig. 3–3–1–a) Current Status of Land Use

As shown in the below map of the ground gradience of the region, farmland is more or less centralized in the narrow plains along the coast, and most of what farmland is left in the highlands and mountains are abandoned farmland. Incidentally, although intensive agriculture is practised in the plains surrounded by mountains, the area of such farmland is too small to be specified in Map 3 - 3 - 1 - a). The waste land and land scattered with shrubbery are mainly located in the highlands and mountains ranging from a gentle slope to a steep hill. They are the results of secondary plantation after repeated cutting of primeval forests and shifting cultivation; the more frequently the land has been object of shifting cultivation, the more seriously ruined it becomes.

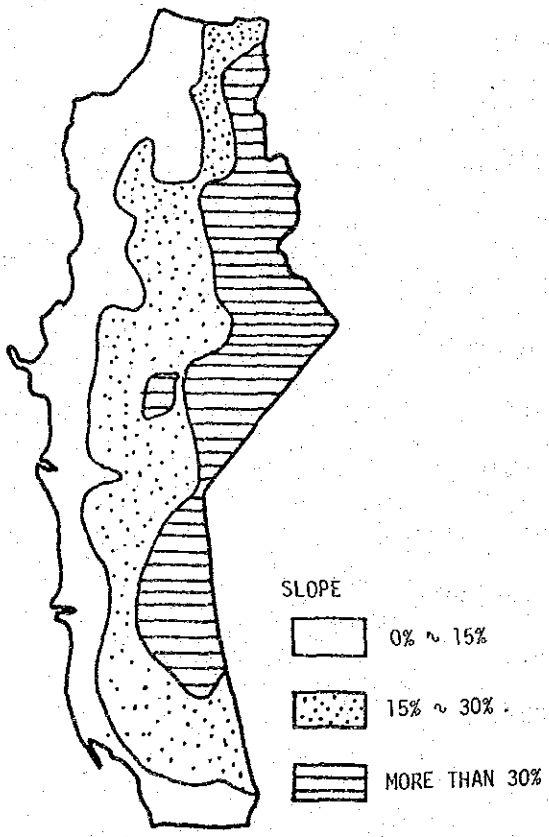


Fig. 3–3–1–b) Ground Gradience

3-3-2 Crops and Plantations

A wide variety of crops and plantation are grown in La Union, as listed below:

Crops:

Garlic

Bulb Onion

Sweet Potato

Cabbage

Pecchay

Radish

Ampalay

Cucumber

Patola

Bush

Squash

Upo

Watermelon

Corn

Rice

Cowpea

Winged Bean

Eggplant

Sitao

Okra

Irish Potato

Sweet Pepper

Black Pepper

Tomato

Cassava

Ginger

Pineapple

Taro

Peanut

Fruit:

Mango

Santol

Orange

Calamansi

Jack Fruit

Guava

Guyabano

Coconuts

Banana

Sineguelas

Starapple

Duhat

Tamarino

Cashew

Trees:

Native Ipil-Ipil

Giant Ipil-Ipil

Narra

Molave

Mahogany

Teak

Yrmane

Falcata

Raintree

Agoho

Talisay

Eucalyptus

Benguet Pine

Alnnus

3-3-3 Land Utilization Planning

Map 3- 3 - 3 shows the projected land use of the region, drawn up in line with the national policy,providing a means of self-sufficiency in food and fuel to the residents of highlands while they settle down in the area, and raising their living standard at the same time.

According to this map of projected land use, virtually all the highlands and mountains, with the exception of a very small portion of cultivated farmland, is adequate for reforestration and qualified to be used for agroforestry. This means that a substantial area of land can be utilized for reforestration and considering such socio-economic factors as providing permanent residence to the local population and guarding against natural disasters, introduction of agroforestry seems indispensable to the plan. As a result, a successful implementation of this plan for land use will depend on the introduction of agroforestry.

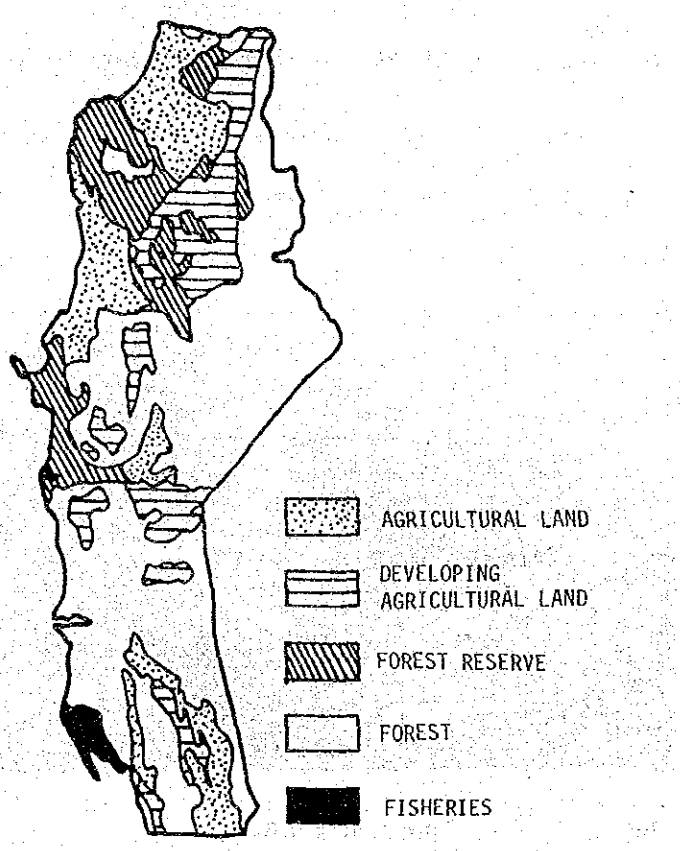


Fig. 3–3–3–a) Projected Land Utilization

Fig. 3–3–3–b) Hill, Plain and Forest with Low Wood

Fig. 3–3–3–c) Plain among Hills

3-3-4 Soil

a) Nature of Soil

Soil in highlands and mountain areas seem to consist mainly of alluvium, yellow soil and orange soil, transformed from sedimentary rocks such as shale and sandstone by weathering. Alluvium exists in the areas along rivers and the areas that used to be basins. It is divided into two kinds according to the difference in the soil layer structures, that is, one including pebbles in its outer layers up to the depth of 20 to 30cm and the other which shows no distinct trace of pebbles in it, although they are both of the same yellowish brown color. Yellow soils are mainly found in areas with a relatively humid climate throughout the year, such as the lower parts of slopes in the hills and mountains and squeezed-out blocks, while orange soils are mainly found in the relatively dry areas such as the middle and upper parts of slopes in the hills and projecting land mass.

b) C/N Ratio of the Soil

In case of raising new crops including trees, the contents of major plant components in the soil such as nitrogen, phosphoric acid and potassium, as well as minor components such as iron, magnesium and manganese are generally studied. However, in case of the troipics where the outflow of plant components are rapid,

it is vital to see whether the substance circulations in the soil caused by dissolutions of organic matters are proceeding smoothly by studying the C/N Ratio rather than the contents of plant components. In other words, it is believed that soil with C/N Ratio of between 8 and 10 representing the amount of carbon in the soil divided by N which stands for the amount of nitrogen is, being favorbale for the dissolutions of organic matters caused by microbes, ideal for crop raising, as long as the supplies of organic matters on the ground such as fallen twigs on leaves are maintained.

For this purpose, in respect to (1) alluvium without a distinct trace of pebbles, (2) yellow soil, (3) alluvium including pebbles, and (4) orange soil, a table was made out indicating the C/N Ratios for each of the above kinds of soil and also for three layers, upper, middle, and lower, the bottom of lower layer being one meter deep. (Please refer to Table 3 - 3 - 4 below).

Judging from the C/N Ratio of soil, particularly of the upper layer soil where the plants strike roots, the highlands and mountain areas are regarded as appropriate for agroforestry.

	1			2			3			4		
		1m	2m		1m	2m		1m	2m		1 m	2 m
N (%)	0.100	0.089	0.055	0.068	0.077	0.069	0.102	0.093	0.089	0.160	0.087	0.047
C (%)	0.850	0.447	0.416	0.575	0.630	0.568	0.743	0.532	0.592	1.532	0.550	0.326
C/N	8.5	5.2	7.6	8.5	8.2	8.2	7.3	5.7	6.7	9.6	6.3	6.9

Table 3–3–4 Comparison of C/N Ratio in Soil

3-4 Infrastructure

As the result of hearing from the university engineers and survey on the Project site, condition of infrastructure on the University Campus are indicated in the following material.

(1) Electricity

Electricity situations in the surrounding areas of the construction site are indicated in Fig. 3 - 4 - a). Electricity cable is drawn overhead into the campus site from high-tension cable of 4,160 volt over the street in front of the campus site. Then electricity cable is again drawin into each building on the campus through current transformers set up on the many electrical poles scattered in the extensive campus. 220 volt and frequency of 60 Hz is used both for single-phase and three-phase. A new high-tension cable will be drawn into the Agroforestry Complex and electricity cable will be drawn into the electrical room through a current transformer set up on an electrical pole near the building.

(2) Telephone

The telephone room of the Philippine Long Distance Telephone Company set up on the campus is connected with the telephone office in Baguio by microwave. Above telephone room is also connected by the switch-board of the telephone company set up in the radio room by four-circuit line, and the above switchboard is again connected to 14 telephones distributed within the campus, partly after party system.

It will be necessary regarding this Agroforestry Complex to draw in additional two-or-three-circuit lines. The position for each telephone and general conditions of drawn-in telephone circuit lines are indicated in Fig. 3 - 4 - a).

(3) Water Supply

Private water-supplying facilities are set up in the University campus. Water is supplied by a spring near the mountain-top on the campus through pipe-lines extending 4 to 5 kilometers and is stored in a water tank. A deep well was dug in order to make up for the water shortage in the dry season. As this Agroforestry Complex demands a steady and ample water supply, it will be necessary to dig a deep well for its exclusive use to secure its water supply. General conditions of the water-supply control facilities in the University campus are indicated in Fig. 3 - 4 - b). Data for water quality are indicated in attached material 10 in Appendices.

(4) Drainage

Existing waste water treatment system adopted on the campus of DMMMSU is common and primary, and water after treatment is let to seep into the ground. In La Union there is no Water Drainage Standard applicable to this Agroforestry Complex. Drainage water from the swinery on the campus is discharged mostly into a nearby river except for the simple pits dug therein. A septic tank for exclusive use will be set up for this Agroforestry Complex and water after treatment will be let to seep into the ground adopting the same method as the existing buildings on the campus.

(5) Gas

As no gas facility is available around the construction site, L.P.G. cylinder gas is used for fuel. Cylinders for 11kg and 50kg are available here, and cylinders for 50kg are used on the campus. L.P.G. cylinder gas will aslo be used in this Agroforestry Complex.

(6) Television and Radio Broadcasting

Four channels, No.3, No.6, No.10 and No.12 , are on air for television. A.M. and F.M. (one channel) is available for radio.

(7) Waste Disposal

Wastes on the university campus is disposed of by digging a hole in an appropriate place, and covering it with soil after brimming it with dust and digging another hole. The same method will be used in this Agroforestry Complex.

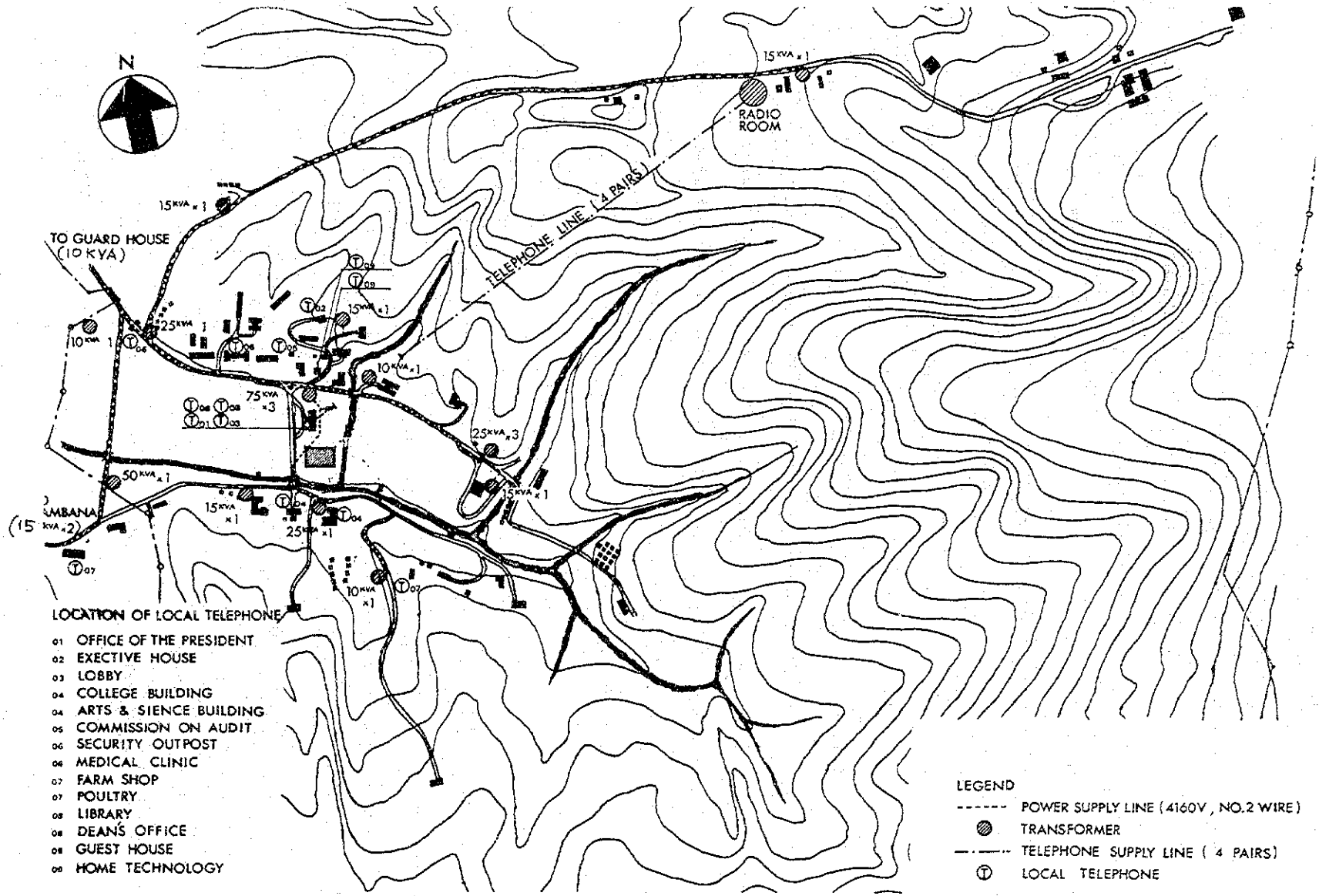


Fig. 3–4–a) Condition of Electrical and Telephone Installations

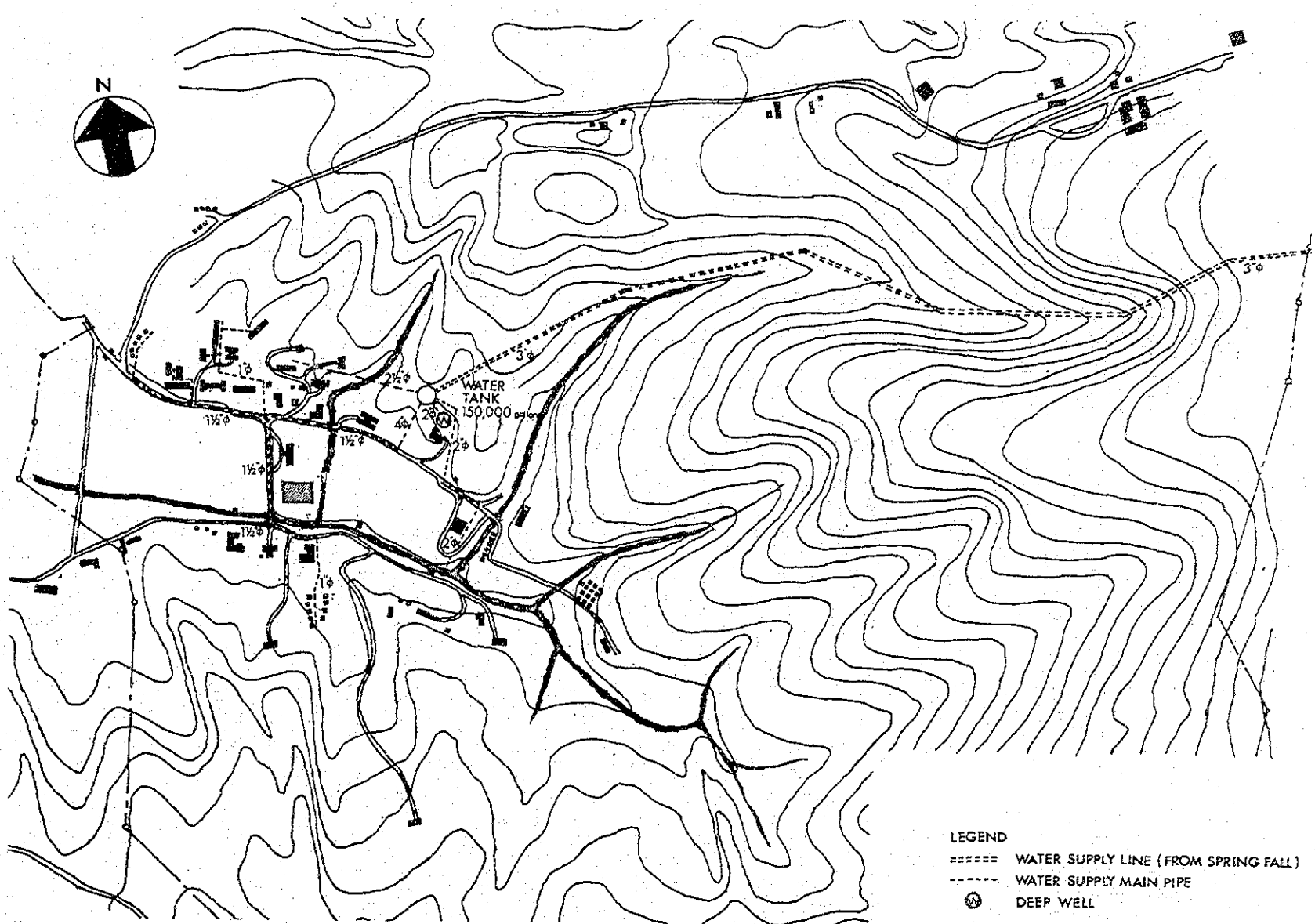


Fig. 3–4–b) Condition of Water Supply Installations

CHAPTER 4: PROJECT

CHAPTER 4: PROJECT

4-1 Objectives and Provisions

The objectives of the Don Mariano Marcos Memorial State Universtiy Agroforestry Complex is to provide the facilities and equipment necessary for the education, research and extension of agroforestry which plays an important role in the regional development of Region I in general and La Union in particular, contributing in the long run to the improvement of the living standards of the residents and the recovery and maintenanace of the forests in the area.

The University is expected to become a pioneer, the first of its kind in the world to have a comprehensive organization for the department of agroforestry, which is still new in its history as a subject of study. In future, the University will function as a center for agroforestry development not only in Region I but in the whole country, and a great deal is expected of the University to be engaged in the education of experts through advanced scientific research and practical training.

Objectives/ To accomplish the following targets by providing the Agroforestry Department of the Universtiy with necessary facilities and equipment:

1) To instruct agroforestry education responsive to the needs of the Region and raise specialists on an intermediate and high level.

2) To facilitate the research on the agroforestry science responsive, particularly, to the needs of the Region.

3) To develop and promote the most effective methods for extending knowledge and technical skills to the local community.

Provisions/

1) Facilities approximately 5,500 m^2

(1) Agroforestry Complex (3-story) 4,900 m^2

(classrooms, laboratories, administration offices, etc.)

(2) Annex Buildings: Field Workshop 240 m^2

Handcraft Workshop/Garage 270 m^2

2) Equipment necessary for the education, research and extension of the following fields of agroforestry:

1) Agroforestry Biological Sciences

2) Processing of Agroforestry Products

3) Agroforestry Resources Management

4) Agroforestry Extension

5) First-aid medical equipment for Agroforestry Dept.

4-1-1 Organization/Staff

Established as a "University oriented to regional development", the Don Mariano Marcos Memorial State Universtiy aims at promoting regional development of La Union in particular and Region I in general, by developing human resources equipped with adequate knowledge and skills responsive to the needs of local industry, in harmony with the local communities. The University lays its ultimate purpose on upgrading the living standards of the residents of the district through various educational activities. The University currently provides education to a total of 9,500 students in Region I, 1,450 of whom study in Bacnotan, where the main campus is located.

There are a total of 224 lectures at the University, 172 of whom are engaged in the following educational programs

Program	Number
Graduate Program	13
BS Degree Program	105
Non-Degree Program	3
Secondary	40
Elementary	11

Table 4-1-1-a)

* Proposed Organization Chart for Agroforestry Department

Details on the system and organization of the Universtiy, and the site and main function of each campus are as described in Chapter 1. As to the Department of Agroforestry, the following organization chart and personnel plan have been drafted by the University, based on the curriculum unit agreed upon by the Univeristy and the Survey Team.

Number of Students: 200 (Department of Agroforestry, Bacnotan Campus)

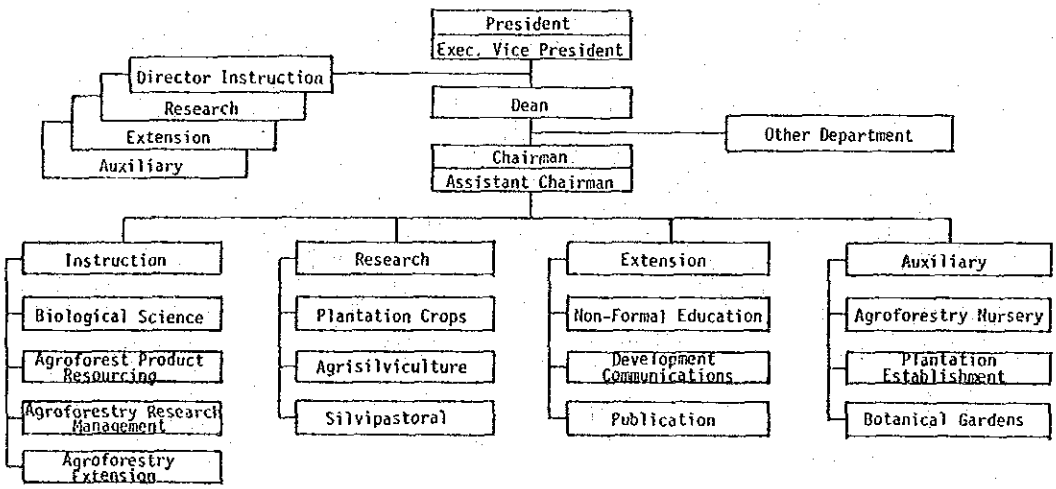


Fig. 4–1–1 Organization Chart of the Department of Agroforestry

The following shows the total number of students on the Bacnotan Campus of the University as of November 1, 1983.

	Level/Department	CURRICULUM YEAR I	II	III	IV	V	VI	TOTAL
I.	Graduate Programs							
	MS in Plant Science	9	13					22
	MS in Animal Science	1	2					3
	MS in Agricultural Education	3	4					7
	TOTAL	13	19					32
II.	Diploma in Agribusiness Management	52						52
	TOTAL	52						52
III.	BS Degree Program							
	BS in Agriculture	24	25					49
	BSA Major in: Agronomy			25	63			88
	Animal Husbandry			11	20			31
	Soils			3	19			22
	BS Agricultural Education	45	49	35	104			233
	BS Agricultural Engineering	19	13	17	33	63		145
	BS Agroforestry	25	32	43	72			172
	BS Home Technology	17	14	25	15			71
	TOTAL	130	133	159	326	63		811
IV.	Non Degree Programs							
	Agroforestry Tech	15	33					48
	Agricultural Technician	15	34					49
	TOTAL	30	67					97
V.	Secondary							
	Agri-Science High School	25	23	18	21			87
	Laboratory High School	79	51	64	43			237
	TOTAL	104	74	82	64			324
VI.	Elementary	22	24	24	21	25	18	134
	TOTAL	22	24	24	21	25	18	134
	GRAND TOTAL	351	317	265	411	88	18	1,450

Table 4–1–1–b)

Number of Students in Bacnotan Campus

Position	Regular Staff	Increased Staff	Total Staff
Professor	–	2	2
Associate Professor	1	2	3
Assistant Professor	1	2	3
Lecturer	12	2	14
Nurse	1	2	3
Assistant Nurse	3	3	6
Forest Patrolman	1	1	2
Researcher	3	1	4
Associate Researcher	4	2	6
Assistant Researcher	2	4	6
Clerks	1	1	2
Cleaning Staff	1	–	1
Total	30	22	52

Table 4–1–1–c) Staffers of the Department of Agroforestry

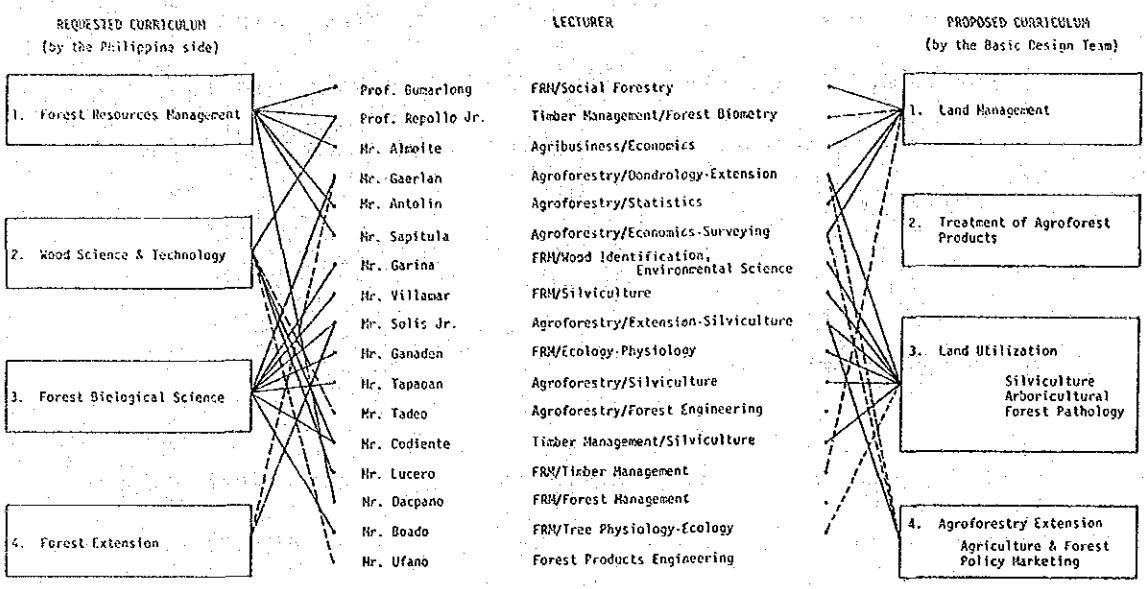
Incidentally, the approximate number of the teaching staff required for carrying out the curriculum plan are 4 professors, 8 associate and assistant professors, and 40 lecturers and researchers. Advances in scientific research will call for an increase in the number of teaching staff in due course.

4-1-2 Basic Curriculum

The Study Team closely examined the curriculum requested by the University and expressed their views that Wood Sciences and Technology are courses which are usually excluded from the area of agroforestry, and proposed that they should be replaced by courses for Agricultural Soil and Crops, and Distribution and Processing of Agroforest Products.

Curriculum Requested by the University	Curriculum Proposed by the Survey Team
Agroforestry Resources Management	Agroforestry Resources Management
Wood Sciences and Technology	Agroforestry Biological Sciences
Agroforestry Biological Sciences	Soil Science and Crop Technology
Agroforestry Extension	Agroforestry Extention
	Distribution and Processing of Agroforestry Products

Contrast Between Lecturer & Curriculum



The University and the Study Team made discussions over this contrast chart and came upon terms on the contents of the basic curriculum. The conciliatory chart of the curriculum, and the tentative form for assigning the teaching staff, are as shown below:

* Basic Curriculum Agreed Upon

1) Agroforestry Biological Science
2) Processing of Agroforest Product
3) Agroforestry Resources Management
4) Agroforestry Extension

DEPARTMENT	UNIT	COURSE	*TO BE PREPARED BY PHILIPPINES SIDE	LECTURER
Agro-Forestry	1. Agroforestry Biological Science	1-1 Dendrology		Mr. E. Gaerlan
		1-2 Ecology		Mr. D. Govina
		1-3 Soil Science		Prof. P. Dazon
		1-4 Silviculture	field is necessary*	Mr. M. Villamas
		1-5 Arboriculture	field is necessary*	Prof. F. Pagert
		1-6 High-land Agronomy	field is necessary*	Prof. A. Sito
		1-7 Tree Physiology		Ms. I. Ganadon
		1-8 Agro-Forestry Crop Protection		Mr. L. Solis
	2. Processing of Agroforest Products	2-1 Crop Technology		Mr. J. Ufano
		2-2 Hand Craft Technology		Mrs. P. Dacpano
	3. Agroforestry Resources Management	3-1 Surveying		Mr. A. Tadeo
		3-2 Applied Research and Statistics		Ms. N. Antolin
		3-3 Economics		Mr. B. Sapitula
		3-4 Forest Biometry		Prof. A. Repollo Jr.
		3-5 Forest Planning and Management		Mr. M. Cadienite Jr.
	4. Agroforestry Extension	4-1 Social Forestry		Prof. R. Bumarlong
		4-2 Information Technology		Ms. C. Boodo
		4-3 Agro-business		Mr. O. Almoite

Basic Curriculum and Assigning

4-1-3 Future Plans

President Marcos is said to have quoted "Let universities be the adobe of the spiritual life of the Philippine people." His words imply that a university should represent something more than a mere campus and its facilities; it should contribute to the building of a nation through an invisible but powerful spiritual influence over its people.
Another statement by President Marcos calls out to universities to "come out of the ivory tower to become the mud covering the rice paddy, the duckweed lining the fish breeding pond, and the rain falling over the forest, and dedicate themselves to social justice in a struggle for establishing democracy in the nation."

The Don Mariano Marcos Memorial State University estbalished in 1981, based on the Decree. No. 1778 of President Marcos, lays its ultimate purpose on responding to the above demands for a universtiy, in addition to raising well-trained human resources maintained by the seven specialized institutions and colleges which make up its main body. The three major duties of the University in future is to equip itself with various facilities, carry out activities with interests oriented to the nation, and develop a constitution responsive to the needs of local communities.

As a result, contribution in academic fields in the various national programs aiming at "improving the livelihood of residents in rural areas" has also come to rank high as a major target of the University. In this respect, the University works closely with such aforementioned programs as KKK and University of Life, etc. promoted by the Ministry of Human Settlements, and are currently engaged in programs for a promising future of the country like providing farms with baby pigs on a regular basis, producing a monthly output of 100 hand-woven blankets, managing a stock farm that gleans 34 million peso a year in production of pigs, establishing a course in agriculture management and granting a degree to 61 students through correspondent courses.
At the same time, the University is working in close collaboration with the Ministry of Energy and the Ministry of Agriculture.

Fruitful results are also expected on international programs recently launched by the University, such as an arrangement with Texas Community College for exchange of information in academic areas. The University also plans to collaborate with other national and international research organizations, an example of which is the Research Service Center Project (target: 1985) which would meet the needs of academic re-research in almost any field.

As to reinforcing its constitution, the University plans to upgrade the ratio of masters versus bachelors and doctors among its teaching staff from the current 69%:31% to 60%:40% in the next five years, simultaneously improving the quality of the general administration staff. A plan for establishing a firm ground for management is also under way, with a target on raising the ratio of the teaching staff versus the administrative staff from the current 1:0.7 to 1:1 during the same period.

Instruction, research and extension of knowledge are the three columns of the Don Mariano Marcos Memorial State University, each of which support the other two, and since the mission of the University is to promote the three areas in response to the needs of the rural areas and Region I in particular, the focus of their activities are naturally laid on agriculture, fishing and agroforestry which are the key industries for development of the region.

The University is already involved in programs for improving the living standard of local farmers, each of whom should be regarded as legitimate members of the society from now on, so the success in extending agroforestry in this region will depend on how to position the productivitiy of each farmer within a more general framework of agriculture as a system.

4-2 Motivation of the Project

The Don Mariano Marcos Memorial State University was established in 1981 as "a university oriented to regional development" by merging seven existing campuses within La Union. The University practices its three policies of instruction, research and extension to maximize the capacity of the limited resources of the area by applying specialized vocational training and advanced learning programs closely adhering to the economy of local communities and aiming at a speedy and effective development of human resources and industries.

In a region like Region I where approximately 60% of the total area are highlands, natural factors like topology, geology and meteorology, as well as socio-economic conditions and natural resources all give evidence to agroforestry as a key industry for regional development. It is even difficult to find a substitute for agroforestry in this region, in terms of regional development in the long run.

In addition to providing regular courses, the University also functions as a pilot laboratory for developing the highland regions (by reforestration and plantation), the plains (by agriculture and livestock farming for poultry and pigs) and the coasts (by breeding fish and growing seaweed).

At the same time, the University executes a lifetime education program in Region I, as a part of its activities for the University of Life, providing the residents of local communities, including experts, with courses in bio-gas technology, plantation of ipil-ipil (as a source of fule), raising sheep and pigs, and processing fruit and vegetables.

Considering the initial objectives for establishing the Don Mariano Marcos Memorial State University, the future of agroforestry and national programs for regional development, the Project for constructing an Agroforestry Complex in the University should lay its target on providing facilities and equipment which serve not only academic purposes but also more practical purposes for an effective and speedy distribution of academic education and research toward the residents of the local communities.

4-3 Basic Design

4-3-1 Policy

As mentioned in 4 - 2 Motivation of Project, the Agroforestry Complex Project plan calls for consideration on practical as well as academic areas. The final plan should be one which consolidates the two areas to provide facilities and equipment most convenient and effective for users.

The Study Team has therefore drafted the following policies for drawing up the Basic Design of the Project.

1) To provide a plan closely adhering to the environments of Region I and the objectives and state of the University with sufficient understanding on the relatively new area of agro-forestry.

2) To understand the objectives of the Project in order to select equipment and construct facilities responsive to domestic economic and technological needs of the Republic of the Philippines.

3) To provide, at low cost, facilities and equipment responsive to the needs of the users.

4) To provide a plan which maintains harmony with the district, with considerations on the natural and surrounding environments and local customs.

5) To provide a plan which can be maintained with ease, and at low cost, with special considerations on the technology, materials and building methods of the local communities.

6) To provide a plan with easy access to future revisions and rebuilding plans.

4-3-2 Site and Location of the Project

To arrive at the site of the Project, one has to make a five-hour trip by car from Manila, going northward from the Super Highway to Route 3 (national road), driving through the town of Bacnotan and proceeding for two more kilometers after making a right turn at the point where the road gradually draws inward from the coastline.

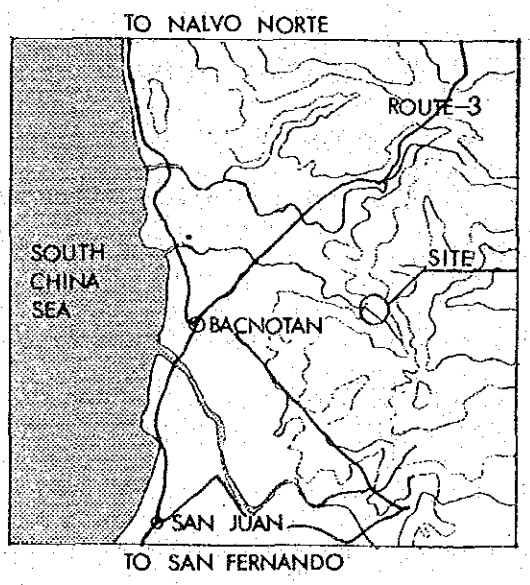


Fig. 4–3–2–a) Location Map

The campus is located in a valley surrounded by mountains with an altitude of 400 to 500 meters, and the river running through the site is joined in the Gantay River which eventually flows into the South China Sea. Transportation by bus is available from Manila up to the main highway of Route 3, from which spot one has to use a jeepney, tricycle or bicycle to get to the campus. Although the University currently has one bus accommodating 60 people, this is far from sufficient, considering the frequent outings for fieldwork, etc.

Fig. 4–3–2–b) Photo of the Site and its surroundings

There are already about 60 buildings on the site. The roads inside the site are arranged to form a large H, the central part of which has an administration building, with classrooms and laboratory buildings lined up to its north and south, and the whole building complex is surrounded by a henhouse, pigpen, workshop, etc.

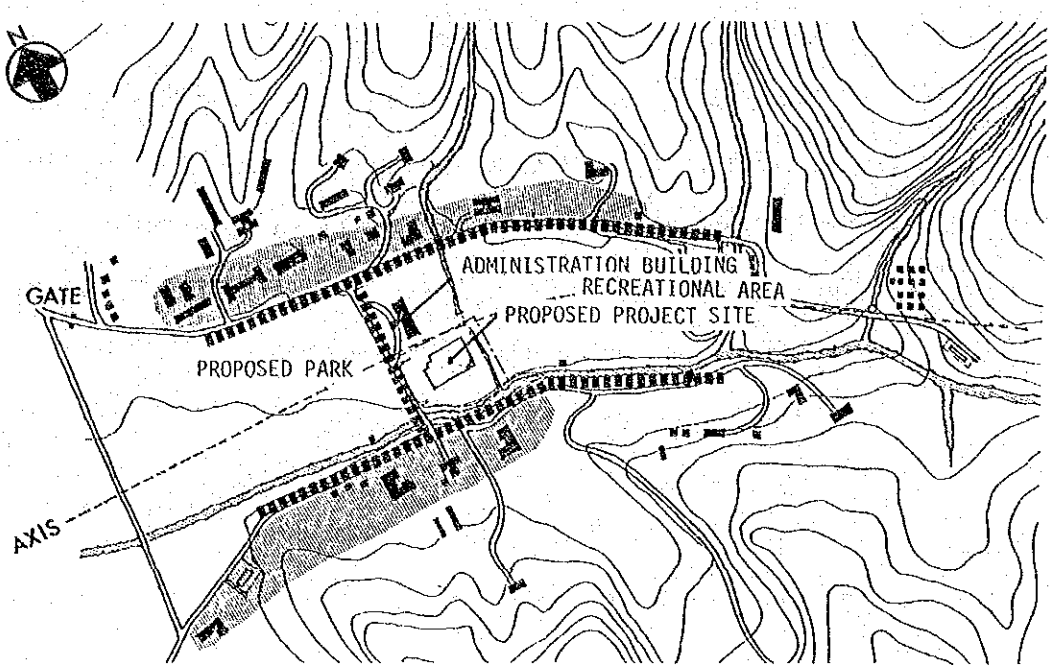


Fig. 4–3–2–c) Location of Existing Buildings

Having closely examined the general site of the Project, the Study Team proposed the following concept for locating the Agroforestry Complex, flexible to changes due to future expansion of the University site. The University accepted the views of the Survey Team that the flat site to the south of the administration building is the most suitable for the site ot the Agroforestry Complex, both from the viewpoint of traffic line and from infrastructures such as electricity, water supply and drainage facilities.

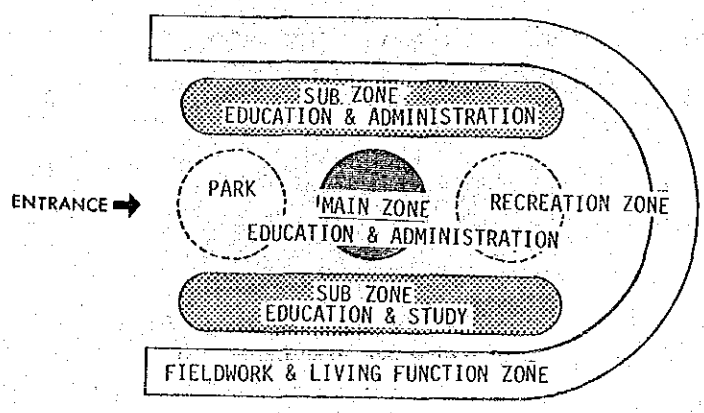


Fig. 4–3–2–d) Proposed Concept of Location

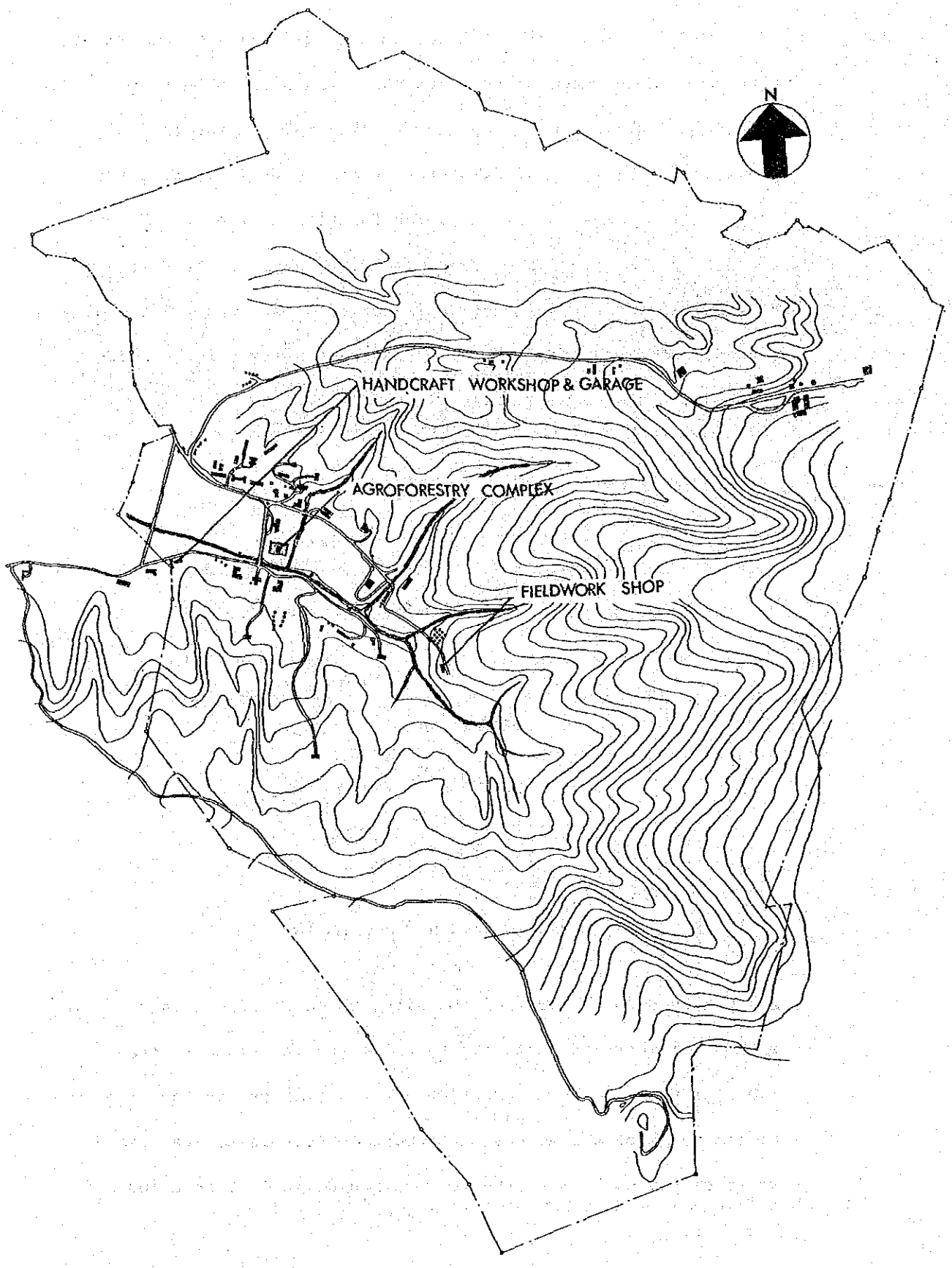


Fig. 4–3–2–e) Building Location of the Site

The site of the buildings other than the Agroforestry Complex are also to be determined by this concept. The nursery beds for seedlings and field workshop for experimental plantation indispensable to the study of agroforestry are to be located in the slopes surrounding the campus which function as the field work and living faculty zone of the University, so as to have access to sufficient water and ventilation facilities, appropriate soil and adequate land area and reserve space for further expansion of the site, as shown in Fig. 4 - 3 - 2 - f).

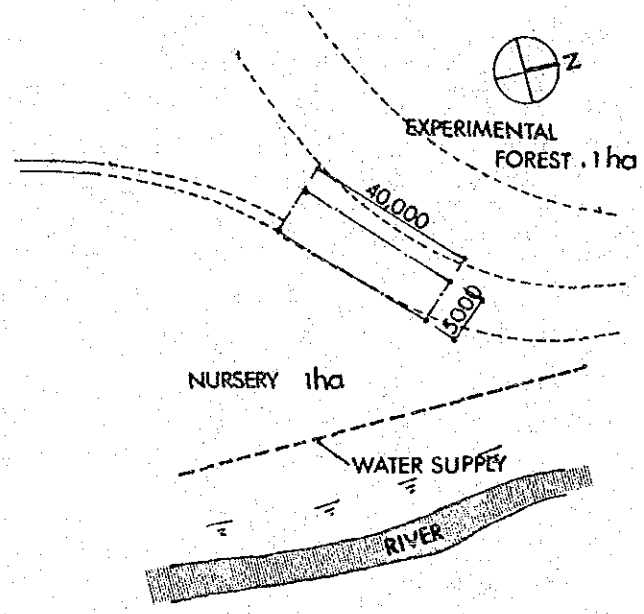


Fig. 4–3–2–f) Concept Plan of the Site

A river runs to the east of the site, which is also favored with sufficient ventilation. By using the 1ha plain to the south of the site as a nursery bed for seedlings and the slope to the north of the site as an experimental forest, the Field Workshop placed between the two has found its most functional location.

In an area favored with good climate and environments, the University has selected an ideal site for implementing the concept that the study of agroforestry should be based not only on academic theories but also on more practical field training.

Fig. 4–3–2–g) Site of the Field Workshop and its Surroundings

To guard against disturbing noise, it was decided that the Handcraft Workshop and Garage Building be separated from the Building Complex and located to the east of the existing Maintenance Shop in the instruction/research sub-function zone of the Project.

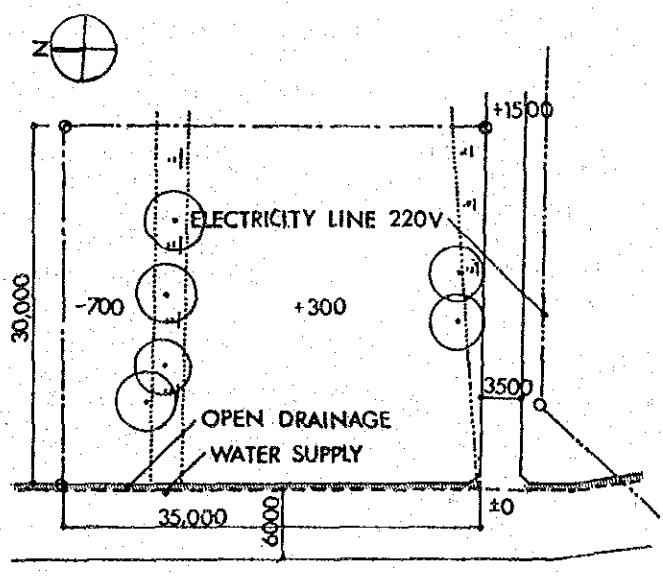


Fig. 4–3–2–h) Projected Site of the Handcraft Workshop and Garage

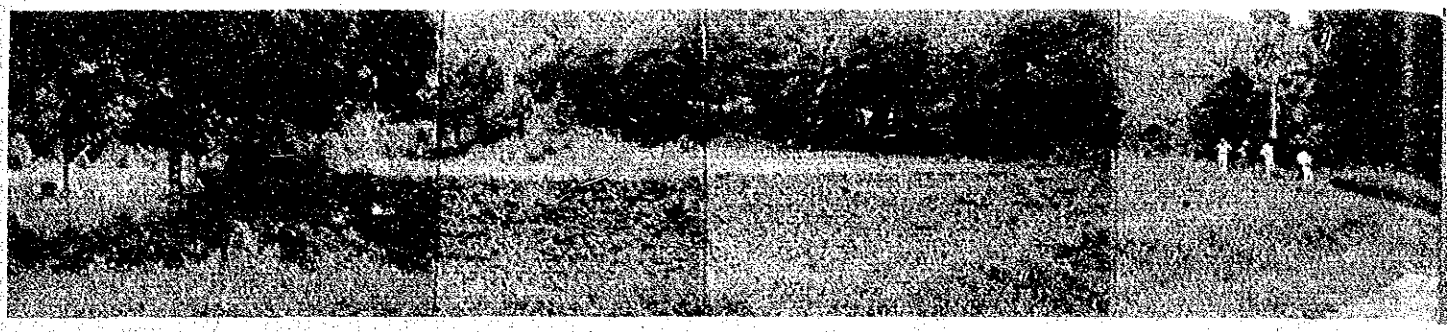


Fig. 4–3–2–1) Photos of the Surroundings of the Site

4-3-3 Architectural Design

The most appropriate facilities that meet the minimum requirements of the Complex should be provided for. In the case of designing facilities for a university, the important step to take before determining the size and location of the facilities is to draft and comprehend an "academic plan" which stipulates the purpose of education and the range and target of research to be undertaken by the University.

After studying in detail the objectives and status of the University and confirming the needs and future directions of the Republic of the Philippines, the Study Team drew up a proposed curriculum for promoting the study of agroforestry in the district and, after some discussions with the authorities at the University, reached a mutual agreement on the basic curriculum. The discussion with University authorities also enabled the Study Team to learn about the original purpose of the foundation of the University and the function of each facility required for the curriculum, an understanding of which is vital for drawing up a physical plan for the Project.

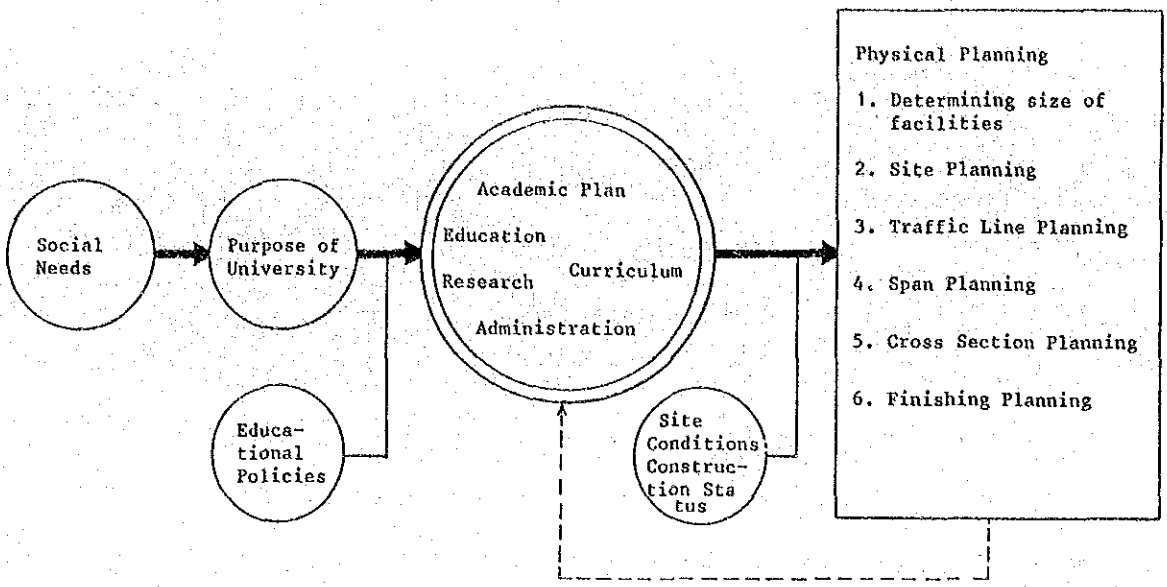


Fig. 4–3–3–a) Flow Chart for the Project Planning

Education, which is essentially the basis of scientific and cultural development, exerts an immeasurable amount of influence over the generations to come. Since the original purpose of the foundation of this University was to provide a cultural center closely adhering to local communities, the facilities for the University should be designed with care; frugal yet durable and functional facilities for a place for building one's characters and freely communicating with other people.

(1) The Size of the Facilities

The following is the list of facilities compiled by the Study Team, based on their survey on the curriculum and personnel plans for instruction, research, extension and administration, and approved of by University authorities through discussions between the two parties.

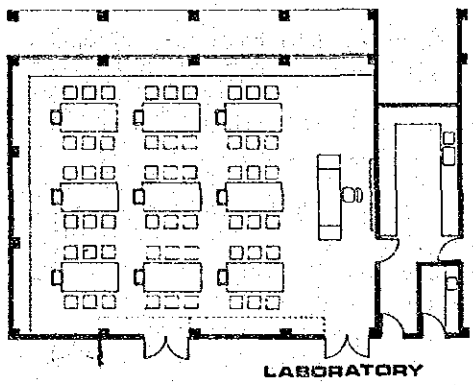
Table 4–3–3 Floor Area of Each Room

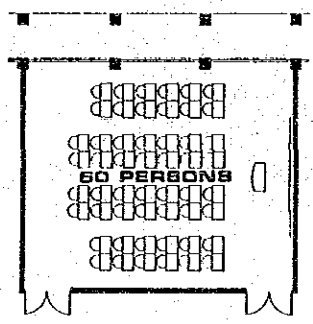
field	name of facility	floor area (m^2)	number of persons		grounds for calculation
Rooms for Faculties of Agroforestry Department	1. Agroforestry Biology				
	Professor's Room	40	1		with secretary (refer to layout)
	Room for Associate & Assistant Professors	20	1		(refer to layout)
	Administration Office for Lecturers	40	6		$5m^2$ x 6 = $30m^2$ conference table to seat 8 10m
	2. Processing of Agro-forest Products				
	Professor's Room	40	1		
	Room for Associate & Assistant Professors	20	1		ditto
	Administration Office for Lecturers	40	6		
	3. Agroforestry Resour-ces Management				
	Professor's Room	40	1		
	Room for Associate & Assistant Professors	20	1		ditto
	Administration Office for Lecturers	40	6		
	4. Agroforestry Exten-sion				.
	Professor's Room	40	1		
	Room for Associate & Assistant Professors	20	1		ditto
	Administration Office for Lecturers	40	6		
	Conference Rooms	20	6		rooms for small seminars and faculty conferences standard: $4.6m^2$/person
	sub-total	420			

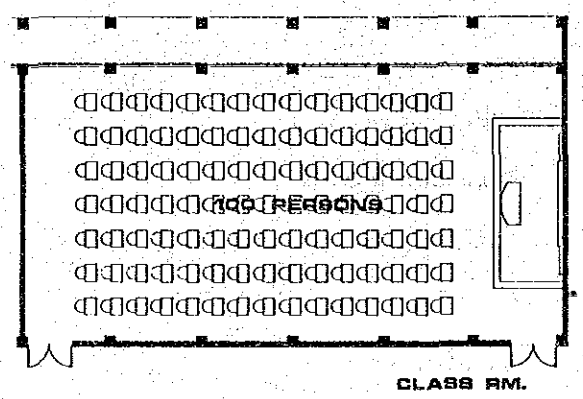
field	name of facility	floor area (m^2)	number of persons		grounds for calculation
Special Laboratories for Agroforestry	Stability Room	30			20°C
	Balance Room	30			
	Darkroom	23			20°C
	Microscope Room	20			
	Warehouse	20			
	Machine Room	20			
	Reference Room	60			for exhibiting samples of insects , etc.
	Library	80			
	Conference Room	60	20		for seminars and study meetings $4.6m^2$/person
	sub-total	380			
Classrooms and Laboratories for Agroforestry	Classroom(small x 5)	80 x 5	50		$1.6m^2$/person, 50 per class
	Classroom(large x 1)	160 x 1	100		$1.6m^2$/person, for common lectures
	Laboratory 1	135	50		for Soil Science (refer to layout)
	Laboratory 2	135	50		for Agroforestry Crop Production
	Laboratory 3	135	50		for Dendrology, Ecology
	Laboratory 4	135			for Crop Technology
	Laboratory 5	90	30		for Agroforestry Statistics
	Drawing Room	90	30		
	Shower Room(male)	30	6		
	(female)	25	4		
	Warehouse	60			
	sub-total	1,395			
Agroforestry Extension Department	A/V Room	400	200		$2m^2$/person
	Control Room	80			
	Machine Room	50			
	sub-total	530			

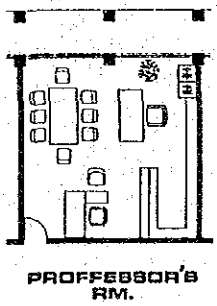
field	name of facility	floor area (m^2)	number of persons		grounds for calculation
Administration Department	Faculty Director's Room	60	1		with secretary (refer to layout)
	Faculty Administration Office	110	10		$5m^2$/person with copy machine, broadcasting facilities and space for storing material
	Special Conference Room	50	10		
	Medical Dispensary	140			(refer to layout)
	Anteroom for Janitors and Cleaning Staff	20	5		for 2 janitors and 3 cleaning staff
	sub-total	380			
Others	Others				
	Entrance Hall				
	Stairway	1,885			
	Corridors				
	Lavatories				
	Machine Rooms				
	sub-total	4,990			
Field Workshop	Handcraft Workshop & Garage	270			
	Field Workshop	240			
	sub-total	510			
	Grand Total	5,500			

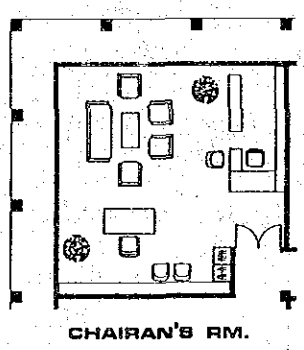
The following are the layouts on which the calculations for floor area were based:

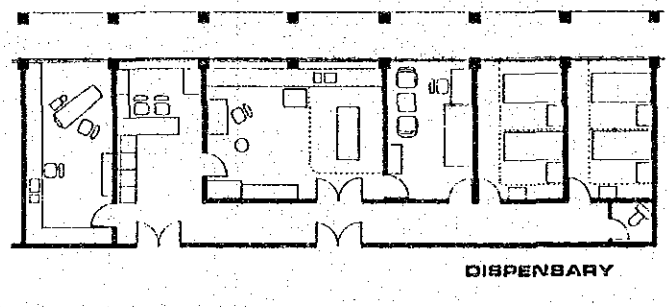












2) Floor Planning with Traffic Line Planning and Span Planning

The various facilities required for the projected curriculum can be divided by functions into the following five zones: those related to faculty (rooms for professors, associate and assistant professors and lecturers), classrooms, special laboratories, rooms for Extension and Administration. Next, by studying the proportions of the areas necessary for each function and the type of equipment to be installed, one comes up with three major blocks; a block related to faculty and administration consisting of individual rooms of a small span, a block for classrooms consisting of rooms of large span, and a block for laboratories where plumbing installations will be required. These three major blocks, and a block for Agroforestry Extension make up a total of 4 zones.

The following plan shows the most effective arrangement of the four zones around a courtyard which will enable natural ventilation and daylighting, with considerations given on such factors as a possible future extension, remedies for preventing noise and securing privacy, and harmony with the adjoining administration building remaining on the site.

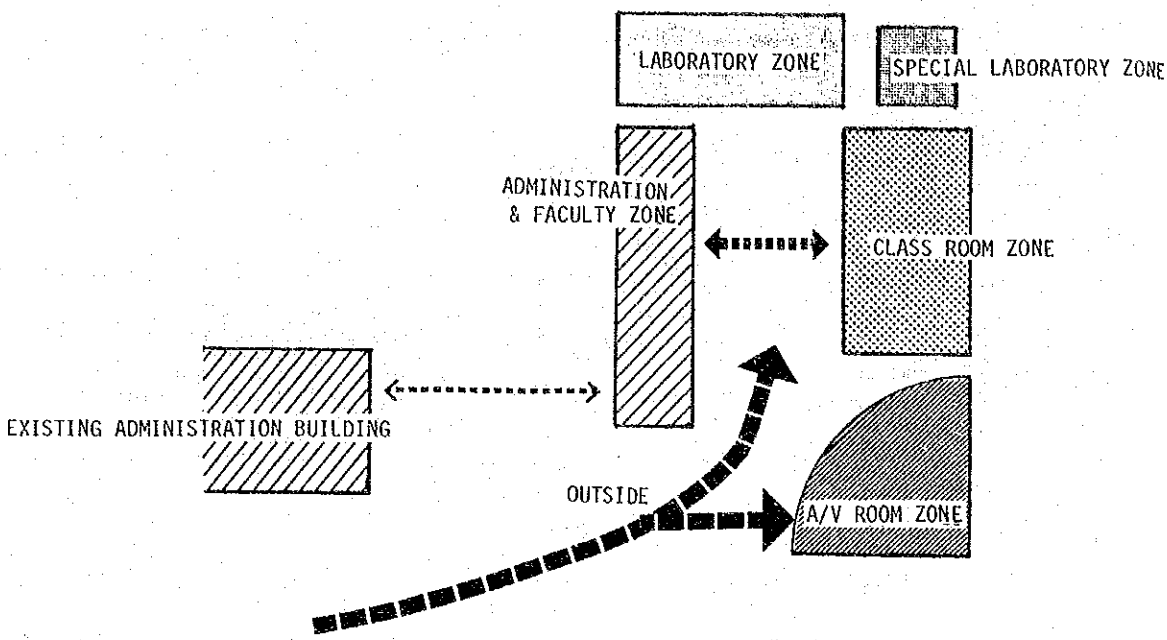


Fig. 4–3–3–b) Concept of the Plan

In an area with severe climate like the Project site, a courtyard will provide an ideal solution for natural daylighting and ventilation, meaning that the facilities can be used even in case of electricity failure which are common in this region. As a result, the courtyard contributed to keeping down the maintenance cost to a minimum.

Taking the traffic line into account, the facilities related to Administration and Faculty are located near the existing Administration Building, with a special arrangement for placing the Dispensary, which provides emergency medical aid, on the first floor. A door is placed near the entrance hall for regular medical consultation, and considerations are also given on the traffic line from the back entrance, which does not cross the main entrance but will nevertheless be used for bringing emergency patients in and out of the Dispensary.

Classrooms and the A/V Room, which will invite a large flow of people, will face the road on the South-west so as to secure an escape in case of emergency and prevent the noise from these rooms from disturbing those in the Faculty Rooms.

Conforming to the policy of the University to extend its functions to the local community, the A/V Room will not only face the Entrance Hall but will also be located in a position most likely to catch the eyes of people approaching from the gate.

In terms of structure, this plan will enable the use of columns with an appropriate span to meet the size of each room, and the method of connecting similar functions in a vertical line makes it easy to design the facility system rationally for users to maintain them. The plan also helps to keep down the initial costs.

At the same time, the courtyard serves as an open space through which the students, teachers and visitors can observe each other. The plan therefore realizes the purpose of the University, namely, the instruction, research and extension of agroforestry.

Classrooms will be arranged in three floors, and the stairway facing the Entrance Hall, which provides an approach for students, will not only serve the practical purpose of connecting the three layers but will also provide a visual sense of continuity. The traffic line for teachers is also taken into account, and privacy to some extent is insured for the faculty-related building.

The entrance of the existing Administration Building will be taken into account for the approach, which will accept an inflow of people from the Administration Building. People entering the Hall through the Entrance will be able to hold a view of each facility in the four divided zones as they approach their destination in a natural motion. Efforts are made to avoid, as far as possible, the use of sash in Corridors, Halls, etc. that can be made open to the air, aiming at protecting the natural environments bordering on the interior and exterior of the building while keeping down the costs.

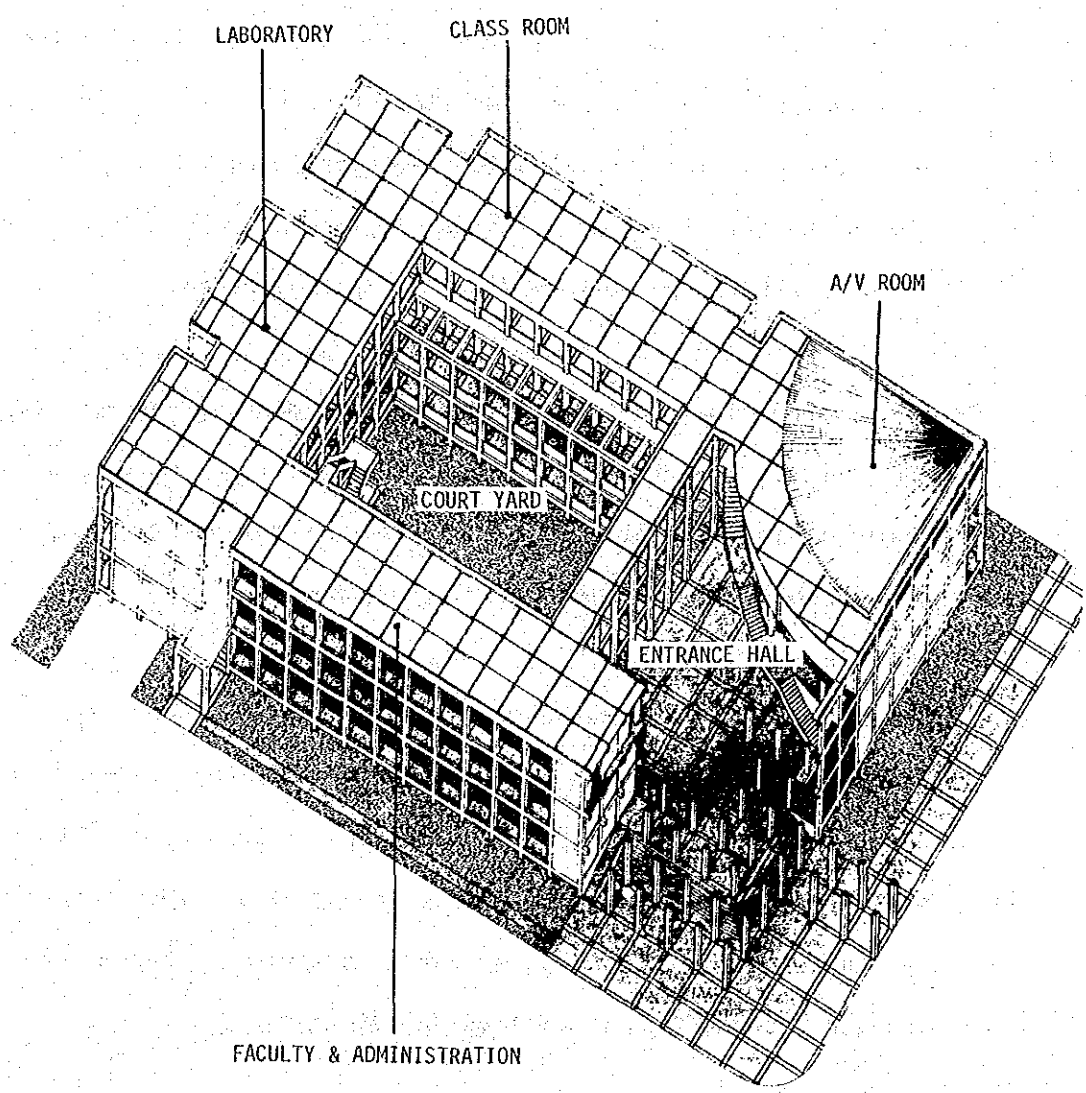


Fig. 4–3–3–c) Isometric

Compact plans are considered for the Field Workshop, Handcraft Workshop and Garage, with common use space like lavatories and shower room located in the center to be shared from both sides. This will also serve as a remedy for preventing the noise from the Handcraft Workshop and Garage from disturbing people in nearby facilities.

3) Sectional Planning

The floor height will be set at 3,400mm, conforming to the legal standard of 2,700mm for ceilings with natural ventilation. This is considered to be a reasonable height, providing a space of 2,500mm under the beams and 3,200mm under the slab, since there is no need for a ceiling.

People approaching from the entrance are guided inside the building in natural motions while going through a continuity of space in the form of a 2-stories void space at the canopy, a 3-storied void space at the Hall (both of which border on the interior/exterior of the building), and finally the Courtyard furnished with sky lighting.

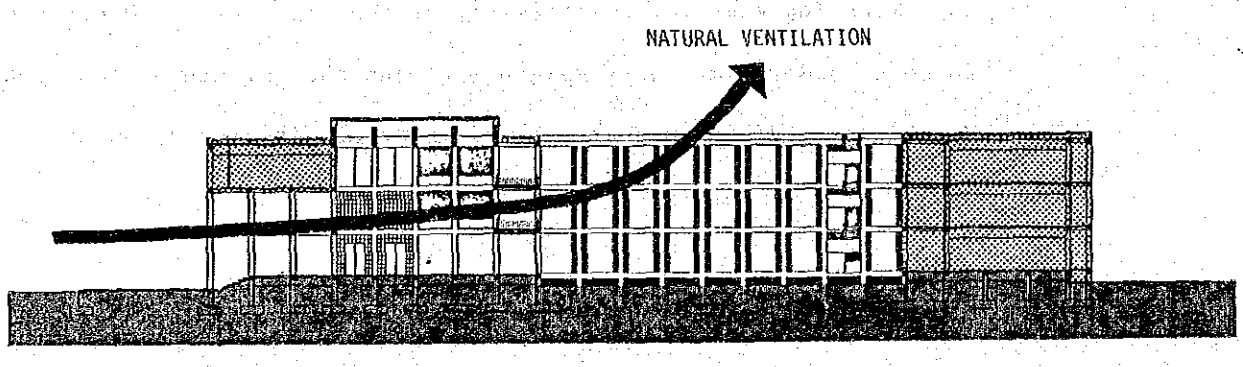


Fig. 4-3-3-d) Sectional Planning

This also invites a smooth flow of wind, giving to each facility the natural environments similar to those provided by a side-corridor method, while maintaining the form of a Courtyard.

The Audio-Visual Room accommodating 200 people will adopt a stepped-stalls method to give a sense of unity to lecturers and the audience, and the position of seats arranged in a single circle will enable a closer communication.

In an area like the Project site which is exposed to the direct rays of the sun, the ideal roof is one which has a heat insulator installed in the garret,however, in order to keep down the costs and avoid the trouble of having roof inclinations in different spans, a plate of asbestos with a layer of air underneath will be spread flat over the roof, providing solutions for the heat insulation and general appearances at the same time.

4) Finish Planning

The local status of construction work should be taken into account for selecting the finish materials for the facilities. Other factors to be considered are easy maintenance and the balance of cost and durability, and the use of natural materials is also encouraged.

Agroforestry Complex

exteriors:

roof: asphalt waterproofing + corrugated cement asbestos board

wall: concrete (exclusively for columns and beams), concrete hollow block, cement mortar, adobe-like chipping finish

fittings: wood, partly aluminum jalousie

interiors:

facilities	floor	wall	ceiling
Administration Rooms	vinyl tile	C.B., cement mortar with paint	sprayed resin
Faculty Rooms	vinyl tile	C.B., cement mortar with paint	sprayed resin
Lecture Rooms	vinyl tile	C.B.,cement mortar with paint	sprayed resin
Laboratories	vinyl sheet	C.B., cement mortar with paint	veneer with paint
A/V Room	vinyl tile	C.B., cement mortar chipping finish	wood, cement slab
Lavatories	mosaic tile	semi-porcelain tile	veneer/paint
Corridor, Hall		C.B., adobe-like cement mortar chipping finish	sprayed resin
Machine Room	concrete with paint	glasswool plate	glasswool board

interior fittings: wood

steel, partly aluminum jalousie

Field Workshop/ Handcraft Workshop/ Garage

exteriors:

roof: prepainted zinc-steel plate

wall: concrete hollow block, mortar , painted

fittings: wood, partly aluminum jalousie

interiors:

floor: concrete with coating or vinyl tile

wall: concrete hollow block, mortar , painted

ceiling: veneer/paint

4-3-4 Structural Design

(1) Basic Policies

a, To adopt a structural plan conforming to the climate and state of affairs in the Republic of the Philippines, and satisfying the needs on the scale, form and purpose of the facilities.

b) To adopt a structural plan with sufficient considerations on the provision and quality of materials, building technics, etc. and encouraging the use of local materials and construction methods, as long as they do not cause any problems.

c) To adopt a structural plan that is both cost effective and durable.

3) Design Load

The following is the standard for design load established for the facilities, based on the codes as mentioned.

a. Dead Loads

(a)	reinforced concrete	$2.4t/m^3$
(b)	structural steel	$7.85t/m^3$
(c)	bricks & blocks	$1.9t/m^3$
(d)	The load for other finish materials will be determined in the process of design implementation.	

b. Live Loads

(a)	roof (general)	$60kg/m^2$
(b)	roof (flat roof)	$100kg/m^2$
(c)	lavatory, shower room, classroom	$200kg/m^2$
(d)	administration office	$250kg/m^2$
(e)	lobby, corridor, A/V room	$500kg/m^2$
(f)	laboratory,warehouse, machine room	$500\ kg/m^2$

c. Wind Loads

The following standard will be established, conforming to the regulations of NSCB.

Wind Pressure = P x Wind Force Coefficient

The site is within Zone II, thus P shall be given as follows:

height:	lower than 9 meters	P=150kg/m
	9m to 30m	P=200kg/m
	higher than 30m	P=250kg/m

d. Seismic Loads

The standard for the earthquake loads will be established according to the regulations of NSCB.

(4) Structural Materials

The following is the specifications of the main structural materials:

a.	reinforcement	deformed reinforcing bar SD 30 (JIS) or the equivalent
b.	concrete	f c =210kg/cm (4-week strength cylinder test)
c.	cement	regular portland cement (ASTM)
d.	steel	SS41 (JIS) or the equivalent

(5) Structure

The main structure will be rigid frame structure with RC shearing walls installed where necessary. Reinforced concrete will be used for roofs and floors, and the walls will be of concrete hollow blocks.

6) Foundation

Details of the foundation will be determined after a boring test is conducted on the site by the Philippine side, however, the previously mentioned conditions of the ground suggest the selection of an independent foundation. The nearby existing facilities are of RC 2-story structure, with foundations settled on the excavated depth of GL-1.0m, based on the allowable soil pressure of $10T/m^2$. A similar type of foundation design will be adopted for the 3-story facilities of this Project.

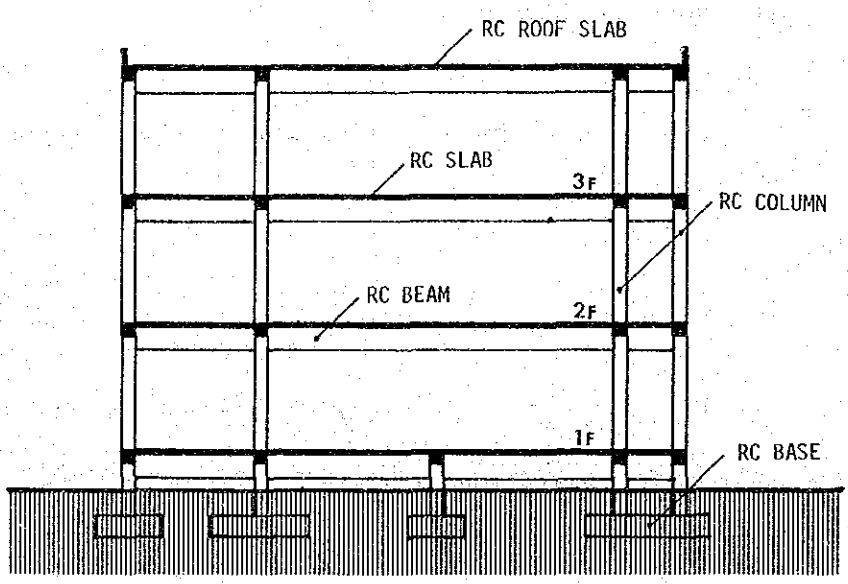


Fig. 4–3–4 Sectional Planning

4-3-5 Utility Design

(1) Design Policy

Utility plan should be conducted according to the basic policy of the Project, with special considerations on the following points:

1) The local situations should be taken into account for drawing up the utility plan, namely, the meteorological features of high temperature around the year and high humidity and heavy rainfalls in the rainy season, and the general shortage in the absolute number of trained engineers. It should also be noted that local provision of spare parts and consumables is not easy. While conforming to local natural conditions, the utility plan should be one which satisfies the requirements of the relatively low illuminance and simple airconditioning system prevalent in the Philippines. At the same time, the utilities should be easy, and relatively inexpensive, to operate with no special technics required for maintenance.

2) The use of standardized goods for apparatus is encouraged, to make future replacement easier.

3) The design should conform to related regulations of the Philippines, and reference should be made to legal standards in Japan in specific cases when there are no applicable regulations in the Philippines.

4) Apparatus for this Project manufactured in Japan should conform to JIS (Japan Industrial Standard). In the same way, apparatus manufactured in the Philippines should principally conform to the industrial standards applicable in the Philippines.

(2) Electrical Design

1) Agroforestry Complex

a) Receiving Installations

Power will be supplied by the Philippine side, up to the transformer mounted on a post on the roof, near the Electric Room on the east side of the building. From thereon, an electric cable will transmit power to the receiving panel in the Electric Room on the first floor. The voltage will be three-phase 220v, single-phase 220v, at the frequency of 60Hz.

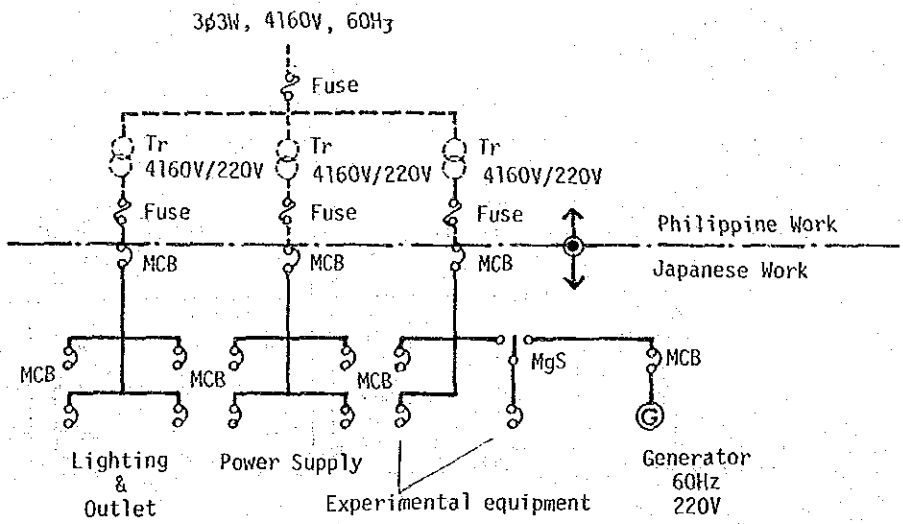


Fig. 4–3–5–(2)–a) Wiring Connections in Receiving Panel

The total installed capacity of the facilities is estimated to be 525 KVA, the breakdown of which is as follows:

Lighting/Plug Receptacle	150 KVA
Airconditioning/Ventilation	150 KVA
Water Supply	75 KVA
Laboratory Equipment	150 KVA
Total	525 KVA

b) Generator

A generator of about 75 KVA will be installled as a stand-by service in case of electric failure, to secure the electric power necessary for laboratory equipment such as refrigerators and heat insulating devices.

c) Main Power Line

Power will be connected by mental conduit tube or cable rack from the power board in the Electric Room to the lighting cabinet panels for laboratory equipment installed on each floor.

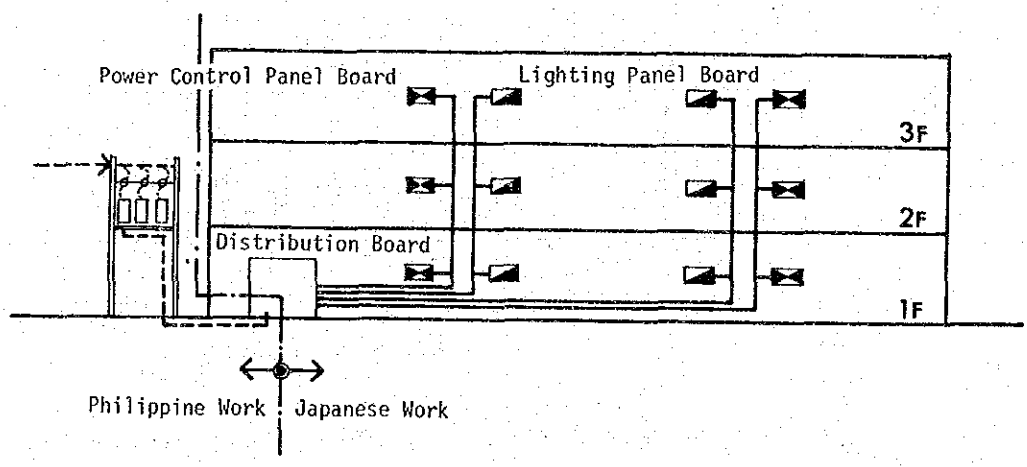


Fig. 4–3–5–(2)–b) Main Power Line

The voltage will be 3-phase 220v for main line power and single-phase 220v for electric lights and plug receptables.

d) Lightings and Receptacles

i) The use of natural daylighting is encouraged. Flouresent lamps will be mainly used for electrical lighting, supplemented by the use of incandenscent lamps in some parts.

ii) The following shows the illuminance of the main facilities:

Administration Office	300 lux
Laboratory	300 lux
Conference Room	250 lux
Classroom	300 lux
A/V Room	250 lux
Lavatory/Corridor	70 lux

iii) Regular receptacles will be used for office machines, etc., whereas receptacles with earth electrode will be used where necessary for laboratory equipment. The standard voltage will be single-phase 220v.

e) Air conditioning/Ventilation

Conduit pipings will be conducted for supplying electric power to airconditioning equipment, ventilating fan, ceiling fan, pump, etc. The voltage will be single-phase 220v for devices with samll capacity such as ventilating fan and ceiling fan, and three-phase 220v for devices with larger load capacity.

f) Telephone

2 or 3 joining lines for telephones will be drawn to the terminal panel at the Guard Room on the first floor. A compact electronics cross-bar type is planned for exchange equipment, and there will be 10 to 15 extension lines. The conduit pipings will connect the terminal panel at the Guard Room to the telephones in each room through the terminal panels installed on each floor.

g) Public Address System

For general public address within the building, a system consisting of an amplifier and a microphone will be installed in the Administration Office on the third floor. connected to speakers in the corridors of each floor. The A/V Room equipped with A/V devices will also have special acoustic equipment that will enable an independent public address system within the Room.

h) TV and Radio

Outlets will be prepared to enable the use of TV and Radio in the A/V Room, with an antenna mounted on the roof.

i) Fire Alarm System

Fire alarm bells will be installed in about 2 spots on each floor so that, in case of fire, the bell will ring and the alarm panel in the Guard Room on the first floor will light up.

j) Lightning Conductor

To guard against damage from lightning, a lightning conductor will be mounted on the roof and lightning equipment consisting of lightning wire and earth electrode will be installed.

k) Wireless Communication

Because of the distance between the Agroforestry Complex and its annex buildings, a wireless communication system will be installed. The key station will be located in the Administration Office of the Agroforestry Complex, and substations will be prepared in the offices of the annex buildings.

2) Handcraft Workshop, Garage

a) Receiving Panel

Power will be supplied by the Philippine side, up to the transformer mounted on a post, near the receiving panel on the east side of the Workshop. From thereon, an electric cable will transmit power to the receiving panel. The voltage will be three-phase 220v, single-phase 220v, at the frequency of 60 Hz.

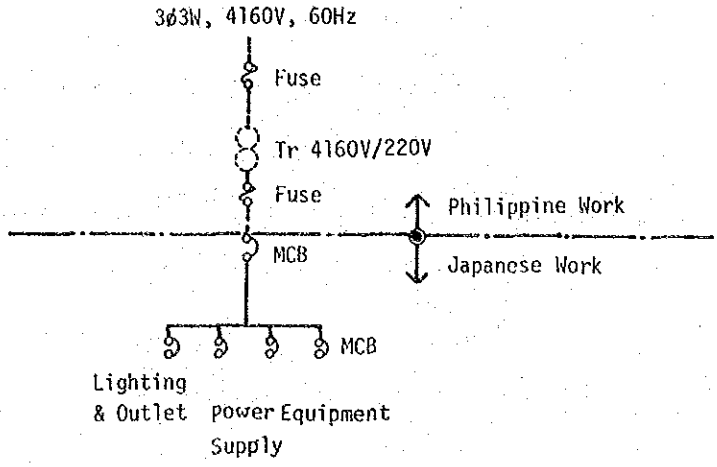


Fig. 4–3–5–(2)–b) Wiring Connections in Receiving Panel

The total installed capacity of the facilities is estimated to be 20 KVA, the breakdown of which is as follows:

Lighting Plug Receptacle	5 KVA
Power for Airconditioning	5 KVA
Power for equipment	10 KVA
Total	20 KVA

b) Main Power Line

Similar to the Agroforestry Complex.

c) Lightings and Receptacles

The following shows the illuminance of the main facilities:

Garage	70 lux
Warehouse	70 lux
Workshop	300 lux

d) Ventilation

Similar to the Agroforestry Complex.

e) Wireless Communications

A wireless system will be installed for communications with the Agroforestry Complex.

3) Field Workshop

a) Receiving Panel

Power will be supplied by the Philippine side, up to the transformer mounted in the post, near the receiving panel on the west side of the building. From thereon, an electric cable will transmit power to the receiving panel. The voltage will be three-phase 220v and single-phase 220v, at the frequency of 60 Hz.

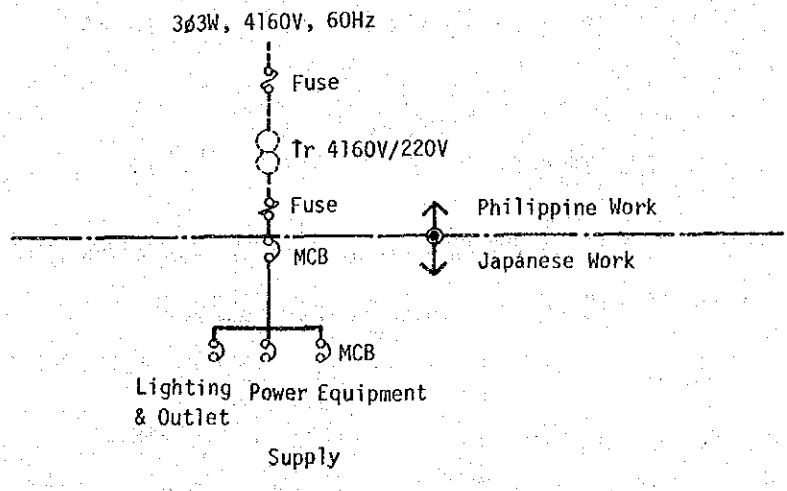


Fig. 4–3–5–(2)–d) Wiring Connections in Receiving Panel

The total installed capacity of the facilities is estimated to be 15 KVA, the breakdown of which is as follows:

Lighting/Plug Receptacle	6 KVA
Power for Airconditioning	6 KVA
Power for equipment	3 KVA
Total	15 KVA

b) Main Line Installations

Similar to the Agroforestry Complex.

c) Lighting and Receptacles

The following shows the illuminance of the main facilities:

Administration Office	300 lux
Workshop	200 lux
Warehouse	70 lux

d) Ventilation

Similar to the Agroforestry Complex.

e) Wireless Communications

A wireless system will be installed for communications with the Agroforestry Complex.

(3) Airconditioning/Ventilation

1) Agroforestry Complex

a) Airconditioning

Airconditioning apparatus will be installed in the rooms as shown in Table 4 - 3 - 5 - (3). This will mainly consist of split-type air-conditioners adopting the air-cooling method. For the auditorium and other special zones, however, a floor-type duct-connected airconditioner adopting the air-cooling method will be installed. Special zones include thermo-stability rooms where the temperature are to be controlled to maintain a certain level.

Conditions for installation:

outside the room:	DB 33° C	RH 70%
inside the room:	DB 29° C	RH 60 ± 5%

* excluding rooms with permanent temperature of 20°C

b) Ventilation

Ventilating fans will be installed in the rooms as shown in Table 4 - 3 - 5 - (3). Ventilation by duct-connected ventilator will also be used in some rooms. The following shows the number of times per hour which the air in the room is to be ventilated.

ordinary rooms/ storage	5 times/hr
lavatories/kitchenette	10 times/hr

AIR-CONDITION & VENTILATION ROOM SCHEDULE

ROOM	Q'TY	ROUND NO. AREA	A/C	VENTILATION	REMARKS
Professor RM.	4	40	○		
Associate Professor RM.	4	20	○		
Office	4	80	○		
Conference RM.	1	60	○		
Thermo-stability RM.	1	30	○		20°C
Storage	1	15		○	
Balance RM.	1	25	○		
Dark RM.	1	15	○		20°C
Reference RM.	1	80	○		
Research Conference RM.	1	60	○		
Lecture RM. (A)	6	80		○	
Lecture RM. (B)	1	160		○	
Laboratory 1	4	140		○	
Laboratory 2	1	60		○	
Microscope RM.	1	20	○		
Drawing RM.	1	120	○		
Shower RM.	1	70		○	
Audio Visual RM.	1	500	○		
Chairman RM.	1	60	○		
Office (Secretary)	1	110	○		
Executive Conference RM.	1	50	○		
Dispensary RM.	1	120	○		
Janitor RM.	1	10		○	
Guard RM.	1	10		○	
Storage (B)	1	60		○	
Entrance Hall	1	300		○	
Toilet	6	25		○	
Kitchenette	3	10		○	

Table 4–3–5–(3)

2) Handcraft Workshop/Garage

a) Ventilation

Ventilating fans will be installed in Garage, warehouses and lavatories. The following shows the number of times per hour which the air is to be ventilated in those rooms:

garage/warehouse	5 times/hr
lavatories	10 times/hr

3) Field Workshop

a) Airconditioning

Split-type airconditioners adopting the air-cooling method will be installed in the office.

b) Ventilation

Ventilating fans will be installed in warehouses, shower rooms and lavatories. The following shows the number of times per hour which the air is to be ventilated.

warehouses	5 times/hr
shower rooms/lavatories	10 times/hr

(4) Plumbing

1) Agroforestry Complex

a) Water Supply

The Philippine side shall prepare a deep well with pump up the water and draw a lifting pipe connected to a water reservoir tank. From thereon, by Japanese side, the water will be pumped up to elevated tank above, and water will then be supplied to necessary places by means of gravity. Each laboratory will secure the amount of water necessary for experiments. The following is the rough estimation of the amount of water necessary at the Agroforestry Complex.

a. students	300 x 0.03m^3 per capita per day	=	9m^3/day
b. faculty staff	70 x 0.10m^3 per capita per day	=	7m^3/day
c. visitors	70 x 0.03m^3 per capita per day	=	2.1m^3/day
d. water for experiments	300 x 0.10m^3 per capita per day	=	30m^3/day
e. others(kitchen, spray water, etc.)		=	5m^3/day
	Total 53.1	⟶	54m^3/day

The capacity of the tanks are as follows:

a. Water reservoir tank $50m^3$

b. Elevated Water Tank $25m^3$

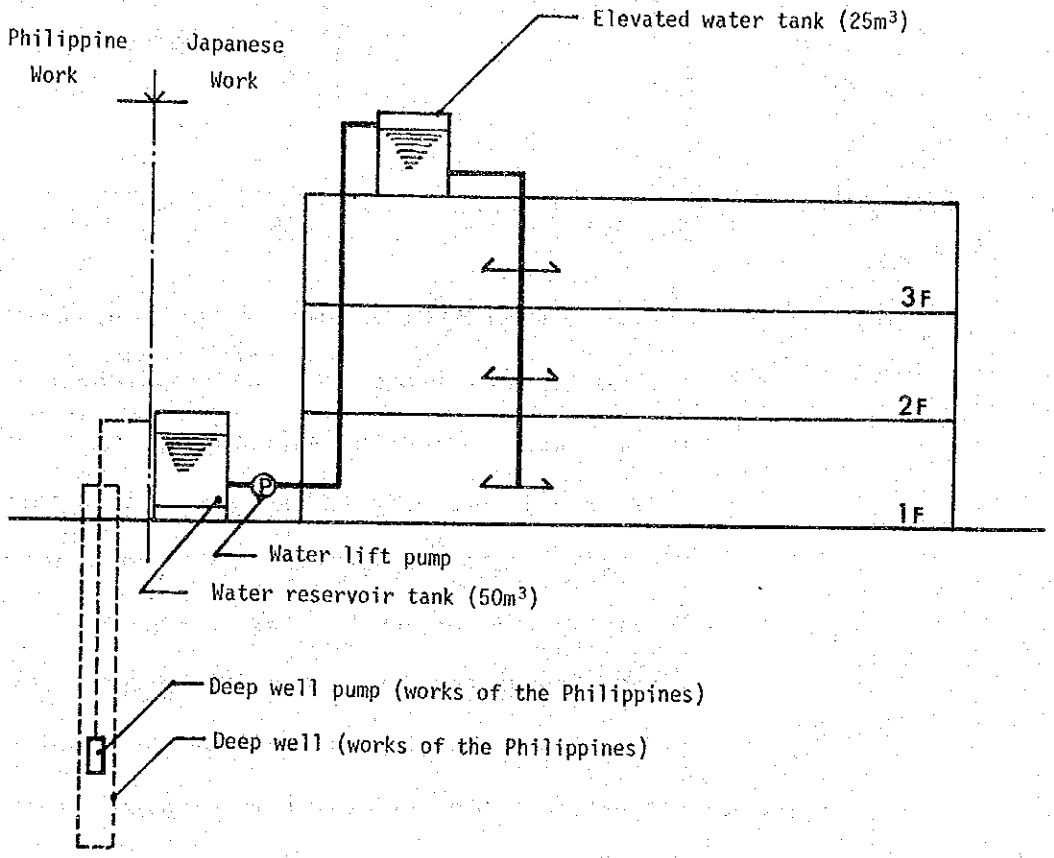


Fig. 4–3–5–(3)–(a) Water Supply System

b) Hot Water Supply System

Electric hot water storage tank is installed wherever necessary, for experiments. The installation of hot water storage tank using solar energy is also considered.

The following is the rough estimate of the hot water to be used at the Agroforestry Complex.

a. For laboratories/ Kitchenette	300 x 0.005m^3 per capita per day	=0.15m^3/day
b. For Shower Room	30 x 0.1m^3 per capita per day	= 3m^3/day
	Total 3.15 ⟶	4m^3/day

c) Drainage System

The drainage system within the building consists of soil sewage, general waste water and laboratory waste water, out of which the soil sewage and general waste water are joined at outdoors and drained into the septic tank for aeration which will be provided by Japanese side. However, from the septic tank, sewage is drained into the river through the drainage system prepared by the Philippine side. The processing capacity of the septic tank is 20m^3 per day, and the quality of water after treatment will be around BOD 90 ppm.

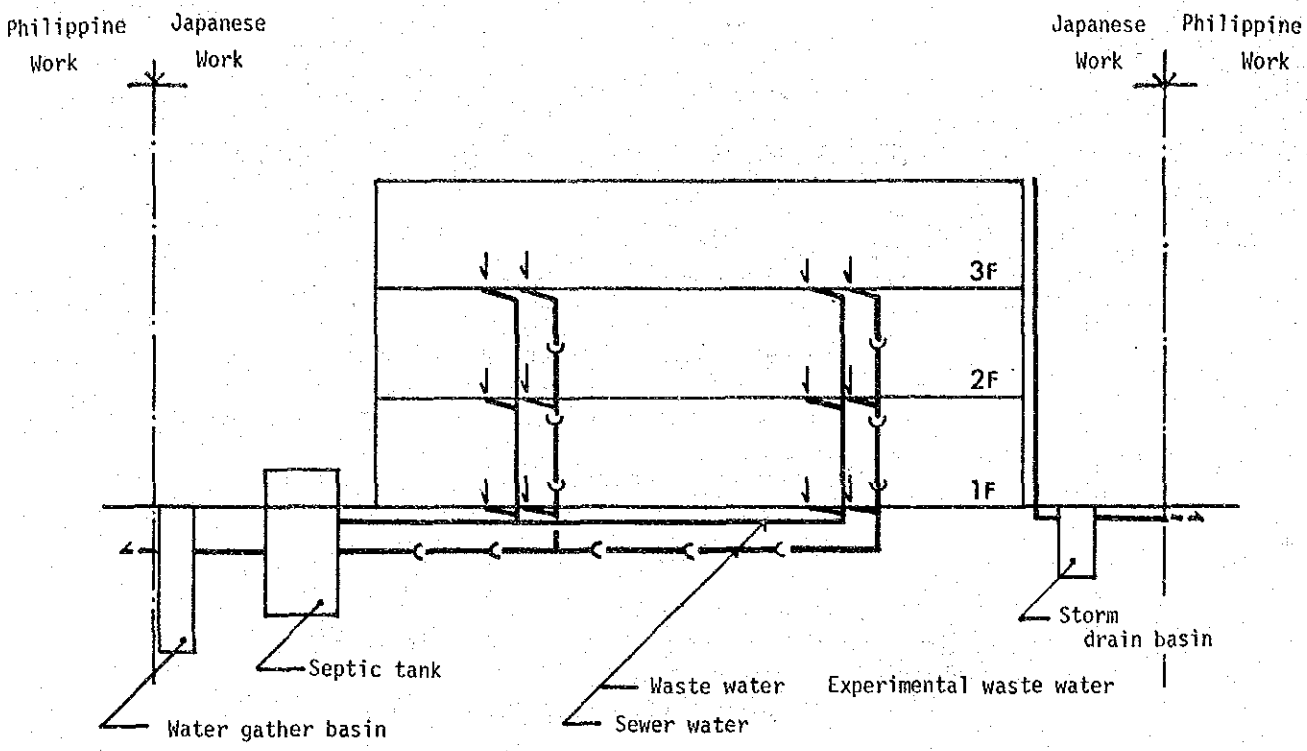


Fig. 4–3–5–(3)–b) Drainage System

d) Sanitary Fixtures

The following sanitary fixture will be installed:

* closet bowl (low-tank method)	*water closet (high-tank method)
* wash basin	*clean-out sink
* shower head/ faucets	*mirrors
* other laboratory sinks and faucets	

e) Gas

Gas cylinders will be installed outdoors, close to Laboratories and other rooms that are in need of LP gas, etc.

f) Kitchen Equipment

A kitchenette unit will be installed in six places, so that beverages and snacks can be served to the faculty staff. The units will have the following attachments:

* electric heater *sink

* shelves

g) Fire-fighting equipment

Wet stand pipes will be installed, conforming to the regulations of the Republic of the Philippines.

2) Handcraft Workshop/Garage

a) Water Supply

The Philippine side will provide construction work for drawing lead-in pipes from the existing feed pipes to the water meter. From thereon, the Japanese side will directly supply water to necessary places. The required feed water pressure is approximately 0.5kg/cm^2, and the following is the rough estimation of the amount of water necessary for the Handcraft Workshop and Garage.

a. car-wash water for Garage — 14 x 0.05m^3 per car per day = 0.7m^3 per day

b. others — 70 x 0.03m^3 per car per day = 2.1m^3 per day

Total 2.8 ⟶ 3.0m^3 per day

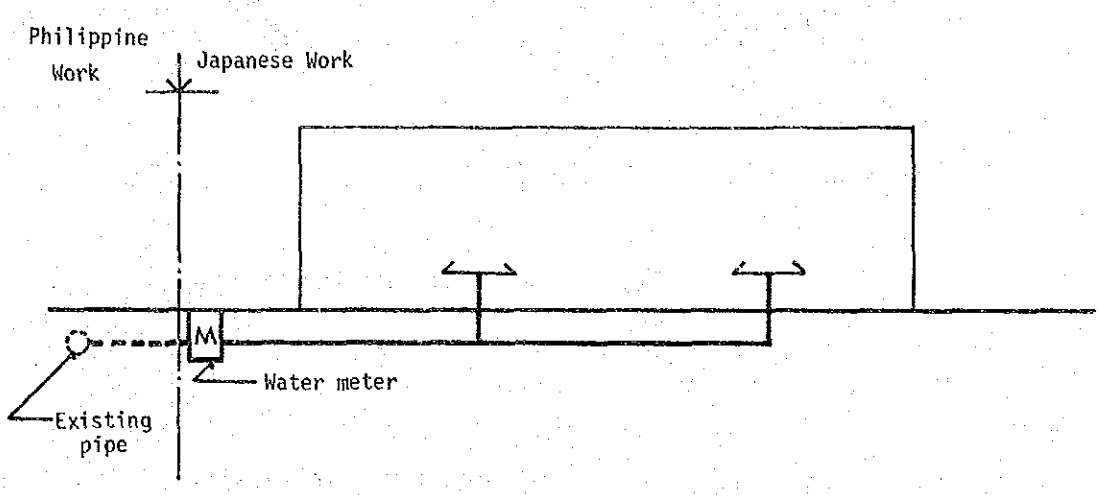


Fig. 4–3–5–3)–c) Water Supply System

b) Drainage System

The drainage system within the building consists of soil sewage and general waste water which are joined at outdoors and drained into the septic tank for aeration which will be provided by Japanese side. However, from the septic tank, sewage is drained into the river through the drainage system prepared by the Philippine side. The processing capacity of the septic tank is 3.0m^3 per day, and the quality of water after treatment will be around BOD 90 ppm.

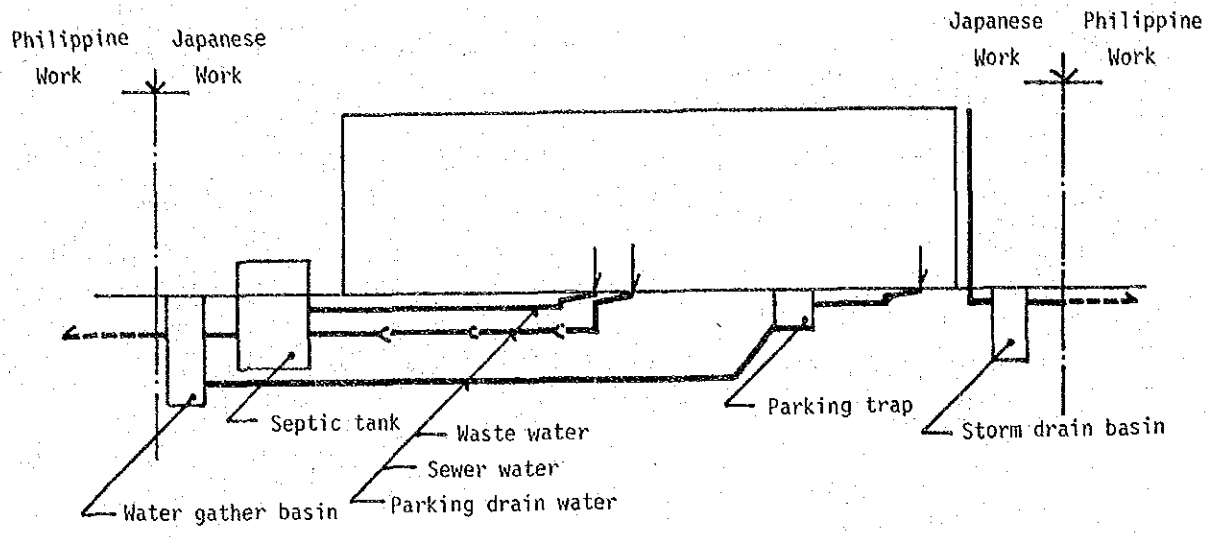


Fig. 4-3-5-3)-d) Drainage System

c) Sanitary Fixtures

The following sanitary fixture will be installed:

*closet bowl(low-tank method) *water closet(high-tank method)

*wash basin *clean-out sink

*mirrors

d) Fire-fighting Equipment

Fire extinguisher will be installed, the location, size and numbers of which will confrom to the regulations of the Republic of the Philippines.

3) Field Workshop

a) Water Supply

The Philippine side will provide construction work for drawing lead-in pipes from the existing feed pipes to the water meter. From thereon, the Japanese side will directly supply water to necessary places. The required feed water pressure is approximately 1.0kg/cm^2, and the following is the rough estimation of the amount of water necessary for the Field Workshop.

a. faculty staff — 10 x 0.3m^3 per capita per day = 3.0m^3 per day

b. water for washing tracters — 8 x 0.05m^3 per car per day = 0.4m^3 per day

Total 3.4 ⟶ 4.0m^3 per day

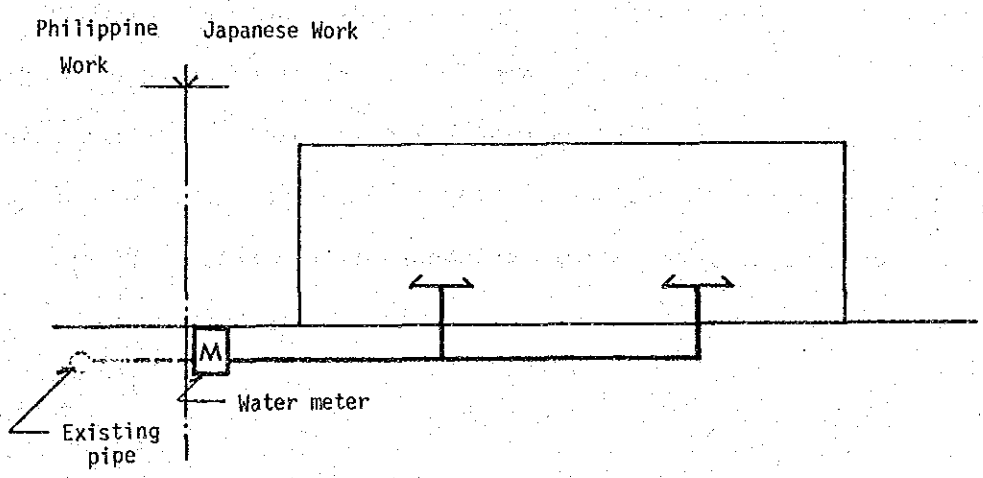


Fig. 4–3–5–3)–e) Water Supply System

b) Hot-water Supply System

Hot water storage tank utilizing solar heat will be considered for supplying hot water to shower rooms.

Electric hot water storage tank will be installed for providing beverages to faculty staff. The following is the rough estimation of the amount of hot water necessary for the Field Workshop.

a. for shower rooms: 20 x $0.1m^3$ per capita per day = $2m^3$ per day

b. potable water: 10 x $0.03m^3$ per capita per day = $0.3m^3$ per day

Total 2.3 ⟶ $2.5m^3$ per day

c) Drainage System

The drainage system within the building consists of soil sewage and general waste water which are joined at outdoors and drained into the septic tank for aeration which will be provided by Japanese side. However, from the septic tank, sewage is drained into the river through the drainage system prepared by the Philippine side. The processing capacity of the septic tank is $4.0m^3$ per day, and the quality of water after treatment will be around 90 ppm.

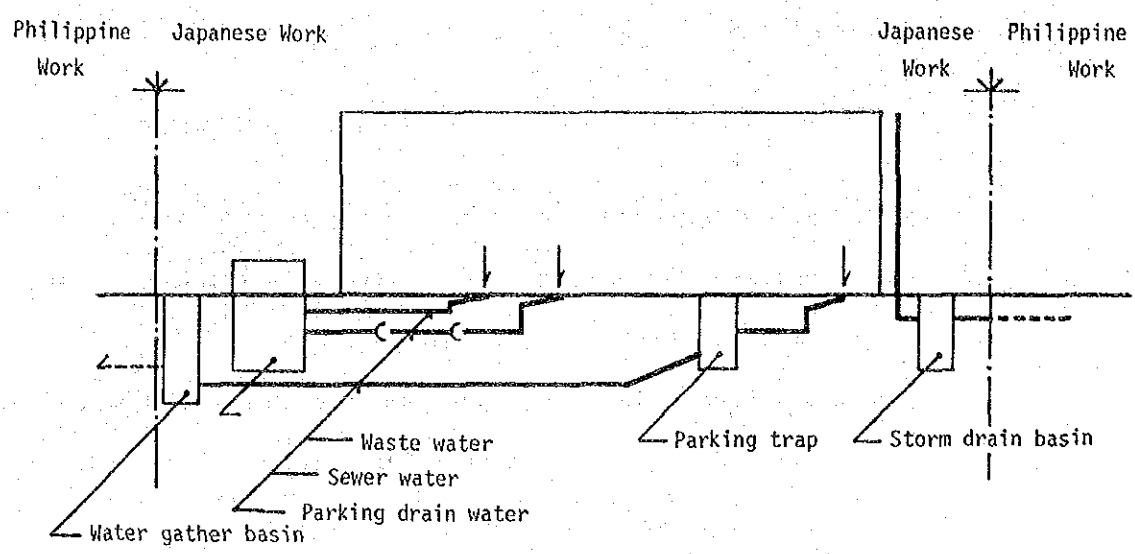


Fig. 4–3–5–f) Drainage System

d) Sanitary Fixtures

The following sanitary fixture will be installed:

* closet bowl(low-tank method) * water closet(high-tank method)
* wash basin * clean-out sink
* shower head/ faucets

e) Fire-fighting Equipment

Fire extinguisher will be installed, the location, size and numbers of which will conform to the regulations of the Republic of the Philippines.